CHAPTER 1

ASSESSING RISKS TO GLOBAL FINANCIAL STABILITY

The global financial system has undergone a period of unprecedented turmoil. Market confidence dwindled and has remained fragile, leading to the collapse or near-collapse of large, and in some cases systemically important, financial institutions, and calling forth public intervention in the financial system on a scale not seen for decades. The financial system has been severely weakened by mounting losses on impaired and illiquid assets, uncertainty regarding the availability and cost of funding, and further deterioration of loan portfolios as global economic growth slows. Finding a purely private sector resolution of financial market strains has become increasingly difficult, while case-by-case intervention by authorities has not alleviated market concerns. In response, more comprehensive approaches are now being considered or implemented to bring about a more orderly process of deleveraging and to break the adverse feedback loop between the financial system and the global economy. Such a comprehensive approach—if well coordinated among countries—should be sufficient to restore confidence and the proper functioning of markets and avert a more protracted downturn in the global economy.

As anticipated in the April 2008 *Global Financial Stability Report* (GFSR), credit quality concerns are broadening. In the United States, credit deterioration has spread to higher quality residential mortgages and to consumer and corporate loans as the economy slows. Pressures are now emerging in Europe, as house prices in some countries decline, economic growth falters, and lending conditions tighten. Although financial firms have recognized much of the subprime-related losses, further potential credit-related writedowns are placing additional strains on balance sheets.

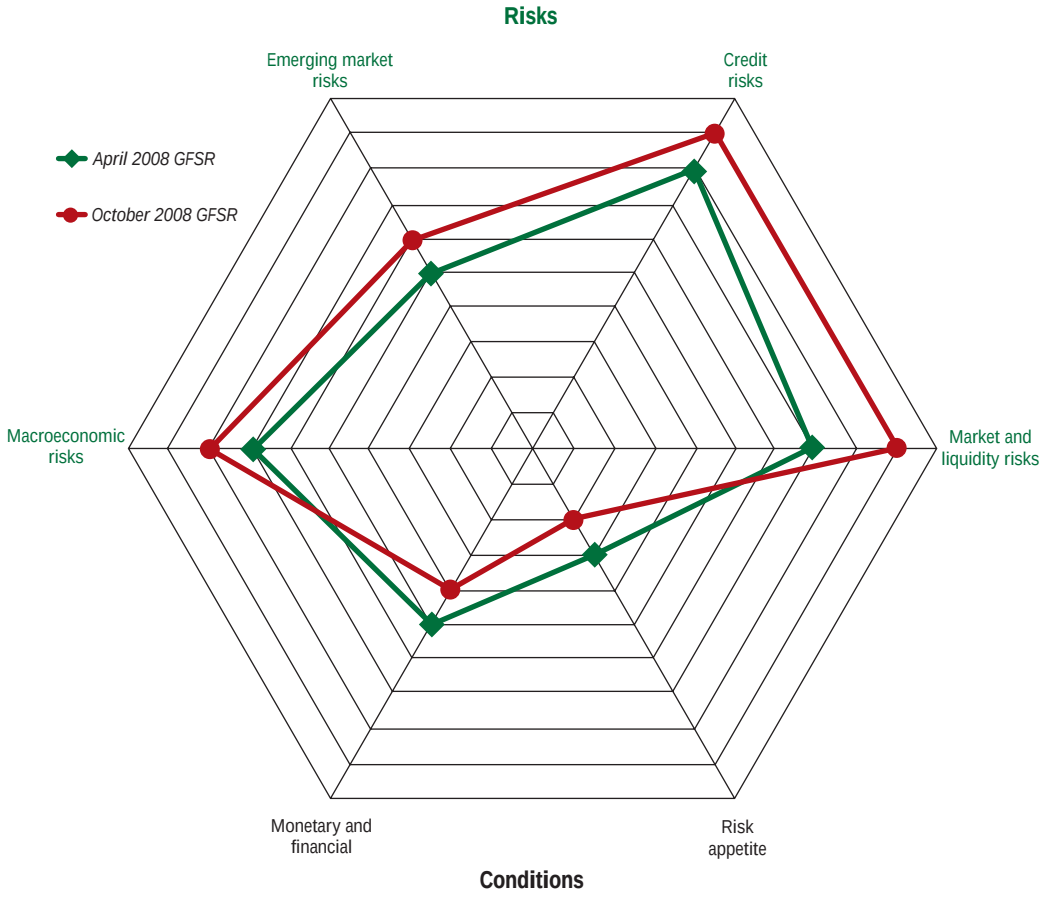
A more resilient financial system will ultimately emerge from restructuring and deleveraging, but market forces are in the meantime resulting in a disorderly, accelerated adjustment process, requiring the use of public balance sheets to restore order. In this environment, financial firms face enormous challenges in raising capital to cover losses, while efforts to shed assets are keeping downward pressures on prices. In addition, doubts about the soundness of some banks and their business models have led to severe impairment of the funding markets and sudden and at times unruly consolidation in the sector. Government initiatives aim to support a more orderly deleveraging process, but its difficult and protracted nature is likely to curtail credit availability, placing a further drag on the economic recovery. The most significant risk remains a worsening of an adverse feedback loop between the financial system and the real economy.

Emerging markets had been fairly resilient to the global credit turmoil, but now face greater risks. The pronounced reduction in investors' risk appetite has resulted in a retrenchment in short-term capital flows to emerging markets, exerting pressure on local markets, and sharply raising costs of credit. Together with slowing global growth, this results in a very challenging environment for some countries.

Policies will need to continue to consider carefully the balance of risks to the financial system and to the broader economy and are likely to require further initiatives to restore confidence. Effective and coordinated imple-

Note: This chapter was written by a team led by Peter Dattels and comprised of Sergei Antoshin, Elie Canetti, Ana Carvajal, Sean Craig, Antonio Garcia-Pascual, Kristian Hartelius, Geoff Heenan, Xiongtao Huang, Phil de Imus, Rebecca McCaughrin, Ken Miyajima, Michael Moore, Chris Morris, Silvia Ramirez, Mustafa Saiyid, Andre Santos, Narayan Suryakumar, Rupert Thorne, and Chris Walker.

Figure 1.1. Global Financial Stability Map



Source: IMF staff estimates.
Note: Closer to center signifies less risk, tighter monetary and financial conditions, or reduced risk appetite.

mentation should stabilize market sentiment and protect against downside economic risks, and allow for a more orderly and smooth deleveraging. Such measures could help asset prices rebound, and with them, the willingness of investors to again provide a now more consolidated banking sector with fresh capital. This would allow financial intermediation and credit markets to normalize more quickly and at less economic cost.

Against this backdrop, Chapter 1 first outlines the key risks that have materialized since the April 2008 GFSR. Second, it examines the depth of the default cycle and potential losses. The third and fourth sections evaluate the challenges posed by the deleveraging of the financial system in mature economies and the broader systemic implications. The fifth section assesses the vulnerability of emerging markets to global stress. Finally, the last section considers near-term policy priorities aimed at rebuilding confidence and improving the functioning of global markets, along with medium-term policies to strengthen the international financial architecture and reduce systemic risks.

Global Financial Stability Map

Since the April 2008 GFSR, monetary and financial conditions have tightened further, risk

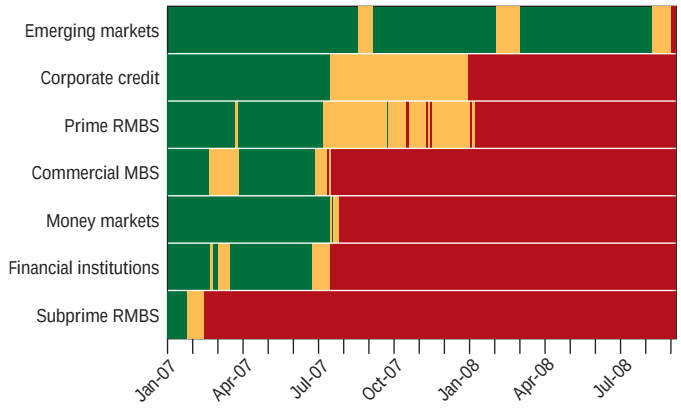
appetite has continued to contract, and global macroeconomic, credit, market and liquidity, and emerging market risks have increased (Figure 1.1).

As envisaged in the last GFSR, an adverse feedback loop between the banking system and the global economy appears to be unfolding, as weakening economic conditions reinforce the credit deterioration and stress in mortgage, credit, and funding markets, with risks also rising in certain emerging markets that had shown considerable resilience until recently (Figure 1.2).

Macroeconomic risks continue to rise . . .

Global economic activity is decelerating as growth in advanced economies slows and expansions in emerging economies lose momentum. Despite better-than-expected performance early this year, rising financial turmoil has led to a downgrade in the IMF's baseline forecast for global economic growth in 2008-09, and global growth is expected to moderate as the forces that weigh on activity remain firmly in place.[1] In particular, the supply of credit is expected to contract markedly, placing a drag on economic growth—not just in the United States, but in other advanced and emerging economies. Global inflation risks have moderated on the back of sharp declines in commodity prices from mid-year highs. However, the volatility of inflation expectations, particularly in emerging markets, is challenging monetary authorities in an environment of slowing growth, and may hamper their abil-

Figure 1.2. Heat Map: Developments in Systemic Asset Classes



Source: IMF staff estimates.

Note: The heat map measures both the level and 1-month volatility of the spreads, prices, and total returns of each asset class relative to the average during 2004–06 (i.e., wider spreads, lower prices and total returns, and higher volatility). That deviation is expressed in terms of standard deviations. Green signifies a standard deviation under 1, yellow signifies 1 to 4 standard deviations, and red signifies greater than 4 standard deviations. MBS = mortgage-backed security; RMBS = residential mortgage-backed security.

[1]See the October 2008 *World Economic Outlook* (WEO) (IMF, 2008d). Both the WEO and GFSR provide assessments of macroeconomic risks, but in the former report, these metrics are viewed in the context of risks around a baseline projection for global growth. The GFSR incorporates these metrics, as well as inflation risks, economic confidence, and other factors, all viewed from the perspective of financial stability. Hence, the overall portrayals of macroeconomic risks in the WEO and GFSR, while closely related, are not directly comparable. See Annex 1.1 for details of the specific metrics.

ity to respond to potential financial stability concerns.[2]

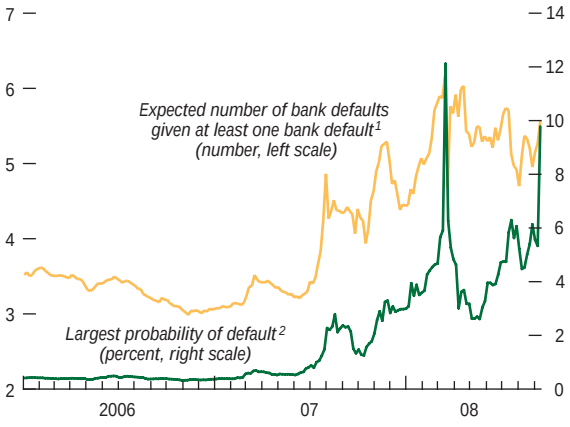
. . . as credit market stress and spillovers have led to a further tightening of financial conditions.

The effects of easing monetary conditions on firms' financing costs in the United States and United Kingdom have been more than offset by equity price declines and wider credit spreads. As financial institutions attempt to delever and reduce risks, their willingness and ability to continue extending credit has been curtailed, resulting in a tightening of *monetary and financial conditions*. The pressure to reduce leverage and risk has also had a pronounced impact on nonbank financial institutions, including hedge funds and other leveraged entities, leading to the demise of the independent broker-dealer model. Exacerbated by the adverse feedback loop between the financial system and the real economy, credit supply constraints could persist for a prolonged period.

Systemic risks have risen as credit deterioration broadens, further straining financial institutions.

Credit risks have risen, reflecting continued pressures on bank balance sheets and weakness in broader credit markets as well as plunging equity prices that make further capital-raising efforts difficult (Figure 1.3). Financial institutions in the United States and Europe continue to face enormous strains as a result of past credit indiscipline, market demands for larger capital cushions, and the likelihood of assets being brought back onto balance sheets. Uncertainty as to the treatment of systemically connected institutions under stress, in particular in the wake of the bankruptcy of a major U.S. broker-dealer, has raised the perception of counterparty credit risk to financial institutions around the world, most visibly in the United States and Europe. As such, the global financial system has

Figure 1.3. Systemic Bank Default Risk



Sources: Bloomberg L.P.; and IMF staff estimates.
[1]Among 15 selected large and complex financial institutions (LCFIs).
[2]Measures the largest probability of default among the sampled LCFIs each day.

[2]The earlier run-up in commodity prices was accompanied by increased investment flows to commodity index funds, but our analysis fails to find meaningful causal relationships between financial positions and prices of major commodities (see Annex 1.2).

entered a new phase of the crisis where solvency concerns have increased to the point where further public resources have had to be committed to contain systemic risks and the economic fallout.

Despite extraordinary measures by central banks to contain systemic risks, market and liquidity risks have risen . . .

Coordinated central bank actions have continued to aim at reducing risks to systemically important financial institutions. However, funding and liquidity strains remain high, as reflected in persistently wide interbank spreads and liquidity premia (see Figure 1.4 and Chapter 2), and have recently risen even further. Funding in interbank and commercial paper markets have locked up with mostly overnight rolls and little to no term activity, reflecting persistent and increasing concerns about counterparty credit risk and future liquidity needs (Box 1.1). Furthermore, the pressure of asset sales from financial institutions as they seek to, or are forced to, delever under highly illiquid and uncertain conditions has pushed *market and liquidity risks* to the same heightened level as credit risks.

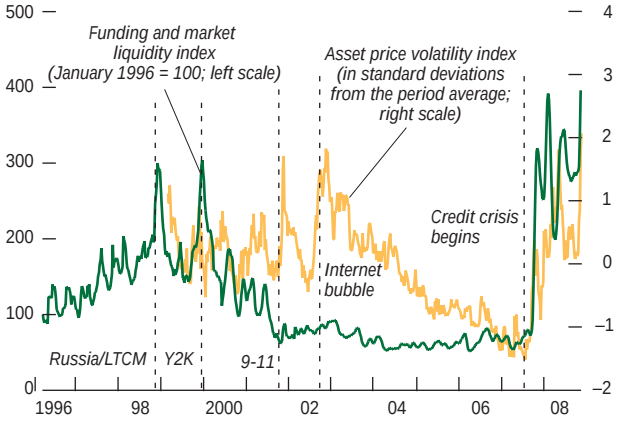
. . . and risk appetite has continued to evaporate.

More fragile market sentiment, the loss of market liquidity, and elevated macroeconomic risks have, in turn, suppressed *risk appetite* to very low levels. A number of indicators show fund managers have become even more risk averse, increasing cash allocations and scaling back positions in risky assets (Figure 1.5). While at times some investors cautiously sought value in distressed assets at current prices, at other times of market stress, the flight to safety has been extreme and broad-based. Going forward, a bottoming in prices of distressed assets is needed to help the financial sector to delever through asset sales and reduced writedowns.

Overall risks to emerging markets have deepened.

Emerging market risks have risen as global financial deleveraging and derisking weigh on

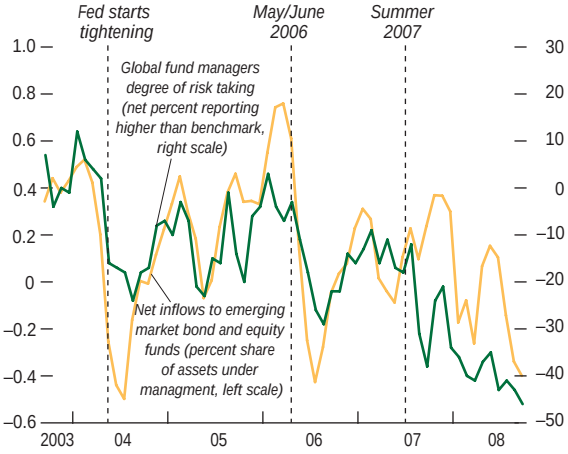
Figure 1.4. Asset Price Volatility and Funding and Market Liquidity



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

Note: Asset price volatility index uses implied volatility derived from options from stock market indices, interest, and exchange rates. Funding and market liquidity index uses the spread between yields on government securities and interbank rates, spread between term and overnight interbank rates, currency bid-ask spreads, and daily return-to-volume ratios of equity markets. A higher value indicates tighter market liquidity conditions. LTCM = Long-Term Capital Management; Y2K = Year 2000.

Figure 1.5. Allocation to Global and Emerging Market Risk Assets



Sources: Emerging Portfolio Fund Research, Inc.; Merrill Lynch; and IMF staff estimates.

Box 1.1. Recent Financial Market Developments

This box describes recent dramatic market developments, including the responses by markets and policymakers, and assesses remaining uncertainties.

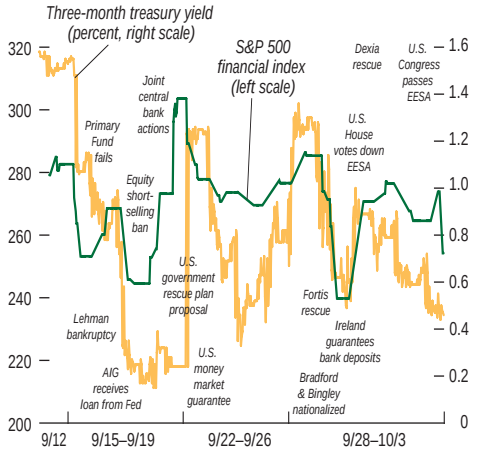
The financial crisis entered a new phase in September as the rise of systemic risks led to a sweeping government response and an unprecedented restructuring of the financial system. First, Lehman Brothers Holdings, Inc. declared bankruptcy, prompting the three largest remaining U.S. investment banks to sell themselves to, or become, depository institutions. Lehman's bankruptcy also spread default risk and removed an important financial counterparty, sharply reducing liquidity in derivatives markets. Second, the insurance conglomerate AIG nearly collapsed, raising broader concerns about financial product insurance and instigating a public sector rescue. Third, prime money market funds experienced massive withdrawals and some closures, forcing asset liquidations and capital hoarding, and bringing into question the viability of financial institutions dependent on wholesale funding.

The market response was swift, intense, and broad-based (see first figure). Risky assets sold off, overnight interbank rates surged, implied dollar funding costs increased, interest rate swap spreads widened, and, as default probabilities increased, credit default swap (CDS) spreads soared. Emerging markets, which had been relatively insulated from the crisis, came under pressure as global financing conditions deteriorated.

Liquidity became increasingly scarce and funding shifted almost exclusively to overnight markets. Demand for dollar funding grew acute, driving rates sharply higher in unsecured funding markets, while bid-ask spreads widened in foreign currency swap markets. As a flight-to-quality intensified, yields on some U.S. treasury bills temporarily became negative and market-making declined sharply. CDS markets became illiquid as counterparty risk concerns rose, making it difficult for investors to hedge positions.

Note: The main author of this box is Rebecca McCaughrin.

Timeline of Recent Market Developments

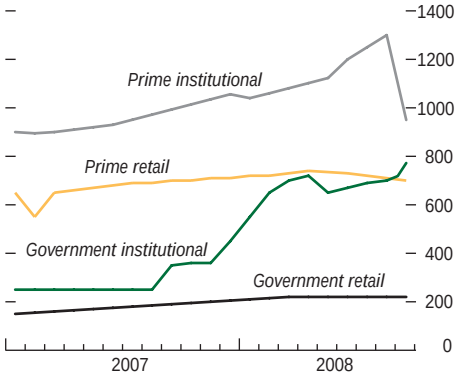


Sources: Bloomberg L.P.; and IMF staff estimates.
Note: EESA = Emergency Economic Stabilization Act.

The beginnings of a run on money market funds led many to limit their investments to very short-term, safe collateral. Prime money market funds, which invest partly in corporate debt and asset-backed securities, suffered some $320 billion of redemptions in one week, threatening especially those with no external support

U.S. Money Market Fund Assets Under Management

(In billions of U.S. dollars)



Sources: iMoneyNet; JPMorgan Chase & Co.; and IMF staff estimates.

Recent Central Bank and Government Actions

	United States	Euro Area[1]	United Kingdom[1]	Other[1]
9/14/2008	Federal Reserve expands eligible collateral for Primary Dealer Credit Facility and Term Securities Lending Facility (TSLF), increases frequency and size of schedule 2 TSLF auctions, and eases restrictions on transactions between banks and broker-dealers			
9/15/2008	$70 billion overnight repos	€30 billion overnight repos	£5 billion 2-day repos	Other central banks provide liquidity, including Japan (¥1.5 trillion) and Australia (A$2.1 billion), among others
9/16/2008	Federal Reserve extends $85 billion 2-year credit line to AIG; $50 billion overnight and $20 billion 28-day repos	€70 billion overnight repos	£20 billion 2-day and £5 billion 3-month repos	Other central banks provide liquidity, including Japan (¥2.5 trillion), Switzerland (SF726.4 million) and Australia (A$1.7 billion), among others
9/17/2008	Treasury announces supplemental financing program for Federal Reserve, and auctions $40 billion special cash management bills	€150 billion 7-day repos	Bank of England (BoE) extends Special Liquidity Scheme	Other central banks provide liquidity, including Japan (¥3 trillion), and Australia (A$4.3 billion), among others
9/18/2008	Federal Reserve expands its temporary reciprocal currency arrangements by $180 billion with major central banks, and conducts $5 billion 14-day and $100 billion overnight repos; Treasury auctions $60 billion for supplemental financing program	€25 billion overnight and $40 billion overnight repos	$14 billion overnight and £66 billion 7-day repos	Other central banks provide liquidity, including Japan (¥2.5 trillion), Switzerland ($10 billion), and Australia (A$2.8 billion), among others
9/19/2008	Federal Reserve announces plan to loan banks funds to buy asset-backed commercial paper (ABCP) and buy agency discount notes (DN) outright; Federlal Reserve purchases $8 billion agency DNs and conducts $20 billion in 3-day repos; Treasury proposes $700 billion troubled asset resolution program, announces guaranty program for money market funds, and auctions $60 billion for supplemental financing program; Securities and Exchange Commission (SEC) tightens restrictions on net short positions on financial stocks	$40 billion in 3-day repos	Financial Services Authority tightens restrictions on net short positions on financial stocks; BoE conducts $21 billion in 3-day repos	Other central banks provide liquidity, including Japan (¥3 trillion), Switzerland ($10 billion), and Australia (A$1.9 billion), among others; several regulatory institutions impose restrictions on equity short sales
9/22/2008	Federal Reserve conducts $20 billion in overnight repos	European Central Bank (ECB) conducts $25 billion 28-day repos	BoE conducts $26 billion repos	

Box 1.1 *(continued)*

Recent Central Bank and Government Actions *(continued)*

	United States	Euro Area[1]	United Kingdom[1]	Other[1]
9/23/2008	Federal Reserve conducts $20 billion in 28-day repos and purchases $2 billion in agency DNs		BoE conducts $30 billion repos	
9/24/2008	Federal Reserve expands its temporary reciprocal currency arrangements to Australian and Scandinavian central banks; conducts $25 billion in overnight reverse repos	€50 billion 84-day repos	BoE conducts $30 billion repos	
9/25/2008	Federal Reserve conducts $22 billion in overnight reverse repos		BoE conducts $35 billion repos	
9/26/2008	Federal Reserve conducts $26 billion in 3-day reverse repos; purchases $4.5 billion agency DNs		BoE conducts $10 billion overnight repos and $30 billion 7-day repos	
9/28/2008		Fortis partly taken over by governments of Belgium, Netherlands, and Luxembourg via €11.2 billion bailout package for 49 percent ownership stake; Germany organizes a €35 billion credit line for Hypo Real Estate	Bradford & Bingley (B&B) nationalized; Santander to pay £612 million for B&B's branches and deposits	
9/29/2008	Federal Reserve increases swap lines to foreign central banks from $290 billion to $620 billion, increases the size of the 84-day Term Auction Facility (TAF) auctions from $25 billion to $75 billion, introduces forward TAF auctions	ECB conducts €120 billion 38-day repos	BoE conducts $10 billion repos	Iceland's government takes 75 percent stake in Glitnir Bank
9/30/2008	Federal Reserve conducts $20 billion 28-day repos	Irish government guarantees all deposits, covered bonds, senior and dated subordinated debt (until September 2010); Dexia receives €6 billion infusion from Belgian and French governments and main shareholders; ECB conducts €190 billion 7-day repos	BoE conducts $10 billion repos	
10/1/2008	Federal Reserve conducts $20 billion overnight reverse repos		BoE conducts $7.5 billion overnight repos and $13.4 billion 7-day repos	
10/2/2008	Federal Reserve conducts $25 billion overnight reverse repos	Greek government guarantees all bank deposits	BoE conducts $8.9 billion repos	Brazilian central bank eases reserve requirements

Recent Central Bank and Government Actions *(concluded)*

	United States	Euro Area[1]	United Kingdom[1]	Other[1]
10/3/2008	Congress approves $700 billion rescue package: Treasury authorized to purchase distressed assets; FDIC temporarily allowed to borrow unlimited funds from the Treasury; FDIC deposit insurance temporarily increased from $100,000 to $250,000; Federal Reserve granted the ability to pay interest on reserves; SEC authorized to suspend mark-to-market accounting rules; Federal Reserve conducts $25 billion 3-day reverse repos	ECB to allow more banks to participate in unscheduled cash auctions; Netherlands government purchases Dutch operations of Fortis for €16.8 billion; ECB auctions $50 billion overnight repos and a €194 billion liquidity-absorbing quick tender	BoE extends eligible collateral for its weekly long-term repo operations to include AAA-rated ABS and highly rated ABCP; conducts $8.2 billion overnight repos and $30 billion 7-day repos	Russian central bank extends unsecured loans to qualified banks for up to six months and introduces other measures
10/5/2008		€35 billion rescue package promised to Germany's Hypo Real Estate Group withdrawn		

Sources: JPMorgan Chase & Co.; and national authorities.
[1]U.S. dollar operations are an extension of the Federal Reserve TAF.

from a parent bank (see second figure). As a result, they were unable to provide the nearly $2 trillion of credit they typically extend daily, leading to difficulties for financial institutions dependent on wholesale funding and nonfinancial corporations needing refinancing.

Global central banks moved rapidly to provide liquidity, including to prime money market funds (see table).[1] Liquidity support was accompanied by other forms of government support and regulatory action. The Federal Reserve extended an $85 billion, two-year loan to AIG when no private rescue materialized, facilitated by the U.S. Treasury's establishment of a supplementary financing facility. In addition, the government announced a guaranty program for money market funds, protecting investors from loss. Regulators in a number of countries limited equity short sales in an effort to stem precipitous declines in financial institutions' share prices. Last, the U.S. government proposed a Troubled Asset Relief Program (TARP) to purchase distressed assets from financial institutions in order to reduce balance sheet pressures.

Market conditions remained mixed in the wake of these initiatives. Liquidity support helped reduce overnight borrowing costs, but effective overnight policy rates experienced significant intraday volatility as a result of the large liquidity injections, increased demand for dollar funding by non-U.S.-market participants, and delays by money managers in completing funding. Term funding costs are still elevated and tiering has become noticeable, reflecting concerns about counterparty risk and future liquidity needs. Conditions in other markets, including, for instance, major equity indices, CDS spreads on key financial companies, short-term dollar lending rates in overseas markets, and emerging market assets, eased from extreme levels, though they remained under stress.

Significant uncertainties remain, resulting in fragile market confidence. First, the scope of government programs to help financial institutions dispose of troubled assets remains uncertain. Second, the simultaneous occurrence of several large credit events is testing the CDS

[1]In addition, a consortium of financial firms set up a pooled fund to provide collateralized borrowing to each other, with the intention of accepting a broader range of collateral for longer durations than central banks.

Box 1.1 *(concluded)*

settlement infrastructure. Market participants are still assessing their counterparty exposures in markets that are neither well-automated nor transparent. Many will face logistical risks identifying, closing, offsetting, and reestablishing positions, while others may face debilitating losses on their credit exposure. Third, markets will remain subject to the potential for disorderly asset sales as current (and likely future) bankruptcy proceedings ensue. Fourth, while the government actions may help accelerate the deleveraging process, this will not eliminate the need for banks to continue to delever and replenish capital over the coming years. Fifth, while the viability of the business models of major independent broker-dealers has now been resolved (in the negative), uncertainties remain about other financial business models, including, for instance, financial insurers, nondiversified mortgage originators and servicers, and certain types of money market funds. Finally, markets remain uncertain about how policy authorities will balance the competing claims of trying to minimize moral hazard while protecting against systemic risk, thus complicating policymakers' abilities to send clear signals about their intentions.

the appetite for emerging market assets and exacerbate vulnerabilities. Emerging market equities and corporate bonds have followed a similar downward trajectory as mature credit markets, and default probabilities have risen on sovereign and corporate debt. Capital outflows have intensified, leading to tighter international and in some cases internal liquidity conditions. Vulnerabilities vary across different economies, but those economies with greater reliance on short-term flows or with leveraged banking systems funded internationally are particularly vulnerable. In addition, slowing global growth could accelerate a downturn in domestic credit cycles, raising defaults. Though inflation concerns have eased over the past few months, sharp increases in inflation volatility could induce financial instability in some local markets, should inflation expectations become entrenched, and reduce policy flexibility amid heightened global risks. Nonetheless, sizable reserve cushions and favorable external balances in many emerging economies and sound policies continue to provide resilience to global stress.

The Default Cycle

The depth and breadth of the credit default cycle will be a key determinant of pressures on the financial system going forward. This section assesses recent performance of key U.S. and European credit markets, and estimates the trajectory of the U.S. default cycle for a variety of loans. The base case suggests that charge-off rates on U.S. residential mortgages, already at historic highs, will climb further, while consumer loans exceed record levels and corporate and commercial real estate (CRE) loans reach multi-year highs (Figure 1.6).[3] The results show that further losses lie ahead for financial institutions, rising well beyond the estimates of nearly $1 trillion in the April 2008 GFSR. Under a more stressed economic scenario, entailing a deeper and more protracted U.S. recession, larger declines in house prices, and a longer period of tight lending standards, charge-off rates on CRE and corporate loans could climb close to historical peaks, exacerbating losses.[4]

[3]A charge-off is a loan that is removed from a bank's books and charged against loan loss reserves. Loans that are removed are those that are no longer collectible, due either to bankruptcy or default. Charge-off rates are the ratio of gross charge-offs minus recoveries to the average level of loans outstanding during a quarter, annualized.

[4]See Box 1.6 in Annex 1.3 for details on the econometric results. In addition to the assumptions in Table 1.1, bank lending standards are expected to be at their tightest in Q4 2008 in the base case. Our stress case assumes lending standards remain tight for a longer period. This scenario analysis was applied only to whole loans (not securities).

Highly levered U.S. households are under pressure from falling net worth and tighter credit conditions.

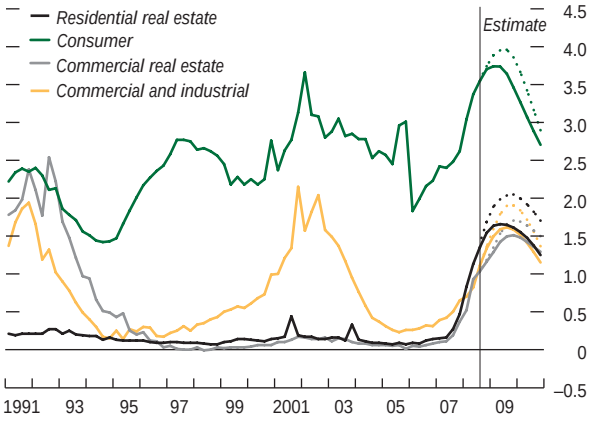
After amassing record amounts of mortgage debt and housing assets in recent years, household balance sheets and real disposable incomes have come under pressure owing to falling house prices, a deteriorating employment backdrop, and rising oil and food prices. In the first half of 2008, U.S. household net worth fell on a year-on-year basis for the first time since 2003, driven primarily by the halt in both real estate and financial asset growth (Figure 1.7).[5]

Falling house prices and a slowing economy threaten to weaken higher-quality mortgages.

U.S. residential mortgages are experiencing unprecedented credit deterioration. Since the last GFSR, delinquencies on U.S. subprime and Alt-A mortgages have risen further and home foreclosures have reached new highs, especially in regions where home prices have fallen the most (Figure 1.8). Reflecting this credit deterioration, bank charge-offs have risen, and prices on nonagency mortgage-related securities (especially Alt-A and senior subprime tranches) have resumed their declines (Figure 1.9). At the same time, nonconforming prime mortgages ("jumbo") are facing tighter lending standards, higher mortgage rates, and more limited securitization potential, making them harder to refinance. The increases in the conforming loan limits of the government-sponsored enterprises (GSEs) and the Federal Housing Authority (FHA) have yet to alleviate pressure in that sector. The conforming mortgage market has benefited from GSE securitization (and a more explicit government guarantee), but faces many of the same cyclical pressures as the broader mortgage market, which have led to a rise in prime mortgage defaults.

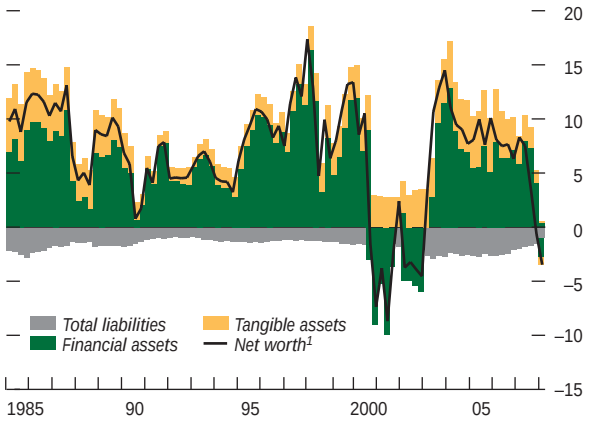
[5]By contrast, during the early 1990s downturn, the growth in household net worth slowed but did not decline, despite the savings and loan crisis. In the downturn beginning in 2000, net worth fell, primarily due to falling equity prices.

Figure 1.6. U.S. Loan Charge-Off Rates
(In percent of loans outstanding; annualized rate)



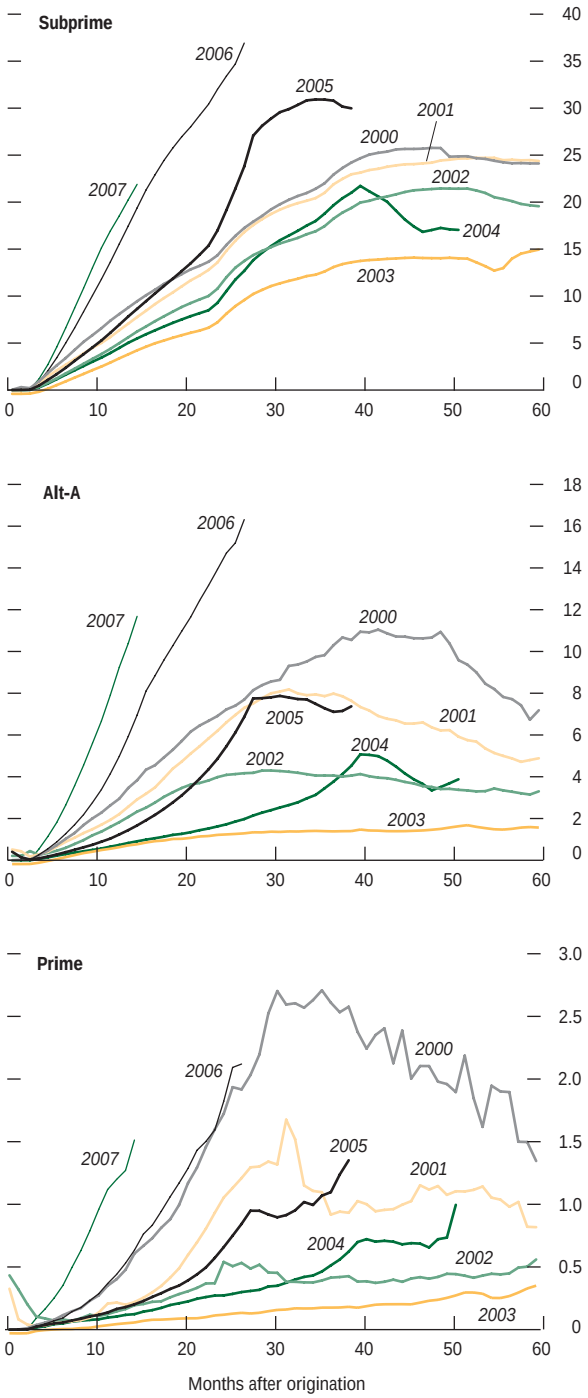
Sources: Federal Reserve; and IMF staff estimates.
Note: Dotted lines are stress case estimates.

Figure 1.7. U.S. Households' Balance Sheets: Net Worth
(Percent yearly contributions to net worth growth)



Sources: Federal Reserve; and IMF staff estimates.
[1]Year-on-year percent change in net worth.

Figure 1.8. U.S. Mortgage Delinquencies by Vintage Year
(60+ day delinquencies, in percent of original balance)



Sources: Merrill Lynch; and LoanPerformance.

While the U.S. housing sector may finally trough at some point in 2009, continued declines in house prices and sluggish growth are likely to deepen and broaden the default cycle. The combination of tighter lending standards, falling home prices, and lower recovery values would lead to a rise in charge-off rates on residential mortgages from the current 1.1 percent rate to a peak of 1.9 percent by mid-2009, and they could remain elevated throughout 2010 (Figure 1.10).

Pressures on household balance sheets presage deterioration in consumer loans.

Charge-off rates on U.S. consumer loans have risen. In addition, there are rising signs of stress as consumers tap credit lines to support consumption amid higher mortgage and other costs. Additionally, the ability to pay down higher-interest credit card debt with cheaper home equity loans has diminished, suggesting that some consumers are being forced to shift from secured mortgage debt to higher-cost, unsecured credit card debt.[6] However, with tighter lending standards, the availability of this type of credit may fall. Our analysis shows that tighter bank lending standards and slowing growth are likely to lead to consumer loan charge-off rates of about 3.9 percent by early 2009, slightly above the peak levels of 2002, before falling to more normal levels by 2010 (Figure 1.11). Under a stress scenario, charge-off rates climb to over 4 percent.

Stresses on U.S. consumers are also leading to credit weakening in commercial real estate loans.

Charge-off rates on U.S. CRE loans have already reached decade-high levels, as weaker consumer fundamentals weigh on the retail and condominium sectors. As with other loan categories, credit deterioration has been more pronounced on recently originated (2006–07) loans, which had weaker underwriting standards

[6]Banks have accommodated this increase so far, partly because credit card securitization has remained relatively robust over the last year.

(e.g., higher loan-to-value and debt service coverage ratios). Econometric analysis indicates that private consumption strongly affects the level of CRE charge-off rates. Charge-offs may rise to a 17-year high of about 1.7 percent by the end of 2009, or to 1.9 percent under our stress scenario, remaining elevated for some time, though still below the levels reached in the early 1990s.

Tighter access to credit is pressuring leveraged companies and small and mid-sized enterprises, while nonfinancial investment-grade firms' access remains relatively robust.

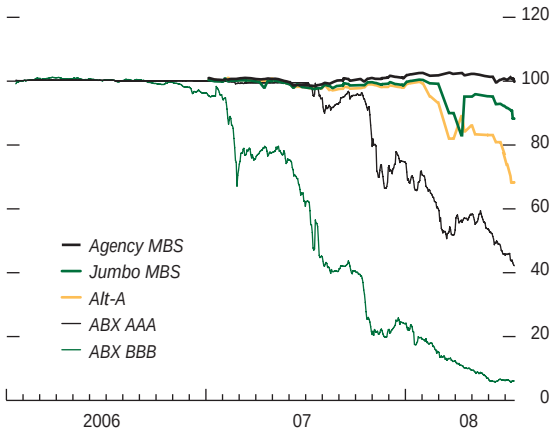
A weakening economic environment is already leading to corporate credit deterioration, especially for firms closely tied to the consumer. Credit quality has deteriorated on leveraged buyout deals in the last few years, as shown by the rising ratio of rating downgrades to upgrades in this sector.[7] Secondary market liquidity for leveraged loans remains low and banks and managers of collateralized loan obligations are selling loans at significant losses. Some of these sales have been to private equity firms, partly encouraged by lower prices and seller-provided financing for the purchases. Consequently, the leveraged loan pipeline has declined to $70 billion from a peak of $304 billion in mid-2007, relieving one source of potential stress on asset prices.

High-yield corporate bond issuance has slowed considerably, and firms are facing reduced access, higher rates, and shorter durations on their commercial paper obligations. As the cycle has begun to turn, default rates have started to increase, rising to 2.5 percent. Through mid-September of this year, globally, 57 corporate issuers have defaulted, compared with just 22 issuers in all of 2007.[8] The cur-

[7]A more pronounced deterioration in recent leveraged loans may ultimately materialize where "covenant-lite" agreements may have hindered early intervention by lenders.

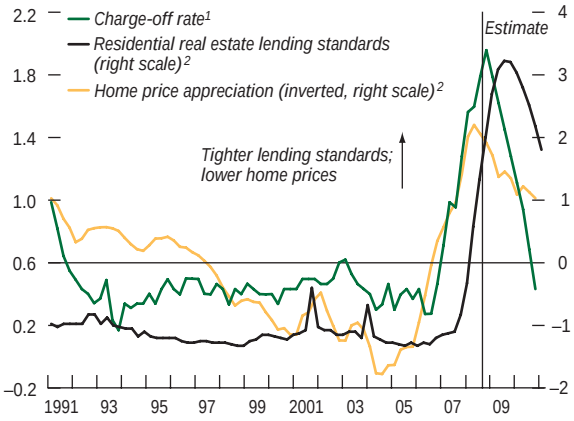
[8]In the United States, the ratio of rating agency upgrades to downgrades on high-yield bonds is at its lowest level in four years.

Figure 1.9. Prices of U.S. Mortgage-Related Securities
(In U.S. dollars)



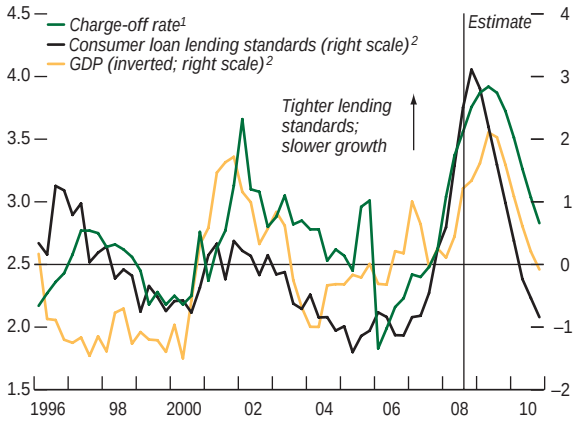
Sources: JPMorgan Chase & Co.; and Lehman Brothers.
Note: ABX = an index of credit default swaps on mortgage-related asset-backed security; MBS = mortgage-backed security.

Figure 1.10. U.S. Residential Real Estate Loan Charge-Off Rates
(In percent)



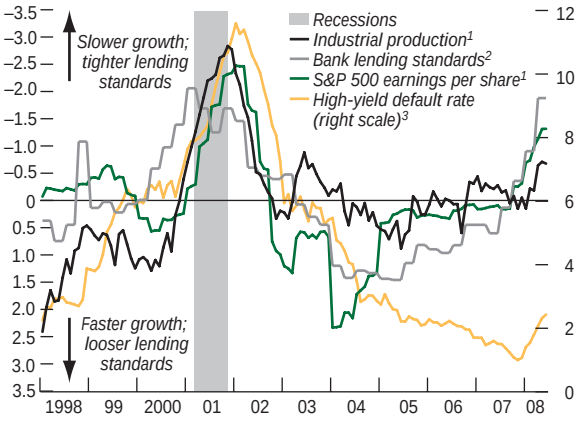
Sources: Federal Reserve; S&P Case-Shiller; and IMF staff estimates.
[1]As a percent of loans outstanding; annualized rate.
[2]Series standardized over the period from 1991:Q1 to 2010:Q4.

Figure 1.11. U.S. Consumer Loan Charge-Off Rates
(In percent)



Sources: Federal Reserve; Bureau of Economic Analysis; and IMF staff estimates.
[1]As a percent of loans outstanding; annualized rate.
[2]Series standardized using data from 1996:Q1 to 2010:Q4.

Figure 1.12. Macroeconomic and Corporate Indicators and Default Rates
(In percent)



Sources: Bureau of Economic Analysis; Federal Reserve; JPMorgan Chase & Co.; Merrill Lynch; Moody's; National Bureau of Economic Research; and IMF staff estimates.
[1]Year-on-year changes; standardized; inverted scale.
[2]Net survey balances; standardized.
[3]Issuer-weighted.

rent trend is broadly in line with our baseline forecast (a 4 to 6 percent U.S. high-yield default rate) (Figure 1.12).[9] Moreover, tighter bank lending standards are set to squeeze small and medium-sized firms, given their greater reliance on direct bank borrowing than on capital market financing. Despite continued strong balance sheets for investment-grade nonfinancial corporations, charge-off rates on commercial and industrial loans have already increased to their highest level since 2004. Our analysis suggests that slowing GDP growth and tighter lending standards could raise charge-off rates from 0.7 to 1.7 percent by the second quarter of 2009—still slightly below the level reached during the 1990–91 and 2001 downturns. They would match the previous peak only under the stress scenario.

Significant writedowns have already been realized, but more may lie ahead. . .

Our estimate of aggregate writedowns based on global holdings of U.S.-originated and securitized mortgage, consumer, and corporate debt has risen to $1.4 trillion (versus $945 billion in April), largely due to higher-than-expected losses on prime mortgage loans and corporate debt (Table 1.1) and wider spreads on related securities.[10]

The scale of the current credit crisis is likely to be higher in dollar terms compared with financial crises over the past two decades, and could be sizable relative to GDP, though costs are more broadly spread across different countries and institutions. The ultimate fiscal cost is highly uncertain at this stage and is policy dependent (Figure 1.13).

Increased writedowns owe to a further deterioration in the corporate debt and prime residential mortgage markets, as the crisis originally centered in subprime mortgages has spilled over

[9]See Box 1.1 of the April 2008 GFSR for details (IMF, 2008a).
[10]The methodology for estimating losses and charge-off rates is discussed in greater detail in Annex 1.3. Losses on loans and securities in other regions are not included in these estimates.

Table 1.1. Estimates of Financial Sector Potential Writedowns
(In billions of U.S. dollars)

	Base Case Estimates of Writedowns on U.S. Loans			Writedowns on U.S. Loans				
	Outstandings	April estimated losses	October estimated losses	Banks	Insurance	Pensions/ Savings	GSEs and government	Other (hedge funds, etc.)
Subprime	300	45	50	35–40	0–5	0–5	—	10–15
Alt-A	600	30	35	20–25	0–5	0–5	—	5–10
Prime	3,800	40	85	25–30	0–5	0–5	45–55	0–5
Commercial real estate	2,400	30	90	60–65	5–10	0–5	—	10–20
Consumer loans	1,400	20	45	30–35	0–5	0–5	—	10–15
Corporate loans	3,700	50	110	80–85	0–5	0–5	—	25–30
Leveraged loans	170	10	10	5–10	0–5	0–5	—	0–5
Total for loans	12,370	225	425	255–290	5–40	0–35	45–55	60–100
	Base Case Estimates of Mark-to-Market Losses on Related Securities			Losses on Securities				
	Outstandings	April estimated mark-to-market losses	October estimated mark-to-market losses	Banks	Insurance	Pensions/ Savings	GSEs and government	Other (hedge funds, etc.)
ABS	1,100	210	210	100–110	40–45	35–55	10–15	10–25
ABS CDOs	400	240	290	145–160	55–75	30–45	15–20	15–30
Prime MBS	3,800	0	80	20–25	10–15	10–20	20–25	0–5
CMBS	940	210	160	80–90	20–25	15–35	10–20	15–20
Consumer ABS	650	0	0	—	—	—	—	—
High-grade corporate debt	3,000	0	130	65–75	20–30	20–35	—	5–20
High-yield corporate debt	600	30	80	45–50	10–15	15–20	—	5–15
CLOs	350	30	30	15–20	0–5	0–5	—	5–10
Total for securities	10,840	720	980	470–530	155–210	125–215	55–80	55–125
Total for loans and securities	23,210	945	1,405	725–820	160–250	125–250	100–135	115–225

Sources: Goldman Sachs; JPMorgan Chase & Co.; Lehman Brothers; Markit.com; Merrill Lynch; and IMF staff estimates.

Note: The prime residential loans category includes a portion of GSE-backed mortgage securities. ABS = asset-backed security; CDO = collateralized debt obligation; CLO = collateralized loan obligation; GSE = government-sponsored enterprise; CMBS = commercial mortgage-backed security; MBS = mortgage-backed security.

to adversely affect economic prospects more broadly. Both high- and low-grade corporate debt have been significantly weakened by developments in the financial sector, while non-financial sectors, such as industrials and utilities, are also starting to weaken.[11] The prime residential mortgage market has been affected by a combination of factors, including especially rising unemployment and falling U.S. house prices. The impact of these factors had previously been felt mostly by less creditworthy borrowers of mortgage loans.

While writedowns have mushroomed over the last year, there is still a significant gap between reported and estimated writedowns. Reported writedowns reached $760 billion by end-September, $580 billion of which were incurred by global banks (Figure 1.14).[12] As expected, losses have been mostly mortgage-

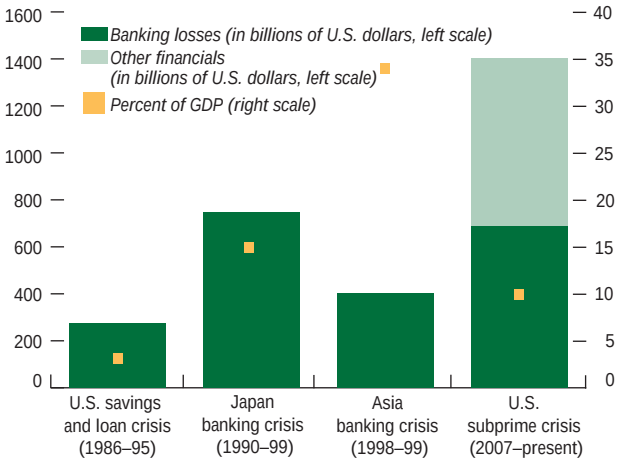
[11]Potential losses due to the bankruptcy of Lehman Brothers are included in our estimates for losses on corporate debt.

[12]Writedowns for individual banks have been somewhat higher than expected. This appears to be mainly due to one or more of the following factors: (1) earlier incomplete disclosure of exposure to problem loans or securities; (2) higher-than-expected loss provisions for loans held to maturity; (3) losses on restructurings and sales of subsidiaries with credit market exposure; and (4) losses on trading and execution, possibly due to leveraged exposure.

related, and have been primarily shouldered by U.S. and European banks, with limited losses in Asia. At the same time, provisioning for future losses on corporate and leveraged loans has increased, and further writedowns have been taken on trading activities and exposures to monolines.

Nonbank institutions have shouldered at least $180 billion of losses to date. Some $100 billion of credit-related losses have been reported by insurance companies thus far (of which $20 billion is by monolines). Writedowns taken by GSEs have been about $20 billion but are expected to climb further by up to $115 billion over the full credit cycle. Hedge funds and other market participants are estimated to have incurred $60 billion in losses. Data on losses by pension and savings institutions are unavailable. Accordingly, at least 55 percent of known potential losses (in our base case) have already been recognized by financial institutions.

Figure 1.13. Comparison of Financial Crises



Sources: World Bank; and IMF staff estimates.
Note: U.S. subprime costs represent staff estimates of losses on banks and other financial institutions from Table 1.1. All costs are in real 2007 dollars. Asia includes Indonesia, Malaysia, Korea, the Philippines, and Thailand.

. . . and could rise further under a scenario of greater stress.

Higher losses could materialize across most loan categories under the stress scenario (Table 1.2).[13] Peak charge-off rates (which are 30 to 50 basis points higher than in our baseline scenario) would translate into losses on bank loans that are about 20 percent ($80 billion) higher. Should markets for securitized debt price in a more negative scenario, losses could be of a greater magnitude.

In Europe, high leverage and falling house prices portend worsening credit quality in some mortgage markets.

Global losses could be higher should credit quality worsen and writedowns mount on non-U.S. loans. Already, fundamentals are deteriorating in some European economies, where house price appreciation has slowed considerably or turned negative, lending standards have tightened, and mortgage rates have risen. Delinquen-

[13]See Annex 1.3 for details on the scenario analysis.

Table 1.2. Estimates of Potential Losses on Loans

(In billions of U.S. dollars; 2007:Q2 through August 2008)

	Outstanding	Base Case	Stress Case	Difference
All residential	4,700	170	210	40
Commercial real estate	2,400	90	100	10
Consumer loans	1,400	45	50	5
Corporate loans	3,700	110	130	20
Leveraged loans	170	10	15	5
Total for loans	12,370	425	505	80

Source: IMF staff estimates.

Note: The analysis applies the specific lending standards index for each loan class, and the assumptions for them are discussed in Box 1.6 in Annex 1.3.

cies have begun to rise on mortgage-related and other asset-backed securities, though they vary by sector, vintage, and collateral type. Collateral performance has been weakest on U.K. mortgage-related assets, for which primary markets are inactive, secondary market liquidity is thin (with the exception of AAA-rated securities), and spreads on related securities continue to widen.

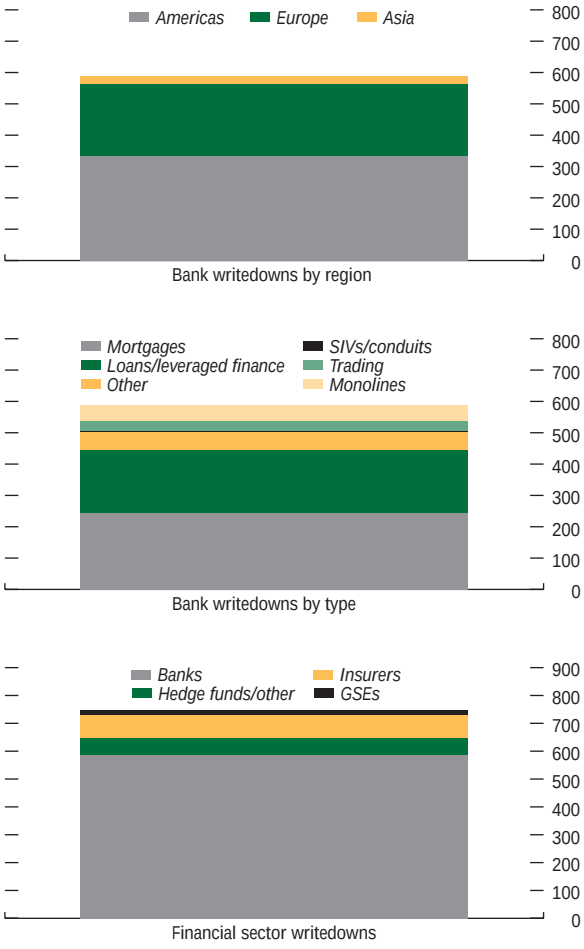
As in the United States, the U.K. household sector is highly leveraged and is now undergoing a similar deleveraging-cum-housing-deflation cycle (Figure 1.15). So far, mortgage arrears have picked up moderately from low historical levels, and bank charge-offs on mortgages remain very low.[14] However, with house prices falling rapidly, arrears and losses are likely to rise several times over. Nevertheless, our analysis suggests that U.K. defaults are unlikely to breach their historical peak, reached in the early 1990s, with mortgage loss rates likely to be considerably lower than those observed in the United States (Figure 1.16).[15] Moreover, the effects of

[14]These data may understate the actual level, since they exclude many of the lenders that specialize in the nonconforming market, several of which have already experienced difficulties and scaled back their operations.

[15]These estimates assume that house prices decline 15.5 percent year-on-year, GDP growth troughs at 0.6 percent year-on-year, and the unemployment rate remains fairly stable at 5.8 percent in 2009.

Figure 1.14. Financial Sector Losses

(In billions of U.S. dollars; 2007:Q2 through August 2008)



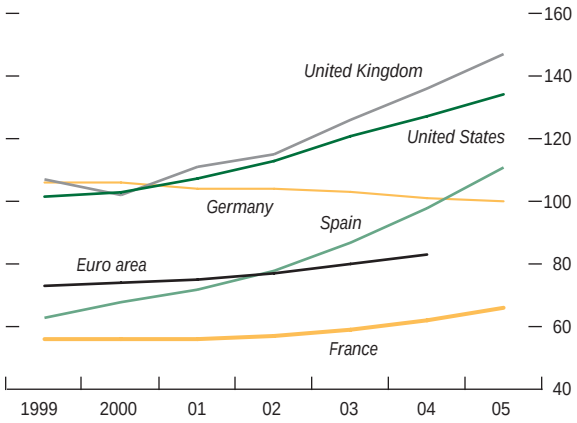
Sources: Bloomberg L.P.; and IMF staff estimates.

Note: SIVs = structured investment vehicles; GSEs = government-sponsored enterprises.

nonprime losses should be less pronounced, given the small market share of U.K. nonprime loans.

The Spanish household sector has also become significantly leveraged in recent years, with the ratio of household debt to disposable income exceeding the average ratio for the euro area, and approaching that of the United States. Doubtful loans are increasing, although from a historically low level.[16] However, as in housing markets with similar appreciations elsewhere in Europe, banks have become more cautious in their lending, with year-on-year euro area mortgage lending falling.

Figure 1.15. Ratio of Household Debt to Gross Disposable Income
(In percent)



Sources: Banco de España; Datastream; Eurostat; and IMF staff estimates.

Financial System Deleveraging

This section examines the difficult and protracted nature of the deleveraging process in the financial system and its implications for the real economy. There has been an epochal restructuring of the financial system, triggered and accelerated to a large extent by market pressures. Financial institutions have been forced to make significant adjustments over the past six months, with the process at times disorderly and exacerbating the systemic aftershocks. Each of the major U.S. broker-dealers no longer exists in its previous form, whether due to bankruptcy or by either becoming, or being absorbed by, a deposit-taking bank. In addition, substantial amounts of capital have been raised. Banks have widened their sources of funding to compensate for dysfunctional securitization and interbank funding markets. Some banks have sold liquid assets and absorbed off-balance-sheet structured investment vehicles and conduits, while attempting to reduce balance sheet risk and strengthen liquidity buffers. Others are allowing illiquid assets to

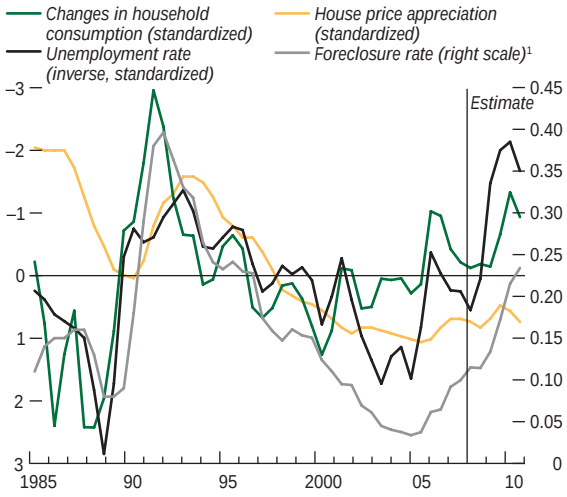
[16]Nonperforming loans at large Spanish banks have risen from 0.6 percent of total loans at the end of 2007 to 1.1 percent as of June 2008. The nonperforming-loan ratio is based on an unweighted average of the five largest Spanish banks. For an assessment of global housing market developments, see Box 1.2 of the October 2008 WEO (IMF, 2008d).

run off at maturity, but this takes time, as the impaired assets have average maturities of four to five years.

The deleveraging process may continue past the end of the decade.[17] Bank balance sheets are under pressure to expand, as certain types of near-bank entities contract, fold, or are bought, and credit is reintermediated, and as firms draw down prenegotiated credit lines.[18] Confidence in securitization markets remains impaired, and regulators, credit rating agencies, and markets are reevaluating whether and how banks should continue to be restructured to cope with the risks revealed during the crisis. The pace of deleveraging will depend on the depth of the economic and housing downturns, the scope for banks to restructure activities and rebuild profits, and the willingness of investors to provide banks with fresh capital. Should conditions improve faster than expected, deleveraging will be smoother and the supply of credit less constrained.

Deleveraging extends beyond the banking system to other leveraged financial institutions, such as hedge funds and other near-bank entities through the unwinding of structures that were highly leveraged, thinly capitalized, and/or

Figure 1.16. U.K. Mortgage Foreclosures
(In percent)

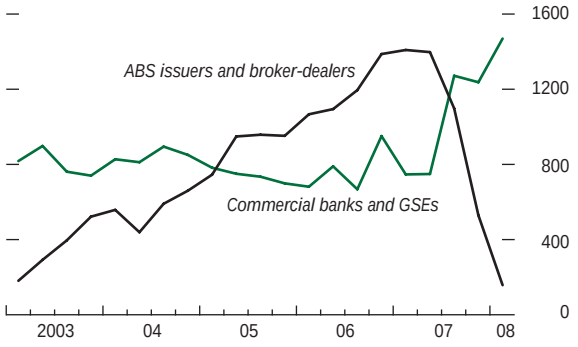


Sources: Bank of England; HBOS; U.K. Office for National Statistics; and IMF staff estimates.
[1]As a percent of all loans.

[17]Deleveraging, in this context, covers a range of strategies. On the liabilities side of bank balance sheets, these strategies entail raising fresh capital, as well as ensuring diversified, longer-maturity, and durable sources of funding. On the assets side, the strategies are to avoid concentrated exposures to illiquid or risky assets, dispose of noncore assets, and adopt hedging strategies that accurately mirror exposures.

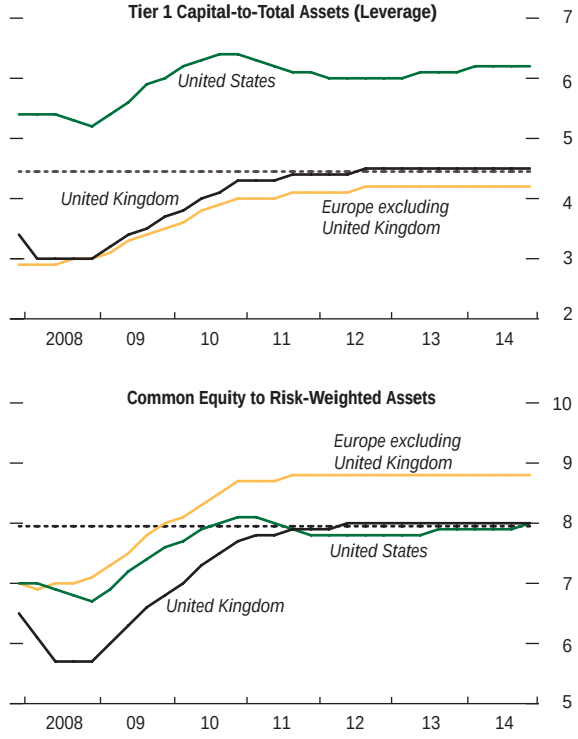
[18]"Near-bank entities" typically intermediate credit (or hold securities of those loans) traditionally originated by banks, primarily rely on capital market financing, have not generally been eligible for regular central bank funding (though access has been expanding), and in some cases are only loosely regulated. They include the special-purpose entities that issue ABS, mortgage-backed securities (MBS), CDOs, and asset-backed commercial paper (ABCP), and firms such as real estate investment trusts, global funds, the GSEs, and, until recently, the five major U.S. investment banks. These entities also intermediate some securities, such as auction rate securities, tender option bonds, and variable-rate demand obligations that transform the long-term liabilities of U.S. municipalities, student loan originators, and others into short-term liabilities.

Figure 1.17. Net Acquisition of Financial Assets by U.S. Financial Firms
(Annual rate in billions of U.S. dollars, four-quarter moving average)



Sources: Federal Reserve; and IMF staff estimates.
Note: ABS = asset-backed security; GSE = government-sponsored enterprises.

Figure 1.18. Bank Ratios
(In percent)



Sources: Bankscope; Bloomberg L.P.; Merrill Lynch; and IMF staff estimates.
Note: Dotted lines represent base case scenario for new standards of capital adequacy.

heavily reliant on short-term financing to fund long-term assets.[19] Deleveraging can be observed in the curtailment in asset acquisition by U.S. ABS issuers and the major broker-dealers since mid-2007 (Figure 1.17).

Capital will need to rise in relation to credit and balance sheet size, but to what standard?

Regulators, rating agencies, and investors use different metrics for assessing bank capital adequacy, and these measures have influenced the amount and form of capital raised by banks. The Basel II regime puts primary emphasis on the ratio of Tier 1 capital to risk-weighted assets. Rating agencies, too, continue to prefer risk-weighted asset measures, although they favor different measures of capital. However, investors have placed increasing emphasis on simple measures, after losing confidence in the valuation and risk assessment of structured finance products and other illiquid assets. The leverage ratio (i.e., the ratio of Tier 1 capital to total assets) is a simple measure that is used as an additional capital floor by U.S. regulators, and recently has been promoted as a complementary measure by Swiss regulators (though as noted below, it is not, by itself, precise enough to be the primary measure of solvency risk) (Box 1.2). The following exercise uses both the ratio of common equity to risk-weighted assets and the leverage ratio to project one possible profile and path of adjustment for U.S. and European banks (Figure 1.18), consistent with the credit growth scenario outlined above.[20] These leverage ratios are reduced over time by rebuilding capital cushions in relation to assets.

[19]As of early 2007, near-bank entities had an estimated $15 trillion of assets, compared with the $10 trillion and $40 trillion in assets of U.S. and European banks, respectively.

[20]This is not the only possible path, and should not be interpreted as suggesting that the new levels of capital are the "correct" ones. They are merely capital ratios that market analysts have suggested as appropriate medium-term goals for banking systems as a whole. Capital ratios for individual banks will, and should, vary, depending on their circumstances.

Box 1.2. Measuring Capital Adequacy

The current global crisis has greatly increased market uncertainty about the appropriate measures that should be used for measuring banks' capital adequacy.

Banking regulators and market practitioners point out that the build-up of excessive exposures occurred while banks were still largely operating under the Basel I capital framework, and that Basel II will more appropriately align capital requirements with risk, but would not have prevented the current outcome. Regulators will now take additional measures to improve the measurement of risks relating to structured instruments, off-balance-sheet items, and contingent liquidity risks. These will improve both the minimum capital requirements that Pillar 1 sets out and the supervisory review of banks' risk management practices under Pillar 2.[1] The net result will be more robust regulatory capital requirements going forward.

But many market participants and other observers are reacting to market valuation uncertainties by monitoring readily calculable measures of capital adequacy, including the leverage ratio—the ratio of equity to assets. Additionally, market observers and rating agencies are placing a particular premium on loss-bearing capital, in the form of common equity, as opposed to hybrid capital. Under current circumstances, the leverage ratio is a useful but simple measure that is not, by itself, precise enough to be the primary measure of solvency risk or to ensure a sufficient buffer against losses on risky assets.

A key lesson is that the risks to solvency cannot be adequately analyzed using only a single-dimensioned statistic. Risk-based capital ratios are, in principle, superior measures of capital adequacy, but their accuracy relies heavily on a proper risk valuation of assets. Under current circumstances, given the uncertainty about valuations of assets, the simple leverage ratio may be a useful complementary measure. Monitoring of multiple measures of capital and liquidity ratios (whether or not formal limits are established for them), together with rigorous stress testing, can help to ensure that firms remain robust to a variety of shocks.

Recent events have also highlighted a dilemma over capital adequacy; in principle, capital exists as a buffer to protect firms under difficult market conditions. But minimum requirements (whether set by regulators, by rating agencies, or implicitly by markets) can become hard limits and in some cases become more demanding during periods of market stress if risk measures rise as market volatility increases. In this regard, some have recommended allowing capital to be drawn down during such times, so that it acts as a true buffer. But such a policy probably implies that there should be significantly higher average capital ratios over the cycle than at present, and even if supervisors may be willing to tolerate buffers dipping during downturns, markets may require further convincing that this is appropriate as they make their own assessments of solvency risks.[2]

Note: The main author of this box is Rupert Thorne.

[1]Basel II is arranged into three pillars: Pillar 1 on minimum capital requirements; Pillar 2 on supervisory review of bank practices; and Pillar 3 on market disclosure.

[2]Chapter 3 provides some rough guidelines given the propensity of fair value accounting techniques to operate procyclically.

The factors influencing the path of adjustment are discussed below.

There are important differences between the drivers of deleveraging in the United States and those in Europe. In the United States, the pressures derive to a greater extent from the need to cover losses, which have depleted capital, while in Europe, the deleveraging process is also driven by the need to reduce leverage multiples closer to those in the United States and to avoid the earnings volatility that comes with having a large marked-to-market balance sheet.

Capital-raising by banks has been significant, but has become more difficult.

Global banks raised some $430 billion of capital from the second half of 2007 through September 2008.[21] However, raising capital has become extremely difficult in recent months. First, as growth weakened and house prices continued to fall, investors' hopes that the turmoil would be short-lived proved false. Second, equity holders in distressed institutions have incurred heavy losses. Third, bank share prices more generally have fallen substantially and could fall further, reducing investors' incentives to provide fresh capital.[22] Fourth, some rights issues in Europe have been poorly received. Issuing banks received the capital they sought, but substantial amounts were left with the underwriters, creating an overhang of shares that then depressed prices further.[23] In response to concerns that short selling was seriously frustrating efforts by financial firms to raise capital, and also concerns that it was aggravating the effects of false reports and unfounded rumors in the marketplace, regulators in several mature and emerging market economies adopted temporary bans on short sales of certain stocks, and permanent measures to broadly discourage "naked" short selling and raise disclosure requirements for short selling.[24]

Under a scenario of still weak housing markets, in which price declines only start to slow in mid-2009, public markets may not be hospitable to raising public capital. Faced with these circumstances, banks would need to rely more on raising capital through retained earnings and from private sources of capital, while slowing the pace of asset growth to reduce leverage. However, in view of further losses ahead, prospects for building internally generated capital are likely to remain poor through 2009.[25]

With the global economy starting to recover later in 2009, consistent with the WEO scenario, and house prices showing early signs of stabilizing, bank earnings rise and prospects for raising capital improve.[26] Just ahead of these developments, the market for raising bank capital is expected to re-open in 2009, allowing banks to raise $675 billion in additional capital globally over the next few years. Nevertheless, sizable adjustments would be needed on the asset side of bank balance sheets, in addition to capital-raising, in order to boost capital ratios and achieve the desired restructuring of business lines, as illustrated below.

Deleveraging through asset sales and run-off is proving to be challenging given current market conditions.

Deleveraging by reducing assets has also proved problematic for banks. Selling assets in illiquid market conditions crystallizes losses that deplete capital and therefore push up leverage multiples. Distressed sale prices can establish a fresh benchmark price to which remaining assets are marked, potentially affecting large

[21]Box 1.3 provides a fuller analysis of reported bank losses and capital-raising by type and source.

[22]In some cases, options granted to strategic investors when banks raised capital at the start of the crisis are pushing up the cost of raising additional capital, as the earlier investors have to be compensated for the paper losses they have suffered before new capital can be raised.

[23]Unlike in the United States, European companies are required to offer new shares to existing shareholders first to protect them from dilution ("preemption rights"), making issuance time-consuming. Under unstable conditions, there can be increased volatility in the price of the shares, which in turn can affect the success of a rights issue if the market price falls below the issue price. Streamlining the rights issue process while ensuring existing shareholders have other mechanisms to protect against dilution would help alleviate these problems.

[24]Countries that adopted such measures included Australia, Belgium, France, Germany, the Netherlands, Russia, Taiwan Province of China, the United Kingdom, and the United States. The U.S. Securities and Exchange Commission (SEC) issued new rules to curtail "naked" short sales—which have been prohibited since 1938—by tightening prior possession requirements and raising penalties for delivery failure. This ban was lifted in early October. The U.K. Financial Services Authority also banned short selling in securities of financial firms and added disclosure requirements for substantial short interest positions in securities undertaking rights issues.

[25]Under our stress scenario, peak defaults would be about 20 to 25 percent higher than in our base case, and they could persist for longer than in our base case. This would considerably aggravate the challenge of acquiring more bank capital.

[26]Although only an illustration, the paths fit well with other approaches. See, for instance, IMF (2008b, 2008d); and Claessens, Kose, and Terrones (forthcoming).

Box 1.3. Global Bank Writedowns and Capital-Raising

This box provides greater detail on bank writedowns and capital-raising efforts, as well as the changing nature of banks' investor base.

Since the turmoil started in mid-2007, global writedowns at banking institutions have totaled roughly $580 billion through September 2008. They have been concentrated in a few banks, with the three largest losers accounting for around 30 percent, and the 20 largest around three-quarters, of the total. About 95 percent of the writedowns were reported by North American and European banks, with only a small amount reported by Asian firms. Over the same period, capital raised has totaled $430 billion and has been similarly concentrated in a small number of institutions in the United States and Europe (see first figure).

The form of capital that was raised changed during this period (see second figure). At first, a substantial portion was in the form of hybrid securities, which combine elements of debt and equity.[1] These were attractive to issuers, as they are tax efficient, do not dilute common—shareholders, and partly count toward—regulatory capital. They were seen as signaling to the market that the bank was in a strong position (in contrast to common equity issuance), and offered investors the security of a bond, with some element of upside potential. However, hybrid capital has become less attractive in recent months as regulators, rating agencies, and investors have grown less comfortable with its high share within total capital.[2] Recently issued hybrid instruments

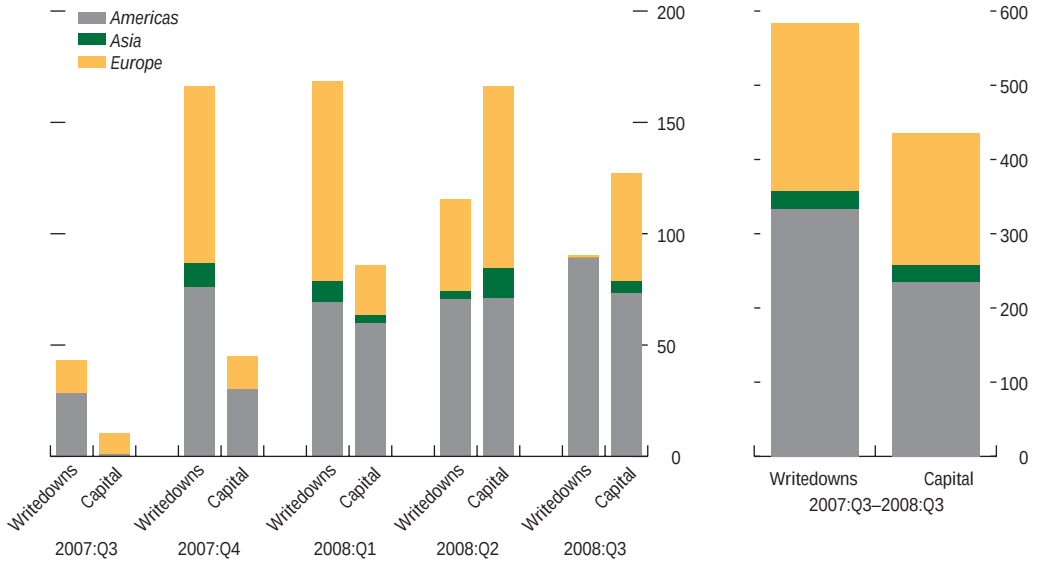
Note: The authors of this box are Ana Carvajal, Antonio Garcia Pascual, and Xiongtao Huang.

[1]These include preferred and preference shares, trust preferred securities, deferrable coupon securities, and various convertible securities.

[2]Beginning in 2009, U.S. banks will be limited to a maximum of 25 percent trust preferred capital to Tier 1 capital (and 15 percent for internationally active banks).

Bank Writedowns and Capital Raised

(In billions of U.S. dollars)



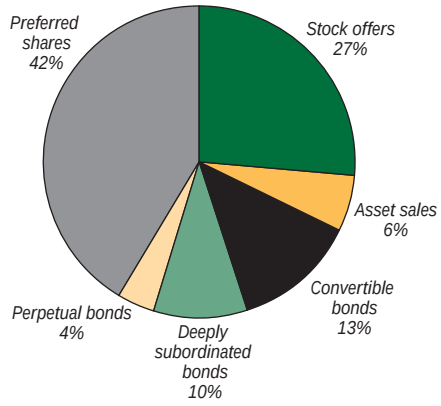
Source: Bloomberg L.P.

Box 1.3 *(concluded)*

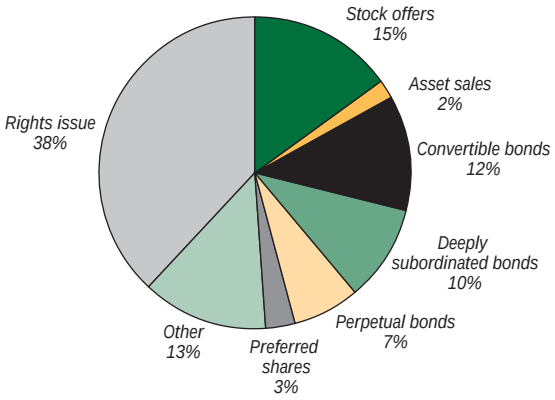
Capital Raised by Type of Instrument

(In percent)

North American Banks
($178 billion)



European Banks
($153 billion)



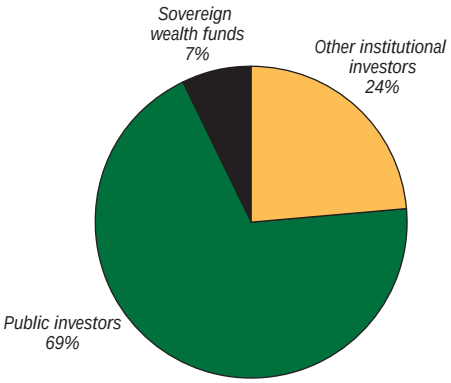
Sources: Bloomberg L.P.; and IMF staff estimates.

carry considerably higher spreads than those issued before the crisis. For example, deeply subordinated bonds issued by some of the affected institutions were paying yields of 7.5 to 8.5 percent (spreads of 300 to 400 basis points over U.S. treasuries), compared with around 6 percent (or about 100 basis points over treasuries) before the crisis.

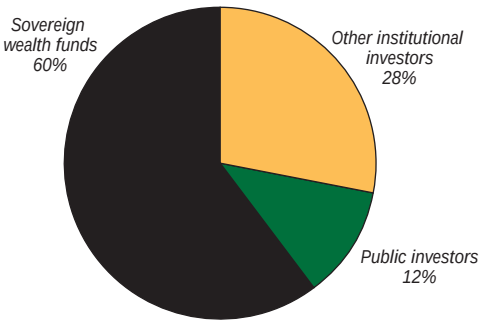
Capital Raised by Source

(In percent)

January 2008–July 2008
($300 billion)



July 2007–December 2007
($56 billion)



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

There has been a marked difference between the forms of capital raised by U.S. and European banks. U.S. banks have issued more hybrid capital, while European banks relied more on new stock issues. The difference reflects in part the larger share of hybrid instruments in Tier 1 capital for European versus U.S. firms already, and the significantly larger use of discounted rights issues by European institutions. Rights issues allow firms to mitigate the "dilution" of existing shareholders that arises from discounted sales that target a narrow group of investors.

The profile of those investing in banks has also changed (see third figure). In the second half of 2007, some 88 percent of fresh capital came from institutional investors and sovereign wealth funds (SWFs), with the latter investing in just a handful of institutions. Since January 2008, in contrast, 69 percent of the funds raised came from public investors and only 31 percent from institutional investors and SWFs.

parts of the banking system and providing a further negative feedback loop.[27] Deleveraging has also been hampered as off-balance-sheet vehicles are absorbed and customers tap credit lines. Banks are renewing such lines sparingly when they expire, but most are reluctant to reduce or withdraw lines before expiry for fear of alienating good customers. While some banks have failed or been bought outright, others are pursuing the sale, or winding down, of businesses less viable under current funding conditions, but this takes time. In the scenario above, we assume that banks are able to sell some $2.4 trillion of assets to nonbanks, while some $7.6 trillion of bank assets run off bank balance sheets during 2008–13, reducing credit growth. In total, U.S. and European banks shed some $10 trillion of assets, equivalent to around 14.5 percent of the stock of bank credit in those regions.[28]

Markets are pressuring banks to fundamentally change business models, and the deleveraging process is forcing industry consolidation.

The financial crisis has prompted a broad reassessment of financial sector business models, and in some cases investors are making swift judgments regarding which institutions are likely to survive or thrive. This has exerted pressure on bank equity valuations, pushing a number of bell-weather institutions into consolidation, and ultimately resulted in the demise of the stand-alone broker-dealer model. Many market participants concluded that the business model they followed made them vulnerable, especially during periods of prolonged market illiquidity. In particular, broker-dealers generally had leverage of around 30 times, with around half of their assets funded in the repurchase ("repo") market. Repo markets are subject to sudden pullbacks by cash lenders, especially when markets are illiquid, since a default may leave the cash lender with collateral that may be difficult to sell. The short maturity of most repo transactions means margins and "haircuts" can swiftly be used to exclude a borrower from the market. If the broker-dealer tries to pass on higher financing costs to its clients, those clients will take their business elsewhere, and may ask for their cash to be segregated, potentially leading to a run on cash at the broker-dealer. After this happened to Bear Stearns, markets were finely tuned to the risk of another occurrence. It was this factor that helped push Lehman Brothers to file for Chapter 11 bankruptcy protection, which created the conditions that were conducive to the merger of Bank of America and Merrill Lynch, and which made the remaining invest-

[27]For instance, Merrill Lynch's $6.7 billion sale of ABS CDOs to an affiliate of Lone Star Funds in August 2008 at a price equivalent to 22 cents on the dollar was seen as establishing a new mark for such assets that all banks would then have to adopt.

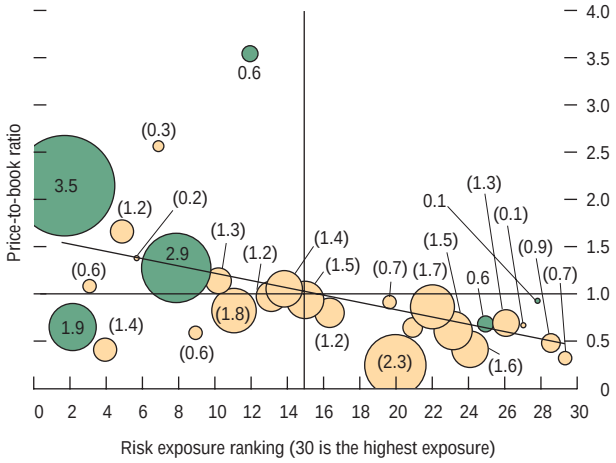
[28]We assume that heavier borrowing in securities markets offsets only a small part of the slowdown in asset growth.

ment banks targets for speculative pressure. Subsequently, both Morgan Stanley and Goldman Sachs were granted approval to transform into bank holding companies, effectively ending the era of a distinction between investment and commercial banking created by the 1933 Glass-Steagall Act.

Markets are also discriminating between different commercial bank business models, as suggested by the relationship between U.S. bank business lines, price-to-book values (P/B), and capital positions (Figure 1.19). First, after having an average P/B of almost 2.0 prior to the crisis, most banks now have ratios below 1.0 as share prices have fallen. Those banks also have Tier 1 regulatory capital ratios that are lower than the average of 8.9 percent for banks with P/B values over 1.0, suggesting that markets may still view these banks as undercapitalized. Second, a majority of banks that have a measure of business risk greater than the median (15) are trading below 75 percent of their book values. This could reflect investors' lack of confidence in the banks' ability to manage future credit losses. Third, most of the firms with a Tier 1 ratio that is more than 1 percentage point below 8.9 percent have especially low P/B ratios. Most of the banks in the bottom right quadrant of Figure 1.19 are U.S. regional banks or thrifts. In sum, market participants are penalizing banks with significant exposure to weaker business lines and lower capital adequacy ratios, suggesting that these banks need to enhance capital buffers, sell assets, or be acquired by more diversified and better-capitalized competitors.

In Europe, banks exposed to falling real estate values have lower relative valuations. For example, the P/B ratios of banks in Denmark, Ireland, and the United Kingdom have fallen significantly since early 2007 (to below 1.0 in the case of Ireland). These countries have experienced the steepest deceleration in real estate values in the region over the last couple of years (Figure 1.20). In contrast, the P/B ratios of banks in Germany and the Netherlands have been steadier over the crisis period, as have their corresponding real estate values.

Figure 1.19. U.S. Banks' Price-to-Book Ratios and Risk Exposures



Sources: SNL Financial; and IMF staff estimates.

Note: Represents the top 30 publicly-traded U.S. banks and thrifts by assets. The size of the circles represents a bank's percentage point deviation from an 8.9 percent Tier 1 regulatory capital ratio. Yellow circles represent negative deviations; green circles represent positive deviations. The risk exposure is a composite ranking of a firm's exposure to real estate loans, to regions that have experienced the largest declines in home prices, and that have the largest share of nonperforming assets.

Within countries, investors are discriminating between banks with high real estate exposures and those with diversified businesses. In the United Kingdom, mortgage banks are currently trading significantly below their book values, while those with more diversified revenue streams (e.g., global exposure, several business lines) are trading above (Figure 1.21). As in the United States, markets are also penalizing U.K. banks that rely disproportionately on wholesale funding. In order to reduce funding risk, banks are competing aggressively for retail deposits, with some mortgage specialists offering retail accounts at above-wholesale-market interest rates. However, markets appear to doubt the longer-term viability of these mortgage banks as stand-alone businesses, leading to speculation that they could be consolidated with more diversified firms.

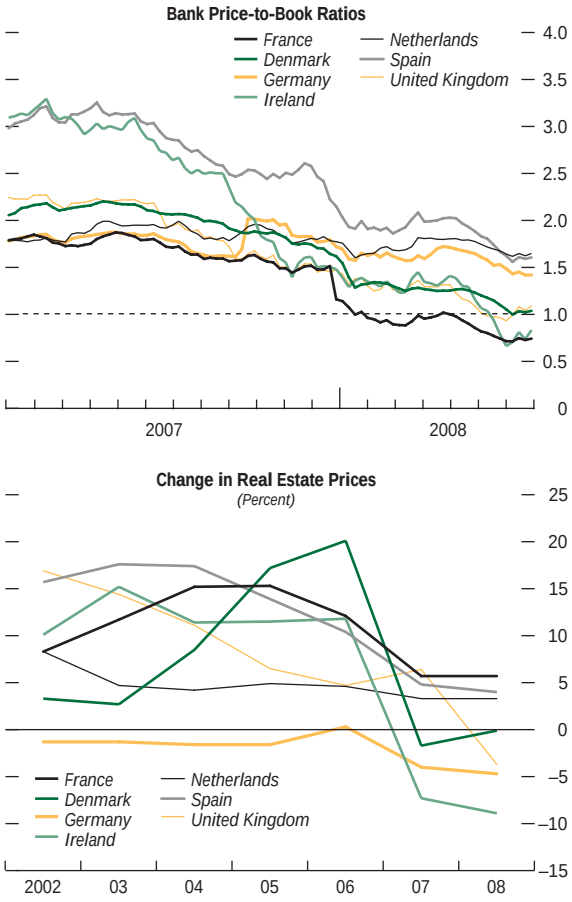
Other factors besides real estate exposure are also affecting bank valuations. For example, overall, Spanish banks have maintained P/B ratios of 1.6, above those in much of Europe. This may reflect their lower leverage levels compared with other European banks, greater reliance on more stable deposit funding, and a better regulatory environment.

In sum, the market is sending clear signals to bank management regarding unfavored business models; this has already resulted in the effective end of independent U.S. investment banks as viable entities. More broadly, this is likely to result in further consolidation, including through the exit of further banks and nonbank intermediaries.

Certain aspects of bank funding models—including over-reliance on cross-border funding—have contributed to vulnerabilities and exacerbated deleveraging pressures.

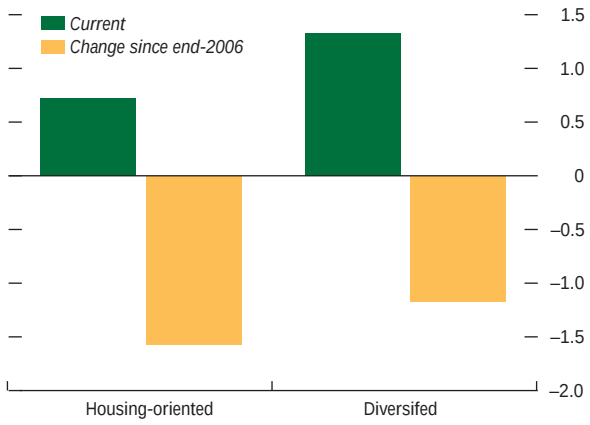
With securitization and wholesale funding markets adversely affected by the credit crisis, many banks have sought alternative sources of funds, including by increasing debt issuance (especially covered bonds, private placements, registered bonds, and offshore issues), aggressively bidding for customer deposits, and drawing on central bank and other facilities. Events

Figure 1.20. European Banks' Price-to-Book Ratios and European Real Estate Prices



Sources: Bloomberg L.P.; and IMF staff estimates.
Note: Price-to-book values less than 1.0 may indicate the market's lack of confidence in the ability of banks in the respective countries to manage potential losses from current exposures.

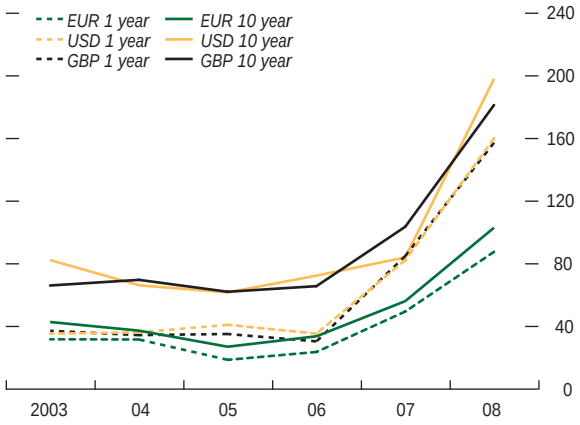
Figure 1.21. U.K. Banks' Price-to-Book Ratios



Source: Bloomberg L.P.

Figure 1.22. AA Rated Bank Bond Index Spreads Relative to Government Bonds

(In basis points)



Source: Bloomberg L.P.

Note: Banks' bond spreads are estimated as the difference in the Bloomberg corporate bond bank AA indices in the United States, United Kingdom, and European Union. Indices covered domestic currency bond issued by the banking industry in corresponding region. The government bond benchmarks are chosen to match the relevant maturities of the bank bond issues.

have shown that over-reliance on wholesale funding can be a critical vulnerability, especially when the quality of the assets funded is called into question.[29]

Simultaneously, refinancing risk and costs have increased (Figure 1.22), as longer-term wholesale financing has become less available, leading to greater bank reliance upon short-term funding (overnight and weekly). Given the shortening in maturity of previous debt and loan issues (Figure 1.23), over the next 15 months the top 15 banks face funding needs of over $700 billion. More creditworthy banks have responded by expanding their issuance of longer-dated paper to secure their funding over the medium term, leading to "barbell-shaped" maturity profiles for their debt.[30]

Some banks with high exposure to less hospitable wholesale funding markets have responded by aggressively competing for deposits. Euro-area banks hit by wholesale funding strains, for example, were able to expand their retail deposit base and reduce their funding gap.[31] Despite these efforts to diversify funding, however, wholesale borrowings remain their largest funding source with large refinancing requirements in 2009 and 2010. In general, highly leveraged and less creditworthy banks that aggressively bid for customer deposits and rely heavily on short-term debt have experienced relatively large increases in their funding costs, reducing their profitability and ability to raise additional capital. The almost complete shutdown of securitization markets in Europe has made deleveraging more difficult (Table 1.3). In contrast, in the United States, the securitization market, though impaired, is still allowing banks

[29]See Chapter 2 for further details.

[30]For example, major Australian banks sharply expanded their bond issuance during the first quarter of 2008, over two-thirds of which was issued in longer-dated offshore tenors, mostly in dollars and euros. As a result, these Australian banks are generally ahead of their funding plans, albeit at a higher cost.

[31]The funding gap was reduced from 1,540 billion euros in September 2007 to 1,410 billion euros in March 2008 (ECB, 2008, p. 110).

Table 1.3. European and U.S. Public Securitization
(In billions of U.S. dollars)

	2008 annualized	2007	2006
European (RMBS and CMBS)	0	250	308
United States (HEL, CMBS, credit card, and student loan)	180	614	790

Sources: Citibank; and IMF staff estimates.
Note: CMBS = commercial mortgage-backed security; HEL = home equity loan; RMBS = residential mortgage-backed security.

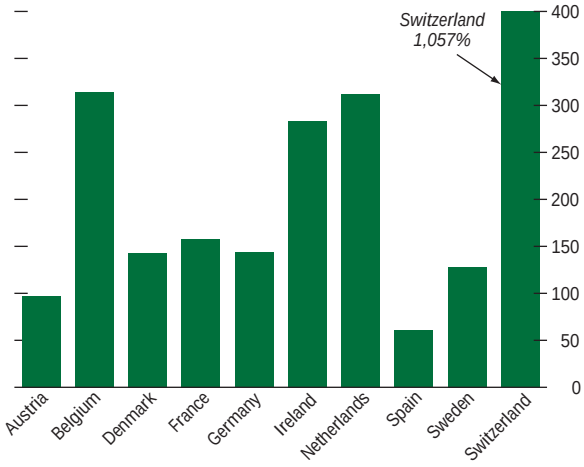
to move some assets they originate off balance sheets.[32]

Cross-border financing of banking systems has also emerged as a source of systemic liquidity risk. Banks heavily dependent on international funding and swap markets experienced significant stress as these markets came under pressure. Indeed, those that have experienced the most severe stress where governments had to inject capital, notably Iceland (Glitnir Bank) and Belgium (Fortis and Dexia), are large relative to their home country financial systems and therefore had to rely more on wholesale cross-border financing to achieve the high leverage necessary to boost returns. European banks with large holdings of dollar assets were especially exposed. These assets were financed in the wholesale market, including from U.S. banks, with much of this short-term borrowing from interbank markets, as reflected in the rise in borrowings from banks shown in Figure 1.24.[33] This became apparent when the crisis hit and European banks responded by raising additional funds in Japanese yen, euros, and British pounds, and swapping them into dollars using foreign exchange and cross-currency swaps. The U.S. dollar foreign exchange swap and the cross-currency swap basis widened sharply against major currencies, as swap markets tended to become

[32]Almost all new securitization in Europe is now retained (mostly for use as collateral with the ECB), as compared to before the crisis when it could be distributed to capital markets.

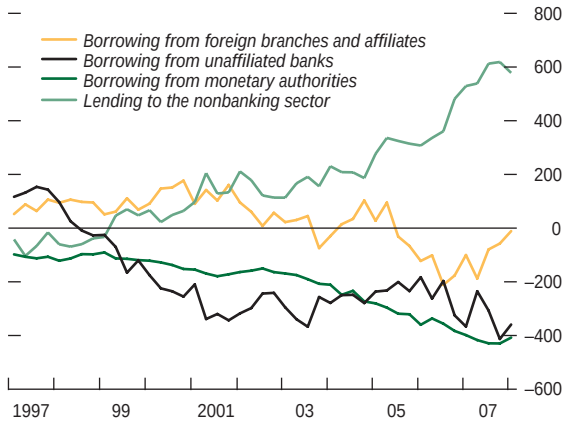
[33]See McGuire and von Peter (2008) for more details on the structure of this financing.

Figure 1.23. European Banks' Cross-Border Liabilities, end-2007
(As a percentage of GDP)



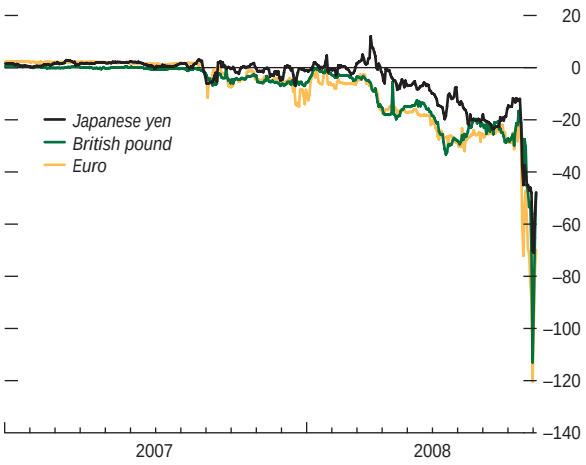
Sources: Bank for International Settlements; IMF, World Economic Outlook database.

Figure 1.24. Net Cross-Border U.S. Dollar Claims of European Banks
(In billions of U.S. dollars)



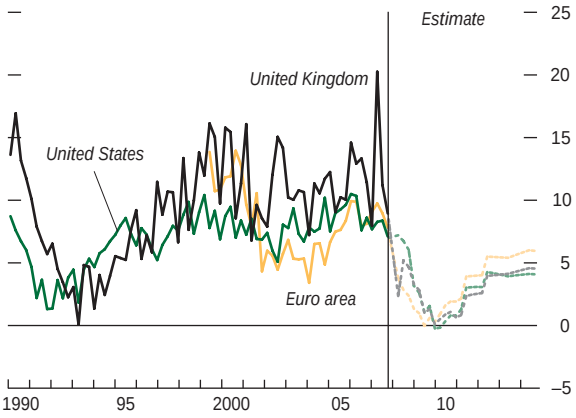
Source: Bank for International Settlements.

Figure 1.25. Cross-Currency Swaps with U.S. Dollar
(In basis points, one-year tenors)



Source: Bloomberg L.P.

Figure 1.26. Private Sector Credit Growth
(Borrowing as a percentage of debt outstanding, quarter-on-quarter annualized, seasonally adjusted)



Sources: Federal Reserve; official sources; and IMF staff estimates.

one-sided and illiquid (Figure 1.25),[34] pushing European and other banks to rely on their branches and subsidiaries in the United States to raise dollar funding. The swap basis widened again around end-March as stresses on global markets increased, raising cross-border funding costs and encouraging European banks to draw on the Federal Reserve's new Term Auction Facility (TAF). In September, it reached record wides in the wake of the Lehman Brothers bankruptcy, and narrowed only when the Fed added an overnight TAF and sharply increased dollars available through swaps with major central banks, effectively substituting for the illiquid swap market. Demand for the European Central Bank (ECB) TAF has been especially strong, as demonstrated by high participation and bid/cover ratios (see Box 2.3 in Chapter 2), particularly by smaller European banks with limited U.S. operations.

However, official support should be used only in the short-term, and many banks that have relied heavily on potentially risky cross-currency funding will need to delever before funding market conditions can return to normal.

The deleveraging process will take a toll on credit growth to the private sector.

The complexity of the deleveraging process is likely to hamper the availability, and raise the cost, of credit for a prolonged period. Building upon earlier analysis (IMF, 2008c), we estimate the impact of bank balance sheet adjustment on the global supply of credit to the private sector.[35] The supply of credit is driven by several factors, including the pace and depth of credit deterioration, capital market sentiment, and the degree of balance sheet adjustment needed

[34]See Baba, Packer, and Nagano (2008) for a more detailed description of the link between swap markets and bank funding.

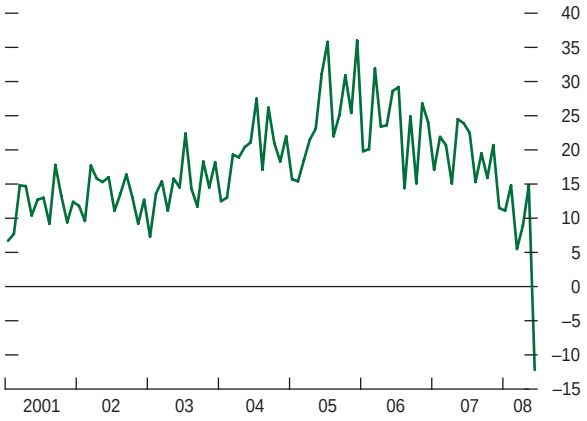
[35]The April 2008 GFSR outlined two scenarios for private sector credit growth for the United States. This analysis draws upon more recent data and broadens the analysis to include the euro area and the United Kingdom. The scenario uses WEO growth assumptions as the basis for generating an implied path for the demand for credit.

to restore capital ratios. The scenario shows that credit growth is likely to fall sharply in the period ahead to levels that are consistent with the "credit crunch" scenario sketched in the April 2008 GFSR (Figure 1.26). These constrained conditions for credit are likely to persist at least through next year, and perhaps longer.[36]

This pattern is consistent with developments so far. U.S. credit growth has started to slow to rates last seen just after the 2001 downturn, broadly in line with the predictions in the last GFSR. Household borrowing has slowed markedly. The growth in corporate lending is likely to abate once existing loan commitments have matured or been drawn down. In Europe, household credit growth is also slowing, driven almost exclusively by mortgage lending (Figure 1.27). Corporate loan growth has begun to slow in Ireland, Spain, and the United Kingdom as earnings prospects have dimmed along with weaker economic growth.

If the expected private sector fresh capital-raising were to fail to materialize, and in the absence of public sector asset purchases, private sector credit growth could fall as low as –7.3 percent quarter-on-quarter annualized in the United States, and would be slightly less negative in Europe (Table 1.4).[37] The private sector bank capital purchases alone would limit that drop, but credit growth would still turn slightly negative quarter-on-quarter in all three regions before rebounding.[38] To the extent the private sector bank capital purchases do not materialize, then a public sector alternative would need to be substituted. Finally, purchases of troubled

Figure 1.27. Euro Area Financial Institution Lending for House Purchase
(In billions of euros)



Source: European Central Bank.

[36]There is, of course, considerable uncertainty surrounding this scenario, and changes in the environment can rapidly alter the outcome. For instance, a more determined effort by banks to shrink their balance sheets through the sale, rather than run-off, of assets may alter the trajectory. Similarly, a greater-than-expected willingness among investors to subscribe to fresh capital for banks might allow more assets to be rolled over rather than to mature, and keep credit growth from dipping.

[37]So far, only the United States has announced a major publicly funded asset management initiative.

[38]As a point of reference, U.S. credit growth to the private sector has never been negative in the 55 years for which records exist.

Table 1.4. Sensitivity of Deleveraging to Public Sector Support
(In percent, quarter-on-quarter)

	Trough in Private Sector Credit Growth		
	United States	United Kingdom	Europe excluding the United Kingdom
With $2 trillion public sector purchases	0.1	0.0	0.1
With private sector bank recapitalization, but no public sector purchases	–2.7	–2.2	–1.3
No public purchases and no private bank recapitalization	–7.3	–6.3	–4.5

Source: IMF staff estimates.

Note: Public sector purchases (50 percent, United States; 10 percent, United Kingdom; and 40 percent, Europe excluding the United Kingdom).

assets of $1 trillion in the United States[39] along with support measures for banks taken and expected from Europe, sees credit growth troughing at just above zero quarter-on-quarter annualized in the base case. In sum, in a disorderly deleveraging scenario where the private sector is unwilling to provide fresh capital to banks or purchase troubled assets, credit growth would become sharply negative, having a profoundly negative impact on the real economy. Government intervention to inject capital and remove troubled assets would be needed to prevent such an occurrence.

Systemic Implications

The global financial system has entered a new phase of the crisis, where the threat to solvency of some institutions has led to persistent, widespread counterparty risk concerns and required the commitment of public resources to contain systemic risks and the economic fallout. The burden of providing liquidity and supporting markets is stretching the existing capacities of monetary and other authorities. This section addresses specific areas of the U.S. and other financial systems that could undergo further stress on a systemic scale. In addition, some wider ramifications of deleveraging are highlighted.

Raising capital from the private sector has become very challenging and segments of the financial system have become undercapitalized.

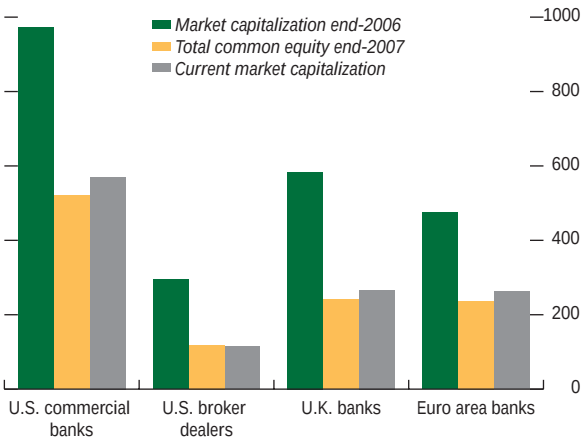
The extreme downward pressure on equity prices of financials can be likened to a "run on bank capital," or rather on the capitalization value of banks. Much as depositors in a conventional run on a bank might rush to withdraw their funds before others do so, now investors have been rushing to sell equities of financial institutions. As a consequence, many banks that were mainstays of their economies until recently have seen their market capitalizations crushed, and are trading at close to common equity and less than book values (Figure 1.28). As a temporary measure to short circuit a vicious downward spiral, the authorities have resorted to temporary bans on short selling. Nevertheless, falling equity prices and the difficulties financial institutions face in raising equity from public markets illustrate a challenge for the authorities in restoring market confidence. The authorities can give reassurance to depositors and, in some exceptional circumstances, other creditors by assurances of prompt action to resolve problem institutions and to prevent failures that could cause systemic problems. But such assurances provide little comfort to equity investors who believe that their investments could be largely wiped out in a public resolution. Indeed, the likelihood of official intervention in less viable banks may, in some cases, have accelerated the downward pressure on equity prices of other banks struggling to delever or absorb the economic downturn. Government involvement in the resolutions of Northern Rock, Bear Stearns, Fannie Mae, Freddie Mac, AIG, Fortis, Dexia, and other institutions have illustrated this, as in each case the announced resolutions failed to support equity prices of other financial institutions.

[39]Including $700 billion under the U.S. Treasury authority to purchase troubled assets, and some $300 billion assumed to result from the earlier commitment to purchase mortgage-backed securities.

The government-sponsored enterprises were unable to withstand sizable losses or provide extensive support to the U.S. mortgage and housing markets without support from the government.

The GSEs' capital positions—which were already thinner than for most other financial institutions—came under pressure as mortgage credit deterioration broadened, posing vulnerabilities for broader markets. Given the massive size of the GSEs' assets and liabilities and global investor base, the broader global markets were vulnerable to further losses (Box 1.4), while further weakness in their capital positions limited their ability to facilitate new mortgage originations. Losses incurred by the GSEs have been relatively limited compared with their outstanding mortgage exposure. However, our estimates suggest that over the next few years, the GSEs are likely to incur a total of $100 billion to $135 billion in gross losses (excluding the effects of hedging and mortgage insurance) (Table 1.1). Although excess capital remained above the surcharge on the minimum regulatory capital requirements for both GSEs, it would have been insufficient had losses breached the upper range of loss estimates.[40] Furthermore, given their public policy mandate, the GSEs were also under pressure to help stabilize mortgage markets, which would have required further capital-

Figure 1.28. Market Capitalization and Equity Book Values of Select Financial Institutions
(In billions of U.S. dollars)



Source: Bloomberg L.P.
Note: U.S. broker dealers include Lehman Brothers, Morgan Stanley, Goldman Sachs and Merrill Lynch. The other three categories, namely, U.S., U.K. and euro area banks, include institutions that have retail banking businesses in their respective regions.

[40]To be classified as adequately capitalized, the GSEs needed to meet the minimum and risk-based capital (RBC) standards. The minimum capital requirement for the retained portfolio of mortgages was set at 2.5 percent of assets plus 0.45 percent of adjusted off-balance-sheet obligations and 0.5 percent for the guarantee business that provides mortgage insurance. As of 2004–05, an additional 30 percent surcharge was applied to the GSEs' minimum capital requirements, though this was reduced to 20 percent in March 2008 (and then to 15 percent in May 2008 in the case of Fannie Mae). The RBC requirement is equal to the amount of capital that each GSE must hold to absorb projected losses and management and operations risk, and is based on interest rate stress test scenarios. The new statutory regulator—the Federal Housing Finance Agency (FHFA)—is formulating new capital requirements for Fannie Mae and Freddie Mac. However, following the placement of the GSEs into conservatorship and the announcement of an enhanced credit line and capital injection from the U.S. Treasury, capital support is essentially being provided by U.S. taxpayers.

Box 1.4. U.S. Government-Sponsored Enterprises and Housing Reform Developments

This box discusses the role of the mortgage-related U.S. government-sponsored enterprises, and assesses government actions taken to restore confidence, reduce systemic risks of a more pronounced liquidity crisis, and stabilize the secondary mortgage market.

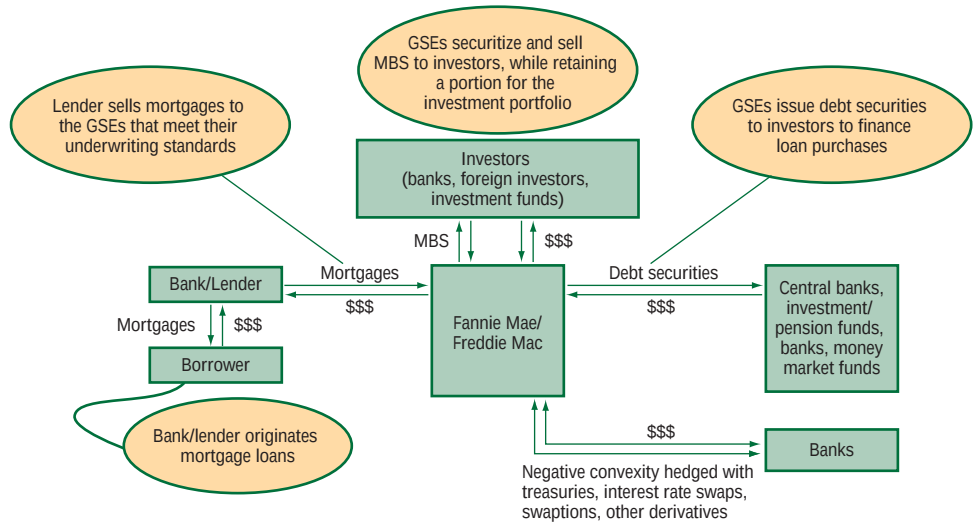
The two largest housing-related U.S. government-sponsored enterprises (GSEs), Fannie Mae and Freddie Mac, were established with the intent of providing liquidity to the residential mortgage market, thereby promoting home ownership, particularly among low- and middle-income households. They fulfill their mission by purchasing mortgages from primary mortgage originators, packaging them into securities, enhanced with credit guarantees, and then selling the guaranteed securities in the secondary market (see first figure). In addition, the GSEs purchase mortgage-related securities, loans, and other types of assets for their investment portfolios; this business line has been the subject of controversy owing to their funding advantage and the lack of a clear public purpose.

The GSEs are systemically important institutions, affecting a wide range of market participants and breadth of assets. Fannie Mae and Freddie Mac have a combined $5.3 trillion in mortgage risk, based on mortgages they securitize ($3.7 trillion) or directly hold in their portfolios ($1.6 trillion). Taking into account the debt issued to fund their activities, the GSEs thus contribute roughly one-quarter of the $31 trillion outstanding U.S. bond market debt (see second figure). The GSEs' activities also have important implications for broader fixed-income asset prices and volatility, since they hedge mortgage convexity risk associated with the prepayments of mortgages with treasuries, interest rate swaps, swaptions, treasury options, and other instruments.

Banks, as large originators of conforming mortgages and investors in agency debt and MBS, have significant ties to the GSEs. Money

Note: The main author of this box is Rebecca McCaughrin.

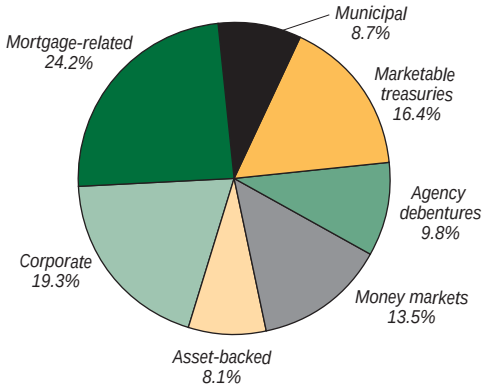
Basic Structure of Government-Sponsored Enterprises' (GSEs) Business Practices



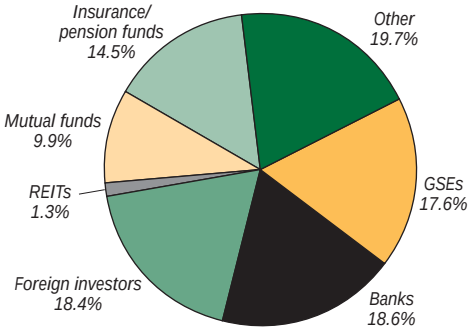
Source: IMF staff.
Note: MBS = mortgage-backed security; GSE = government-sponsored enterprise.

U.S. Fixed-Income Market
(In percent)

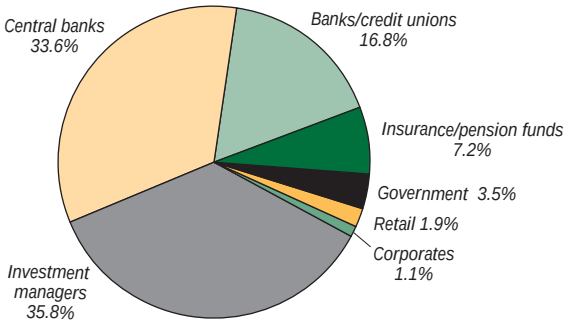
Composition of Outstanding U.S. Bond Market
($30.5 trillion, as of 2008:Q1)



Primary Investors in Mortgage-Related Securities
($6.6 trillion, as of mid-2007)



Primary Investors in Fannie Mae/Freddie Mac Debt
($1.7 trillion as of mid-2008)



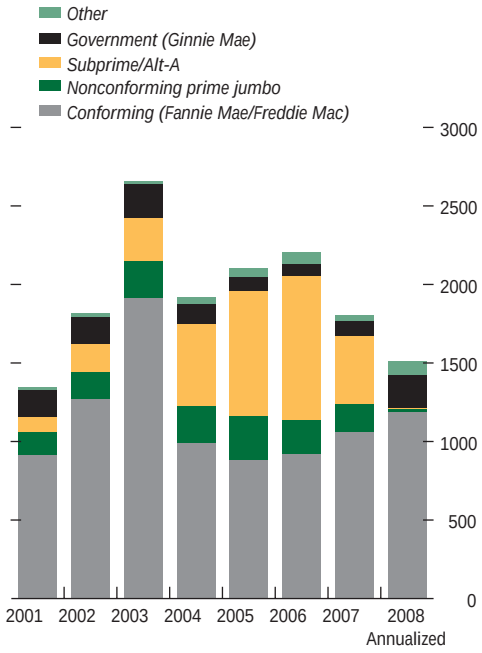
Sources: Bloomberg L.P.; Fannie Mae; Freddie Mac; Inside MBS & ABS; Securities Industry and Financial Markets Association; U.S. Treasury; Federal Reserve; Thomson Financial.

market funds are also dependent on the short-term discount notes issued by the GSEs, particularly as other forms of short-term investment (e.g., asset-backed commercial paper, auction rate securities, etc.) have declined or become more risky. Foreign institutions—central banks in particular—also have significant exposures to debt issued and guaranteed by the GSEs.

The GSEs are important participants in the mortgage market, both as investors and providers of mortgage financing. As the credit turmoil deepened, traditional investors scaled back their demand for mortgage products, as did providers of mortgage financing, shifting the burden more heavily to the GSEs. Despite the deterioration in the housing market, the GSEs have continued to (modestly) grow their investment portfolios and to guarantee mortgages that conform to their requirements. Together with Ginnie Mae, they stepped up their provision of liquidity to the secondary mortgage market, accounting for over 90 percent of new securitizations in recent months, as liquidity provided by private securitizers dried up (see third figure).

Box 1.4 *(concluded)*

Mortgage Securitizations
(In billions of U.S. dollars)



Sources: *Inside MBS & ABS*; and IMF staff estimates.

As capital needs intensified owing to rising losses and limited alternative sources of mortgage financing, government efforts sought to reduce the probability of a liquidity-driven event at the GSEs and to stabilize mortgage markets. The government initially implemented a series of measures, including (1) a temporary increase in the line of credit with the U.S. Treasury;[1] (2) temporary authority for the U.S. Treasury to purchase unlimited equity in the GSEs at terms and conditions it sets; and (3) a temporary consultative role for the Federal Reserve to regulate the GSEs. In the interim, the Federal Reserve also temporarily provided an unconstrained liquidity backstop to the GSEs through collateralized loans at the primary discount rate.

However, as risks to the overall safety and soundness of the enterprises and to broader financial markets continued to increase, the government sought a more direct and broad intervention, placing Fannie Mae and Freddie Mac into conservatorship under the direction of the newly created Federal Housing Finance Agency (FHFA). The U.S. Treasury injected capital through the purchase of $1 billion of senior preferred equity in each company (plus warrants representing 79.9 percent of the common stock) and was given authority to inject a maximum of $100 billion of capital into each entity to ensure their net worth remains positive. Dividends on existing common and preferred stock were immediately suspended, in effect drawing a distinction between debt and equity holders. Under the new structure, Fannie Mae and Freddie Mac are able to securitize GSE-eligible mortgages without limit, while their investment portfolios are permitted to expand moderately (to $850 billion each) through end-2009. Beyond that period, they will be required to shrink their investment portfolios 10 percent per annum until each reaches $250 billion. In addition, the U.S. Treasury was granted temporary authority to purchase new agency-backed MBS through a designated asset manager. Finally, a short-term secured credit facility was established for the housing GSEs, including the Federal Home Loan Banks (FHLBs).

The government's actions achieved three goals in the short term. First, by appointing FHFA as the conservator, the U.S. Treasury avoided full nationalization and instead became a stakeholder, thus limiting the potential fiscal impact. Second, the plan ensured the GSEs will maintain positive net worth (up to a limit), in turn restoring confidence in the agency debt market, while the reduced risk of a portfolio reduction by the GSEs and the U.S. Treasury's authority to purchase agency-backed MBS supports that market. Third, the secured lending facility, which is intended to serve as a last resort liquidity backstop, reduced

[1]The line of credit had not been increased since it was set at $2.25 billion in 1957, and was generally viewed as insufficient given the growth in the GSEs since then.

the potential for liquidity problems among the GSEs in the future.

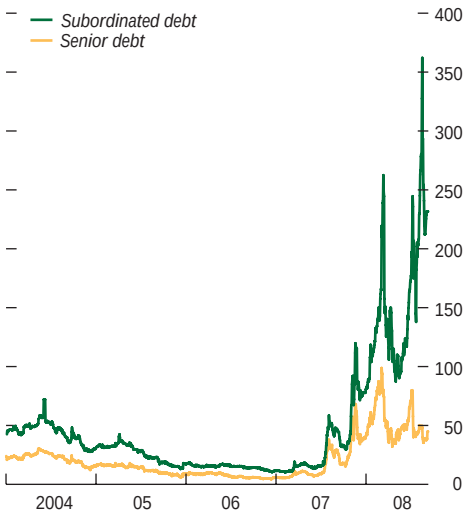
The longer-term role of the GSEs, though, must still be resolved. Ultimately, the government will need to determine the GSEs' status and role in the housing markets. The U.S. Treasury has explicitly noted that their business model is inherently flawed.[2] This suggests that the hybrid nature of the companies is not sustainable and that they will eventually need to be converted either into fully private or fully public companies or operate under a stronger regulatory framework. There are a number of outstanding questions that remain beyond 2009, once the U.S. Treasury's extraordinary support expires and the portfolios of the GSEs begin to shrink over the coming decade.

Reinforced government support has helped to bolster confidence in the GSEs' debt and MBS. While the major rating agencies cut the ratings of the preferred stock issued by the GSEs in light of the suspension of dividends and the dilutive impact of the government's capital injection, they also upgraded their outlook on the GSEs' subordinated debt, owing to the reduced risk of a deferral of interest payments. Reflecting a more explicit government guarantee, senior and subordinated agency debt and agency-backed MBS debt spreads tightened relative to both treasuries and interest rate swaps and default risk fell (see fourth figure). The risk premia on the GSEs' regular short-term discount note and longer-term debt auctions declined, thus enabling the GSEs to continue to

[2]Statement by U.S. Treasury Secretary Henry M. Paulson, Jr. on Treasury and Federal Housing Finance Agency Action to Protect Financial Markets and Taxpayers, September 7, 2008.

Credit Default Swap Spreads on Government-Sponsored Enterprise Debt

(In basis points, five-year tenors)



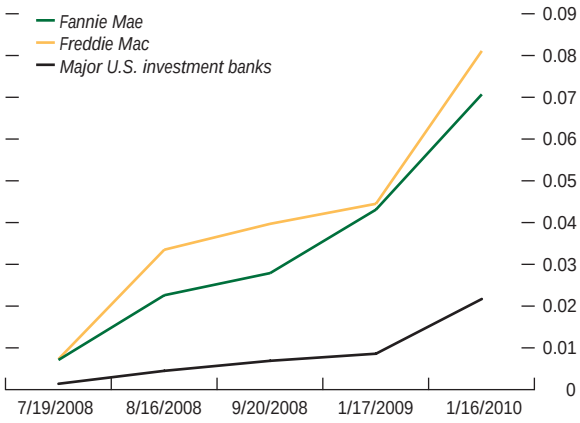
Source: Datastream.

guarantee new mortgages. The spread between MBS issued by public (e.g. Ginnie Mae) and conventional (e.g., Fannie Mae, Freddie Mac) entities also narrowed. Debt issued by the FHLBs, which had been trading in line with agency debt, continued to do so under the new structure, since all three entities have access to the short-term credit facility. With the existing shareholders diluted and dividends suspended, the GSEs' common and preferred equity prices plunged. Placing the GSEs into conservatorship introduced an additional operational complication for the credit default swap market, since such an action constitutes a credit default-triggering event.

raising efforts, over and above those entailed by absorption of credit losses.

In July, the U.S. authorities put in place the legal apparatus and authority for more direct and explicit support to the GSEs, but hopes that this would be sufficient to restore market confidence and encourage further private capital provision subsequently diminished. Those pressures were reflected in market-based indicators. For instance, equity option prices implied, at the time, that the probability of equity values falling to zero was higher than for investment banks

Figure 1.29. Probability of Default Based on Equity Option Prices
(In percent)



Sources: Bloomberg L.P.; IMF staff estimates; see Capuano (2008) for further details.

and that the GSEs needed to increase their capital base in the next few quarters in order to delever their portfolios and adjust their balance sheets (Figure 1.29).[41]

The loss of confidence in the GSEs and risks to the global financial system prompted the government to intervene in early September, placing the two largest GSEs into conservatorship. The authorities' intervention has reduced the risk of portfolio reduction by the GSEs in the near term, removed uncertainty regarding their capital adequacy, potentially freed up scarce market capital, reinforced confidence in their debt and mortgage guarantees, and in general helped to improve mortgage securitization. The GSEs now have greater ability to support the mortgage market through a (modest) expansion in their investment portfolios through end-2009, supplemented by the U.S. Treasury's intended purchases. The initial market reaction was a tightening in agency debt and agency-backed MBS spreads, while GSE equity prices fell sharply. Tighter agency-backed MBS spreads and lower guarantee fees should, in turn, help to reduce mortgage rates and increase the availability of mortgage credit for GSE-eligible borrowers. However, the government's plan has only limited beneficial impact on the moribund primary and secondary nonagency mortgage market. More generally, the deleveraging trend remains in place, as do pressures on the housing market and household balance sheets.

Mounting credit losses could result in further bank solvency issues, potentially stretching deposit insurance resources.

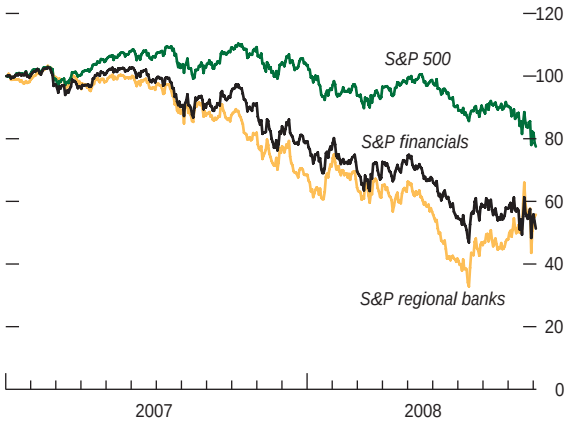
In view of their significant exposure to real estate assets, a number of U.S. regional banks have come under significant pressures (Figure 1.30). The dilution of existing GSE equity and the elimination of dividends appears manageable for most banks, but a few have signifi-

[41]The higher probability of default based on equity option prices may also have reflected the risk that equity holders may not be prioritized in the event of a government recapitalization.

cant exposure relative to their tangible capital. In addition, the banking sector will likely continue to face a challenging environment until U.S. house prices stabilize. This raises concerns about the adequacy of Federal Deposit Insurance Corporation (FDIC) reserves to cover the insurance of deposits, especially given a possible increase in the size of covered accounts.

Were further big depository institutions to fail, this could put a substantial strain on government depository insurance funds. There have been few failures in deposit-taking institutions in the United States so far—especially in comparison with the savings and loan crisis—though the failure of IndyMac, one of the large mortgage lenders (with assets of about $30 billion) has raised concerns about the adequacy of funds for multiple large-scale bank resolutions. The Emergency Economic Stabilization Act (ESSA) has provided for additional resources in such an event.[42] Other countries also face challenges with respect to deposit insurance. A number of authorities are taking steps to boost market confidence by temporarily expanding the coverage provided by their deposit insurance regimes. Some are also considering steps to make more permanent improvements in the design of schemes. For instance, the U.K. authorities are considering reforming their deposit insurance regime following the deposit run on, and subsequent nationalization of, Northern Rock, including improving the clarity and funding of the arrangements. Deposit guarantee arrangements in a wide range of other countries are being reassessed, and lessons need to be shared between countries.

Figure 1.30. U.S. Equity Index Performance
(January 2007 = 100)



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

[42]As of the second quarter of 2008, FDIC data showed that large banks ($50 billion and larger) are all well-capitalized. However, the number and combined assets of banks on the FDIC's regulatory watch list rose to 117 and $78 billion, respectively. FDIC reserves have fallen to $45.2 billion (representing just 1.01 percent of all insured deposits, which is considered historically low), owing to costs of absorbing IndyMac and other bank closures. If funds are drained further, the FDIC may raise insurance premiums to replenish its reserves, borrow up to $40 billion from the Federal Financing Bank, and, with the passage of EESA, request an unlimited line of credit from the U.S. Treasury.

Operational risks in credit derivative and repurchase markets pose risks, already evident during the bankruptcy of Lehman Brothers, spreading and intensifying concerns of counterparty risk.

Despite actions taken by the major market participants, encouraged by the Federal Reserve Bank of New York and other authorities to reduce the risk of unconfirmed trades and settlement problems, the settlement of CDSs referencing Fannie Mae, Freddie Mac, Lehman Brothers Holdings Inc., and other systemically important financial institutions could cause a disruptive chain reaction in the event of a failure of a major CDS protection counterparty. The problem lies in the large overhang of redundant bilateral contracts, as counterparties often establish offsetting contracts rather than close out existing contracts, thereby increasing counterparty risks. These risks have been partly mitigated by increased efforts to terminate offsetting contracts, more electronically processed transactions, and the creation of a central clearinghouse (although it will not be fully operational until late 2009).[43] Somewhat similar operational challenges can occur in the settlement of repurchase transactions, including those via triparty arrangements, and other over-the-counter derivative trades. Moreover, these challenges can be exacerbated by the potentially complex nature of the bankruptcy of a large counterparty. The Lehman Brothers Holdings Inc. bankruptcy demonstrated how such operational risks can have systemic implications because it was one of the 10 market makers standing behind about 90 percent of outstanding contracts. The logistics of closing out trades in which Lehman Brothers was a counterparty are daunting. All surviving counterparties will have to replace, offset, or close their outstanding derivative trades (not just CDS trades) against Lehman Brothers. These operational challenges are exacerbated by elevated market volatility, reduced liquidity, and concerns about the creditworthiness of other prospective counterparties.

Deleveraging and funding pressures are having wider repercussions on liquidity in core markets . . .

Global deleveraging, financial sector consolidation, the reduced number of leveraged investors and market makers, and heightened uncertainty have reduced trading liquidity in various core markets and have reduced the ability of market participants to adjust their positions quickly to market developments.[44] This, in turn, further contributes to reducing liquidity and increasing idiosyncratic and basis risks. Such risks are evident in sovereign swap and bond markets where hedging activities associated with synthetic structures have led to high volatility, resulting in sizable losses for dealers. Reduced liquidity extends to emerging markets where market-making costs have increased significantly as use of bank balance sheets has been circumscribed, for example, in offering total return swaps. With counterparty concerns at elevated levels, some prime brokers have experienced a sharp drop in liquidity as hedge funds have shifted funds into segregated accounts or into trust vehicles, and many are aiming to reduce their concentration in a single prime broker after the Lehman Brothers bankruptcy. In turn, prime brokers are tightening lending standards or, in some cases, have ended their relationships with hedge funds, reinforcing the broader deleveraging of the financial system (Box 1.5).[45]

. . . posing significant threats to financial intermediaries.

Persistent strains on term funding markets have escalated to a point where most credit is

[43]For any given participant, all transactions on the same underlying entity will be netted to a single position, and a single margin account maintained on its whole portfolio of CDS.

[44]For example, in Japan, foreign relative-value hedge funds have largely departed the Japanese market after many suffered large losses in March. Typically, government bond market makers hedge their cash positions in the futures market. However, the volume of open futures positions has fallen dramatically, and correlations with cash market movements have declined.

[45]Since banks that have large prime brokerage units cannot use segregated funds to help finance their assets, this therefore adds to deleveraging pressures.

Box 1.5. Impact of Credit Market Turmoil on Hedge Funds

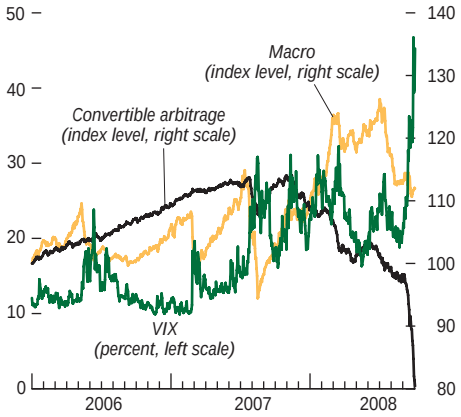
This box discusses the channels by which the credit market deterioration has affected hedge fund performance.

A number of hedge funds with large credit-related exposure have been negatively affected by the current market turmoil, particularly those with U.S. mortgage-related asset-backed securities and collateralized debt obligation exposure. Equity funds have also suffered losses, especially those with net long exposure to financials and consumer cyclical companies. The more volatile trading environment also appears to have impaired the performance of many hedge funds, including macro and convertible arbitrage strategies (see first figure).[1] Finally, the credit market crisis has resulted in tighter financing conditions specifically for fixed-income-oriented hedge funds, reducing their ability to lever returns.

Typically, hedge funds seeking direct (or explicit) leverage can obtain funding either through margin financing from a prime broker or through private repo markets. Margin financing from prime brokers has been cut, and haircuts and fees on repo financing have increased (see first table). The combination of these factors has caused average hedge fund leverage to fall to 1.4 times capital (from 1.7 times last year) according to market estimates.[2] Hedge funds have also increased cash balances. In the United States, cash balances have doubled to 16 percent of portfolios over the past year. Globally, average cash balances of hedge funds have risen to 22 percent (up from 14 percent one year ago) (see second figure).

Hedge funds are reportedly receiving large-size redemption requests from investors seeking to withdraw capital before others. Only a certain amount of capital is allowed to leave the fund through a "gate" at each quarter. The first ones to redeem come out relatively whole as the fund's most liquid assets are sold to service their requests, compared with those that seek to redeem later and are left holding more illiquid assets. Ninety-five percent of hedge funds have "gates" in their offering memoranda, which allow redemptions of up to 10 percent of fund assets. Redemption requests are usually allocated on a pro-rata basis, a procedure that

Performance of Hedge Fund Strategies and Risk Appetite



Sources: Bloomberg L.P.; and IMF staff estimates.
Note: VIX = S&P 500 volatility index.

Note: The main author of this box is Mustafa Saiyid.

[1]Theoretically, higher market volatility should have increased profit opportunities for strategies such as macro and convertible arbitrage, allowing macro managers to take advantage of wider swings in the performance of various asset classes, and convertible arbitrage managers to go long or short on the more highly-valued convertibility option relative to the underlying stock.

[2]Changes in leverage are calculated over the whole universe of strategies, heavily weighted by equity long-short and merger arbitrage strategies, which typically carry low leverage of 1.5 to 2.0 times (equity) capital. Other strategies typically operate with much higher levels of leverage, although it is difficult to make a direct comparison between equity and fixed-income leverage. For example, leverage is 4 times capital for tactical/macro funds; 5 to 9 times capital for convertible arbitrage funds; and as much as 10 times capital for relative value/fixed-income arbitrage funds. Since fixed-income arbitrage strategies rely more heavily on leverage to generate returns, changes in financing conditions affect the performance of these strategies more than others.

Box 1.5 *(concluded)*

Typical "Haircut" or Initial Margin

(In percent)

	April 2007	August 2008
U.S. treasuries	0.25	3
Investment-grade bonds	0–3	8–12
High-yield bonds	10–15	25–40
Equities	15	20
Investment grade corporate CDS	1	5
Senior leveraged loans	10–12	15–20
Mezzanine leveraged loans	18–25	35+
ABS CDOs: AAA	2–4	95[1]
AA	4–7	95[1]
A	8–15	95[1]
BBB	10–20	95[1]
Equity	50	100[1]
AAA CLO	4	10–20
Prime MBS	2–4	10–20
ABS	3–5	50–60

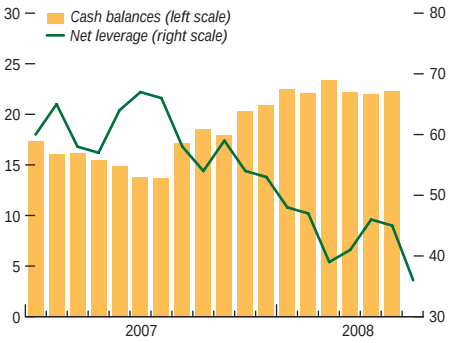
Sources: Citigroup; Morgan Stanley Prime Brokerage; and IMF staff estimates.

Note: ABS = asset-backed security; CDO = collateralized debt obligation; CDS = credit default swap; CLO = collateralized loan obligation; MBS = mortgage-backed security; RMBS = residential mortgage-backed security.

[1]Theoretical haircuts as CDOs are no longer accepted as collateral.

Leverage and Cash Balances of Global Hedge Funds

(In percent)



Source: Morgan Stanley Prime Brokerage.

Note: Leverage defined as assets divided by equity capital cash balances as a percent of total assets.

results in investors seeking larger redemptions than they need, as this increases the likelihood of being allocated redemption amounts more in line with their actual needs.

The combination of falling asset values, higher volatility, rising collateral haircuts, and investor redemptions have resulted in an increasing frequency of hedge fund failures in recent months, especially for those with exposure to structured credit.[3] Fixed-income hedge funds that have failed since June 2007 managed $97 billion in assets (see second table). Losses of investors in these hedge funds may already be as high as $60 billion over the course of the past year.

In response, hedge funds are seeking to restrict redemptions, but in return are having to cut their fees. Some are seeking to lengthen "lock-ups" of investor capital for as long as three years, while others have increasingly invoked "gates." Moreover, the average annual base fee has declined by as much as 50 basis points from 2 percent last year.

New restrictions on short selling could add further pressure to business models of hedge funds. Equity long-short strategies, which make up almost half of the $2 trillion hedge fund universe, are likely to suffer from reduced opportunities to make money from short positions. Some hedge funds report that they are avoiding the financial sector altogether, as they are unable to hedge long exposures with

Large Hedge Fund Failures

(June 2007–August 2008)

Strategy	Number	Assets[1]	Asset-Weighted Leverage[2]
Fixed-income	31	97	16
Structured products	21	79	17
Sovereign/Macro	4	8	14
Other fixed-income	6	10	10

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

Note: Includes hedge fund failures exceeding $100 million.

[1]In billions of U.S. dollars

[2]Leverage is defined as the ratio of assets to equity capital.

[3]Even relatively small declines in performance—5 to 10 percent, for instance—can force funds to liquidate large amounts of assets to meet margin calls or redemption requests. See Table 1.3 in the October 2007 GFSR (IMF, 2007).

shorts in this sector. Prime brokers comment that there are few alternatives to short sales, as synthetic shorts through options markets remain expensive and the credit default swap market provides imperfect hedges for long stock exposures.

From a systemic point of view, mounting strains on hedge funds could force rapid and disorderly unwinding of positions in various assets with wider ramifications for market liquidity. This could have potential knock-on effects for other market participants, for example, through counterparty exposures in derivatives markets. Institutional investors, including some pension funds and endowments, could suffer losses on exposures to fixed-income and equity long-short hedge funds, as such allocations had risen significantly in recent years.

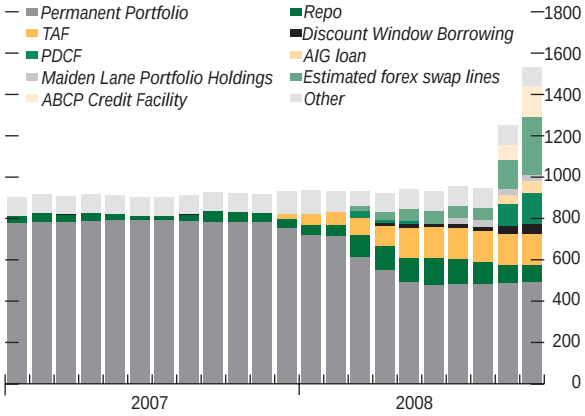
now provided primarily on overnight terms. As a result, a number of nonbank institutions face possible failure, require official sector support, or must sell assets into illiquid markets to meet redemption pressures. Prime money market mutual funds (MMFs) have already experienced escalating redemptions, forcing failures in some cases, and a shortening in duration and reallocation to safe haven assets in other cases (Box 1.1). Instead of their traditional role of supplying liquidity to banks, they are now competing with banks for overnight funds and with financial firms for safer assets. This has exacerbated interbank funding pressures and increased rollover risks. The conservative stance of prime MMFs has also reduced the availability and raised the cost of commercial paper financing to nonfinancial corporations. To break this spiral, the U.S. authorities introduced a temporary guarantee on MMF investments in ABCP. Importantly, hedge funds are also facing tighter funding conditions, exacerbating redemption pressures due to weak performance, reduced investor risk appetite, and the impact of equity short selling restrictions. There are risks of a forced unwinding of their asset positions in the months ahead and a disorderly exit from hedge funds, with wider ramifications for market liquidity and volatility (Box 1.5).

Rising public commitments could put pressure on perceived risks of sovereign credits.

Since balance sheet stresses in both the bank and near-bank sectors have severely compromised their ability to provide credit to the broader economy, the official sector has had to play a more active role in alleviating stresses. Government efforts to bolster market confidence and support broader financial and nonfinancial sectors should eventually assist in an orderly deleveraging by providing support to private balance sheets (Figures 1.31 and 1.32). However, increasing government commitments could further raise concerns about sovereign risk as risk is transferred from the private to the public sector. For instance, there are significant uncertainties about the budgetary impact of the U.S. government's GSE rescue operations, supplemental financing support to the Federal Reserve, support to the FDIC and other government agencies, and the $700 billion troubled asset purchase program. There is similar fiscal uncertainty related to government bilateral commitments introduced in Europe to support troubled institutions.[46] Reflecting concerns about a deterioration in fiscal positions and uncertainty

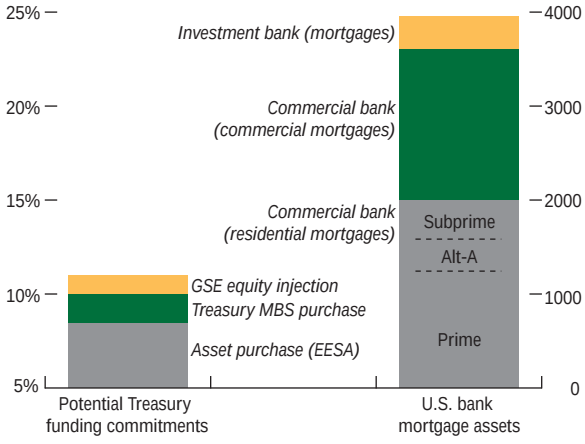
[46]There are several channels through which fiscal costs could rise: (1) a decline in net worth in the GSEs, thus requiring further capital infusions; (2) a deterioration in U.S. secondary mortgage market, requiring additional purchases of agency-backed MBS; (3) funding difficulties among the GSEs, leading to the extension of funds through the secured lending credit facility; (4) losses due to price declines on troubled assets that the U.S. Treasury might purchase from financial institutions; (5) increased demand for temporary insurance for money funds; and (6) a depletion in FDIC reserves, requiring a line of credit or other funds. At this stage, it is difficult to quantify the outlays with any degree of confidence.

Figure 1.31. Total Assets on Federal Reserve's Balance Sheet
(In billions of U.S. dollars)



Sources: Federal Reserve; and Morgan Stanley.
Note: ABCP = asset-backed commercial paper; AIG = American International Group; PDCF = Primary Dealer Credit Facility; TAF = Term Auction Facility.

Figure 1.32. Potential U.S. Commitments and Mortgage Markets
(In percent of GDP; and billions of U.S. dollars)



Sources: Federal Reserve, *Flow of Funds*; JPMorgan Chase & Co.; and IMF staff estimates.
Note: GSE = government-sponsored enterprise; MBS = mortgage-backed security; EESA = Emergency Economic Recovery Act.

regarding the effectiveness of the government actions, mature market sovereign CDS spreads have widened (Figure 1.33).

Emerging Market Resilience Is Being Tested

Global stress spreads to emerging markets . . .

As the global financial turmoil has intensified, emerging market countries that once appeared relatively immune to the financial and economic shocks emanating from mature markets have increasingly been tested. Deleveraging by global financial institutions has raised the cost and reduced the availability of external financing, and investor risk appetite has decreased, reducing the demand for emerging market assets. Hopes for "decoupling" of emerging market countries from mature markets have diminished,[47] and emerging market policymakers are coping with a global growth slowdown, the risk of capital outflows, and inflation risks on the back of earlier commodity price increases.

. . . and vulnerabilities are broadening.

Vulnerabilities have risen in a number of emerging markets, some of which are highlighted in Table 1.5. Emerging Asia has suffered a substantial increase in vulnerability over the last six months, with inflation and terms-of-trade shocks hitting particularly hard, accompanied by concerns over the region's gearing to weakening global growth. Latin America has generally benefited from a positive terms-of-trade effect from higher commodity prices, while monetary policy has been more aggressive in containing inflation risk, but recent commodity price declines have raised concerns about the region's continued ability to resist a global slowdown. As highlighted in earlier GFSRs, domestic credit and inflation have grown rapidly in emerging Europe, and now that the domestic credit cycle

[47]Chapter 4 examines whether increasing financial integration has potentially raised emerging markets' vulnerability to external global shocks, focusing on the channel of equity markets.

is turning in some economies, the risk of a hard landing or regional financial crunch has increased.

Against the backdrop of rising emerging market risks, institutional investors have reduced positions, especially in equities.

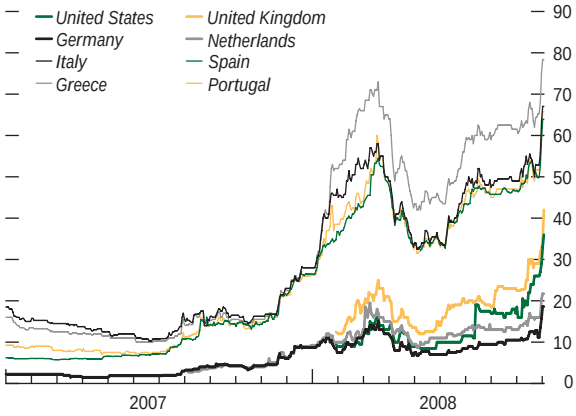
Mutual and pension funds have scaled back emerging market exposure in response to rising emerging market vulnerabilities. Flows into emerging equity markets have slowed or reversed since the beginning of the year, amid investor concerns about emerging market inflation and exposure to a slowing global business cycle (see Chapter 4 and Figure 1.34).[48] This has been more pronounced in Asia, with especially heavy outflows from Korea and Thailand, bringing net sales of Asian equities to $56 billion in the year through September. Latin America and Emerging Europe, the Middle East, and Africa have also experienced net equity portfolio outflows in recent months. As a consequence, share prices have dropped sharply.

Tightening external and internal conditions in emerging markets could result in a downturn in the domestic credit cycle.

Emerging economies are faced with more costly and less available external financing, as strained global banks restrict funding in the face of the credit crunch. Spreads on emerging market sovereigns and corporates have widened substantially (Figure 1.35). Issuance of emerging market external corporate debt contracted from $88 billion in the first three quarters of 2007 to $40 billion during the same period in 2008. Leveraged investors—such as hedge funds—that depend on funding from prime brokers or other financial institutions have been forced to scale back emerging market investments. The slowdown or reversal of funding inflows has contributed to sharp increases in onshore dollar funding costs—as implied by currency forwards or cross-currency swaps—in economies as

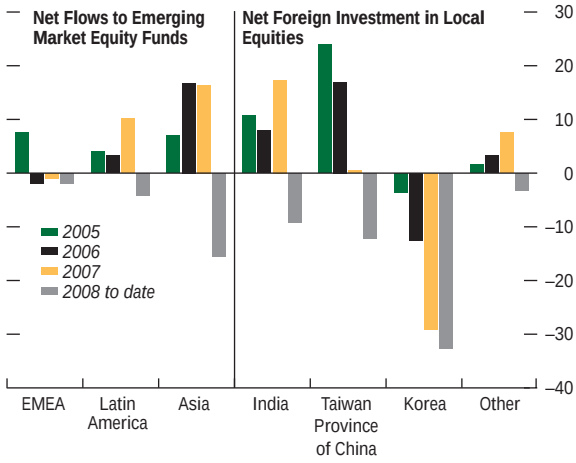
[48]Chapter 4 provides a longer-term view of vulnerabilities to equity market changes.

Figure 1.33. Sovereign Credit Default Swap Spreads
(In basis points, ten-year tenors)



Source: Bloomberg L.P.

Figure 1.34. Net Foreign Equity Investment in Emerging Economies
(In billions of U.S. dollars)



Sources: Bloomberg L.P.; and IMF staff estimates.
Note: "Other" includes Indonesia, Philippines, Thailand, and Vietnam.
EMEA = Emerging Europe, the Middle East, and Africa.

Table 1.5. Macro and Financial Indicators in Selected Emerging Market Countries[1]

	Commodity Price Sensitivity[2] *(Ratio)*	Current Account Balance[3] *(In percent of GDP)*	Gross Reserves to Short-Term External Debt[4] *(Ratio)*	Net External Position vis-à-vis BIS-Reporting Banks[5] *(In percent of GDP)*	Growth in Credit to the Private Sector[6] *(In percent, year-on-year)*	Inflation[7] *(In percent)*	Real Policy Rate[8] *(In percent)*
Europe							
Bulgaria	1.6	–21.9	1.1	–29.0	54.5	14.5	–9.4
Croatia	1.1	–9.0	0.9	–59.7	11.6	8.4	. . .
Estonia	1.2	–11.2	0.2	–78.7	21.5	11.1	. . .
Hungary	0.6	–5.5	0.9	–54.1	18.0	6.7	1.8
Iceland[9]	3.9	–8.0	. . .	–267.9	. . .	13.6	1.9
Kazakhstan	4.5	–1.7	0.6	–8.0	22.8	20.0	–9.5
Latvia	1.9	–15.0	0.3	–72.5	22.2	16.7	–10.7
Lithuania	1.2	–10.5	0.9	–45.6	36.4	12.2	–7.0
Poland	0.7	–5.0	0.8	–17.1	29.5	4.8	1.2
Romania	0.6	–14.5	0.9	–36.4	62.0	9.0	1.2
Russia	4.1	5.8	2.9	2.2	51.4	14.7	–3.7
Serbia	. . .	–16.1	2.8	–15.1	37.0	14.3	. . .
Turkey	0.3	–6.7	0.9	–12.2	32.9	12.1	4.7
Ukraine	0.6	–7.6	1.0	–9.5	63.9	26.8	–14.8
Gulf States							
Kuwait	13.6	45.2	. . .	8.9	35.5	11.4	–5.7
Saudi Arabia	7.6	31.3	. . .	27.9	28.5	10.6	. . .
United Arab Emirates	5.3	27.5	. . .	–1.3	45.3	. . .	. . .
Africa							
Egypt	2.1	0.8	7.5	16.0	12.6	22.2	–11.2
Ghana	2.7	–9.8	. . .	–8.0	. . .	15.3	. . .
Nigeria	4.5	6.5	. . .	15.5	96.5	9.7	. . .
South Africa	1.2	–7.7	1.6	4.7	15.2	11.6	0.4
Uganda	2.8	–7.7	. . .	13.4	41.2	8.7	. . .
Asia							
China	0.3	9.8	6.9	1.1	17.5	6.3	1.2
India	0.5	–3.1	5.9	–8.9	24.1	12.0	–3.0
Indonesia	1.2	1.8	2.1	–8.5	31.4	11.9	–2.9
Korea	0.2	–1.0	1.3	–17.5	16.0	5.9	–0.7
Malaysia	1.4	11.7	6.0	–10.1	10.3	7.7	–4.2
Pakistan	0.6	–6.9	12.1	4.8	21.6	24.3	–11.3
Philippines	0.3	2.1	2.2	–2.2	5.2	12.2	–6.5
Thailand	0.6	3.4	3.1	3.2	7.0	9.2	–5.7
Vietnam	1.9	–13.6	14.5	–10.2	63.9	27.0	–13.0
Latin America							
Argentina[10]	6.7	0.4	1.1	2.8	37.6	9.1	–0.2
Brazil	1.8	–0.7	1.7	–8.1	31.0	6.4	6.6
Chile	2.5	–0.5	1.1	–7.9	17.8	9.5	–1.8
Colombia	4.8	–4.9	1.7	0.4	21.0	7.5	2.5
Mexico	1.4	–1.0	1.4	–2.3	11.5	5.4	2.9
Peru	2.7	–0.2	3.0	2.6	31.7	5.8	0.2
Venezuela	8.3	7.2	2.2	24.1	51.8	33.7	–8.9

Sources: Bloomberg L.P; Bank for International Settlements (BIS); IMF, *Direction of Trade Statistics, International Financial Statistics* (IFS), and *World Economic Outlook* (WEO); and IMF staff estimates.

[1]The shaded boxes of the table point to areas of potential concern. Cut-off values are as follows: measure of commodity price sensitivity of less than 1; current account balance below –5 percent of GDP; ratio of reserves to short-term debt below 1; net external liabilities to BIS-reporting banks less than –10 percent of GDP; growth of credit to the private sector greater than 20 percent year-on-year; inflation greater than 10 percent year-on-year; real policy rates below zero.

[2]The ratio of exports of primary commodities to total exports divided by the ratio of imports of primary commodities to total imports estimated by IMF staff. Average of 2002–04.

[3]Projections of the current account balance and GDP for 2008 in dollar terms from the WEO.

[4]Short-term debt is measured at remaining maturity. End–2007 estimated by IMF staff.

[5]Data on external positions of reporting banks vis-à-vis individual countries and all sectors from the BIS.

[6]The latest observations ranging from February 2007/08 to June 2007/08 from the IFS.

[7]Year-on-year inflation in July 2008 or latest observations.

[8]Policy rates in mid-August 2008 are deflated by inflation shown in the previous column.

[9]Though it is classified as a mature market, Iceland is included in this table becuase of its relatively high levels on some indicators included in this table.

[10]Analysts believe and various indicators suggest that actual inflation is considerably higher than the official data.

diverse as Brazil, Korea, and India (Figure 1.36). Smaller corporates and financials have been especially squeezed and in some cases shut off from dollar funding.

A combination of global credit tightening, rising domestic interest rates based on inflation concerns, and a global growth slowdown could accelerate a downturn in domestic credit, which, following a lending boom, is likely to lead to rising defaults and deterioration in asset quality. Credit growth in several emerging markets has begun to slow, forcing a downturn in real estate prices in some cases.[49] Most emerging market banking systems had been insulated from the global credit turmoil (Figure 1.37),[50] but some are facing increasing external financing pressures. In those dominated by foreign-owned banks dependent on parent bank financing, the deterioration in asset quality as well as a downturn in parent banks' home markets, could slow external funding, as seems evident in the Baltics. In countries more reliant on portfolio flows, banks have come under stress as outflows have tightened money market liquidity, raising concerns about access to funding. These pressures are most evident in Russia, where they aggravated concerns about counterparty risk and led to illiquid interbank markets and substantial emergency public support to avert a systemic crisis.

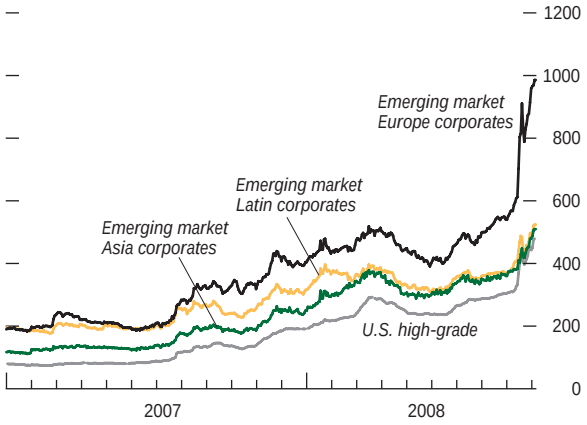
High inflation rates have complicated policymaking, sending real interest rates below zero.

Inflation-targeting regimes are being tested as inflation exceeds central bank targets in many emerging markets. In response, many central banks have tightened monetary policy. However, policy rate increases have often been insufficient to prevent real interest rates from falling, often into negative territory, as monetary policy

[49]See Figure 1.40 in Annex 1.1 for private sector credit growth among emerging market economies.

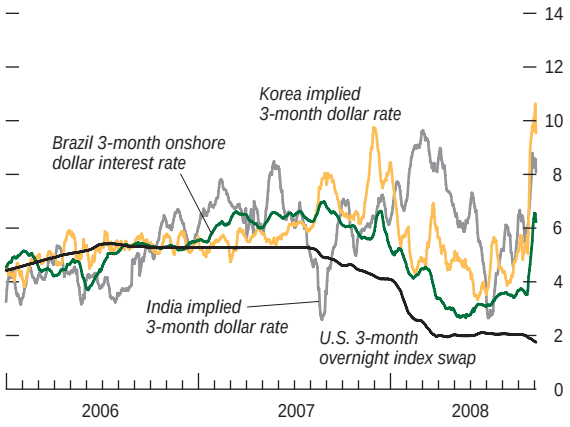
[50]Emerging market economies have largely avoided direct exposure to mortgage-related structured products, reflecting in part that attractive domestic investment opportunities obviate the need for complex products that enhance yield.

Figure 1.35. Emerging Market External and U.S. High-Grade Corporate Spreads
(In basis points)



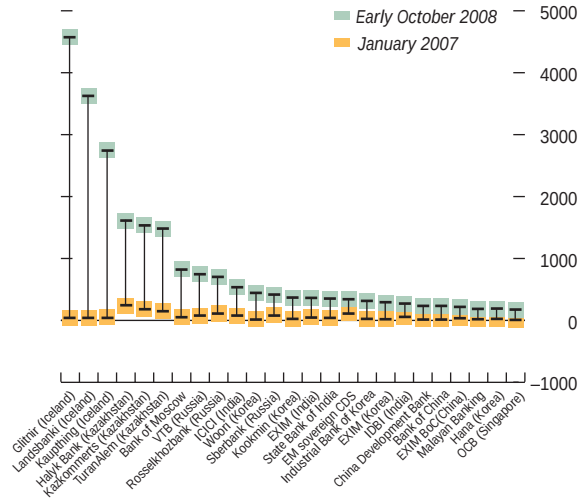
Sources: J.P. Morgan Chase & Co.; and Merrill Lynch.

Figure 1.36. Onshore Emerging Market Dollar Interest Rates
(In percent; 10-day moving averages)



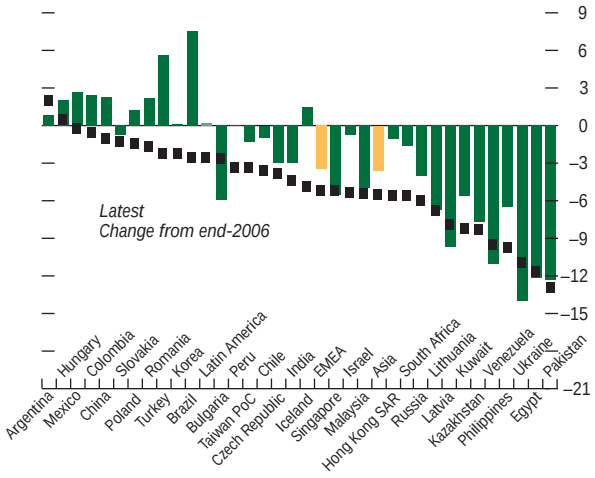
Sources: Bloomberg L.P.; and IMF staff estimates.

Figure 1.37. Credit Default Swap Spreads on Selected Emerging Market Banks, January 2007—Early October 2008
(In basis points)



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

Figure 1.38. Real Policy Rates: Latest Levels and Changes from end-2006
(In percent)



Sources: Bloomberg L.P.; and IMF staff estimates.
Note: Policy rates or similar indicators used by market analysts and year-on-year inflation in December 2006 and September 2008 or latest. Analysts believe and various indicators suggest that actual inflation is considerably higher than the official data in Argentina. EMEA = Emerging Europe, the Middle East, and Africa.

authorities viewed commodity price shocks as either exogenous or transitory (Figure 1.38).[51] Compounding the problem, policy settings in many economies were relatively loose coming into the credit crisis, partly owing to accommodative monetary conditions in mature economies.

More recently, with global growth prospects weakening further, commodity prices have fallen, leading to a moderation in market-based inflation expectations (Figure 1.39). However, the gradual removal of distortionary subsidies, while welcome, and the potential for another run-up in commodity prices once the global economy stabilizes, continue to pose risks to the inflation outlook. Moreover, signs of second-round effects are showing up on the back of relatively robust domestic demand, as core inflation and wages have risen.

The risks of a hard landing are highest in Eastern Europe.

House prices in eastern Europe have soared in tandem with domestic credit growth, and the credit portfolios of banks in emerging Europe have become increasingly exposed to the real estate sector. Banks have not experienced a significant increase in loan losses so far, but have increased provisions for bad loans. Internal risk controls could force a sharp reduction in credit growth to protect bank capital if asset quality deteriorates sharply. The risk of such a scenario has risen, for instance, in the Baltics, where house price appreciation has slowed or prices have fallen, real credit growth is falling sharply (Figure 1.40), real GDP growth has decelerated sharply or turned negative, and inflation remains elevated. Elsewhere in eastern Europe, specifically in Bulgaria, Romania, and Ukraine, house prices and domestic credit are still growing, but credit spreads have risen as well, signaling an increase in risks.

Domestic banks in central and eastern Europe have also built up large negative net foreign

[51]See Chapter 3 of the October 2008 WEO (IMF, 2008d) for a discussion on the linkage between inflation and commodity prices.

positions vis-à-vis international lenders. In these countries, the maintenance of credit growth hinges crucially on cross-border lending by foreign parent banks to local subsidiaries.[52] Most of those parent banks remain vulnerable to a downturn in market sentiment as they obtain a substantial part of their funding from international wholesale markets, and many—including parent banks in Sweden, Austria, and Italy—have come under increasing stress from the global credit shocks in September. While most are committed to a long-term presence in the region, if external financing conditions deteriorate further and force parent banks to contract credit to the region, a soft landing in the Baltics and southeast Europe could be jeopardized. Indeed, IMF analysis finds that, under a stress scenario, shocks emanating from common western European lenders could have widespread spillover effects across emerging Europe, provoking or contributing to contagion in the region (Àrvai, Driessen, and Ötker-Robe, forthcoming).

Global spillovers and rising vulnerabilities could test the resilience of emerging markets

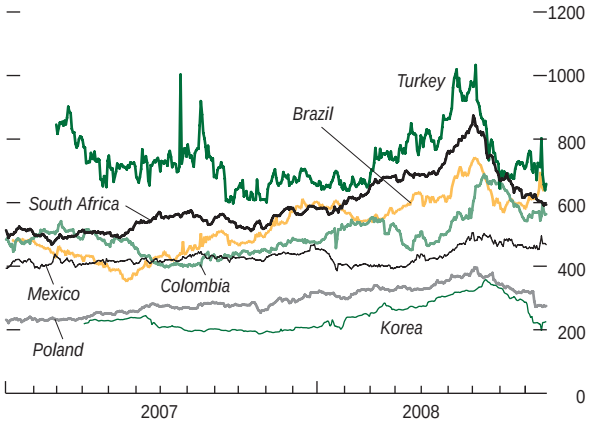
A continuation of heavy capital outflows from emerging markets would pose challenges for countries that rely heavily on external financing and with lower reserve ratios. Should difficult external credit conditions persist or even intensify, economies that are more leveraged, or those where domestic credit growth has been particularly rapid, are likely to see a buildup of pressures on domestic banking systems. Under such conditions, the premium on the maintenance of a sound macroeconomic framework is increased.

Financial Stability Policies

The analysis in this report sets out the sizable adjustments needed as part of the deleveraging process and highlights the pressures that

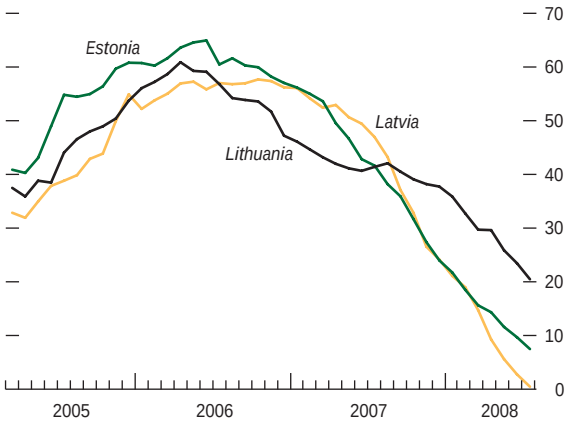
[52]Net foreign liabilities (external positions vis-à-vis Bank for International Settlements (BIS) reporting banks) have risen as a consequence of sustained large current account deficits and rapid growth in domestic credit (Table 1.5).

Figure 1.39. Break-Even Inflation Rates
(In basis points)



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

Figure 1.40. Baltic States: Real Bank Loan Growth to Nonfinancial Private Sector
(In percent, real terms, year-on-year change)



Sources: Bloomberg L.P.; European Central Bank; and IMF staff estimates.

systemically important institutions are facing as part of that adjustment. Even before the events of recent weeks, finding a purely private sector resolution of financial market strains had become increasingly difficult in an environment marked by declining asset values, exacerbated by procyclical forces such as ratings downgrades, and the challenges of distinguishing good from bad assets and strong from weak institutions. Now, the global disappearance of trust in counterparties and widespread cash hoarding that has surfaced recently has made it inevitable that, if a resolution plan is to achieve an orderly deleveraging process that limits damage to the financial system and the economy, the authorities will need to play a major role in it.

The ultimate goal should be to mitigate the adverse feedback loop between the financial system and the economy. To achieve this, measures must focus on rebuilding confidence in institutions and markets and on reducing the pressures on banks to cut back the provision of new credit as part of their deleveraging. The public sector must signal as clearly as possible the principles that guide its approach. In recent months, volatility and illiquidity have been exacerbated by market uncertainty about how authorities will balance the competing claims of minimizing moral hazard and protecting against systemic risk.

Measures must be comprehensive, timely, and clearly communicated, addressing the underlying causes of uncertainty and the areas under strain from deleveraging pressures. IMF experience in previous financial crises indicates that early and decisive action is needed in order to normalize markets and stem the spread of financial and economic distress. To halt—and begin to reverse—the negative spiral in markets and the economy, the policy strategy needs to address three key, interrelated, sources of stress: first funding markets need to be restarted; continuing uncertainties about problem assets need to be reduced; and firms' capital positions need to be improved.

Actions to stabilize the global financial system should be coordinated across countries, and in particular across the major financial centers. While the specific measures adopted may vary from country to country, depending on their individual areas of weaknesses and relative strengths, coordination of early action to address problems would send a strong signal to boost market confidence, and will also help avoid adverse effects that one country's measures may have on others or perverse incentives in international markets. Authorities need to ensure that they can rapidly respond to further emerging pressures, based on a mechanism for the early detection of strains, to contain systemic repercussions. This may require an enabling framework that allows for decisive action when needed.

Private sector solutions are preferred but, if needed, emergency government interventions should be temporary and taxpayer interests protected. The objectives of intervention should be clear and operating procedures transparent. Accountability of government actions to all stakeholders is important and conditionality for support of institutions should include steps to restructure weak but viable institutions so as to place them on a sounder footing. Mechanisms should limit moral hazard and taxpayer costs as much as possible, while recognizing the exigency of the situation and the clear need for public support. Those measures that have a distorting effect on markets should be removed once confidence is restored.

Lastly, measures taken must further the medium-term objective of a restructured financial system that is sound, competitive, and efficient. Achieving this requires an orderly resolution of unviable banks and the repairing of market discipline. Funding and securitization markets critical to pricing and intermediating credit should be strengthened, including by reducing over time counterparty risks through centralized clearing. This period of change provides an opportunity to reexamine the international macrofinancial stability framework governing the regulation of the financial sector and strengthen the hand of supervisors and regulators. Events have highlighted the need to

focus regulation and supervision on the types of financial activities, rather than the type of intermediary—bank, insurance, company, or investment fund. Mechanisms for closer and more effective cross-border coordination and collaboration among supervisors, regulators, and central banks are needed.

In the near term, a comprehensive and global approach is needed to stem crisis risks and address their underlying causes.

The worsening in confidence and market dysfunction in September led the U.S. authorities to supplement their case-by-case approach that addresses points of distress as they arise with a more comprehensive and systemic response. The new approach encompasses a wide-ranging set of measures, including liquidity support for banks and near-bank institutions such as broker-dealers and money market funds; asset purchases to free up bank balance sheets; support for the housing market; extending deposit insurance; and restricting short selling. The actions taken by the U.S. authorities are intended to relieve pressures on financial balance sheets and to restore confidence. These measures are positive, comprehensive, and necessary; their goal is to provide a catalyst for private markets to support asset prices, open up funding, and allow the rebuilding of capital cushions. It is too early to assess their impact, but, given the obvious continuing uncertainties, these measures have provided some reassurance to markets that the authorities stand ready to take the necessary measures to avoid more disruptions.

While the epicenter of the crisis is the United States, the financial strains caused by a disorderly deleveraging and a rapid retrenchment of risk positions is global, and thus many other countries around the world have undertaken policy responses. Actions have been the most wide-ranging in the United States and Europe, while some Asian countries have expanded their liquidity support to markets.

In Europe, measures to improve funding have been coordinated within the euro area through the ECB's operations, and internationally, dollar liquidity needs have been alleviated through swap facilities between European central banks and the Federal Reserve. EU-wide action is also under way to improve supervisory capital requirements and other aspects of market structure. However, near-term measures to address capital, shortages, and problem assets have tended to be undertaken more on a case-by-case and on a national basis.

Policy actions to date have varied, both between Europe and the United States, and between different countries within Europe, partly reflecting different circumstances. In the case of the United States, there is a greater need to address the resolution of problem loans themselves—notably subprime mortgages—than in Europe, where problems over the loan quality of domestically generated assets have been less severe to date and housing market conditions vary widely from country to country, but financial institutions have faced funding and asset quality problems in both U.S. dollars and domestic currency.

However, the common cross-border problems that financial institutions, markets, and real economies face argue for more globally consistent policy approaches than have so far been the case. Without such coordination, the adjustment process is likely to be more painful and protracted, steps by individual jurisdictions to defuse their own market pressures may spill over to other jurisdictions, and concerns about inequitable burden-sharing may prevent necessary but costly measures from being taken. This may reduce the benefit of policies to restore confidence to the global financial system and increase the costs.

Measures to address problem assets.

As private sector balance sheets seek to shed assets in order to delever, the use of public sector balance sheets can help prevent "fire sale" liquidations that threaten to reduce bank capital. Countries where banks have large exposures to securitized or other problem assets could consider mechanisms for the government to purchase or provide long-term funding to assets.

This should create greater certainty about balance sheet health. Setting up an asset management company provides a framework of legal clarity and accountability for the process.

The Troubled Asset Relief Program (TARP)envisaged under the recently enacted U.S. Emergency Economic Stabilization Act presents both opportunities and challenges. The program represents a systematic approach to purchase troubled assets from financial institutions and is consistent with international experience that removing unsound assets from banks' balance sheets is a vital step in the resolution of crises. However, its operational design has yet to be established and international experience suggests that it is these operational details that will be crucial to its success. In order to reduce public costs, it is important that the objectives behind the repurchase program be clearly set out from the beginning, that asset purchases help to reestablish market prices, and that appropriate expertise and incentives be put in place to ensure reasonable returns for public sector capital. Management of the program needs to be independent of political considerations, but still be subject to a high degree of accountability.

A major challenge will be to avoid adverse selection in the troubled assets that the government buys. The structured assets to be bought under the program are inherently heterogeneous and the difficulty of accurately estimating their value and risks lies at the heart of the crisis. Care will therefore be needed to ensure that the purchase process results in prices that adequately reflect the difference in quality of the assets bought. In the absence of such differentiation there is the risk that those parties that own more inferior assets benefit at the expense of those that showed more credit discipline during the boom and therefore offer higher-quality assets under the program.

Although the program should improve banks' liquidity and free up space on their balance sheets, its impact on banks' capital positions will likely be uneven. Indeed, banks' sale of assets may crystallize their losses, potentially accelerating the need to raise new capital. The program has enough flexibility to be able to focus on the capitalization needs. In addition, the asset purchases may need to be combined with a wider capital-raising strategy, or with a plan to resolve banks that may become unviable. Moreover, in balancing both objectives, experience shows that capitalization should be the first priority. In the meantime, relief from strict application of mark-to-market prices for regulatory capital purposes or some other form of regulatory forbearance may avoid accelerating capital needs while capital-raising remains very difficult.

The major budgetary implications of an asset purchase program mean that any decision in Europe to set up such a program will inevitably need to take place at the individual country level, but further coordination and a common approach is needed, even if the implementation has to be tailored to the specific circumstances of each country. It is also an opportunity to resolve the diversity of deposit insurance regimes, one of the most important reforms needed to strengthen the financial stability framework in Europe. Governments in countries where market confidence in their financial institutions is being hindered by large exposures to structured, securitized assets trapped on balance sheets due to illiquid markets, or by other problem assets (whether U.S. or domestic), should similarly consider putting in place mechanisms for government purchase or funding of problem assets. Authorities should ensure that these mechanisms are consistent with each other in their design and underlying principles, to avoid adding to uncertainty over valuations of assets and balance sheets.

Measures to improve capital positions.

To keep credit growing while strengthening capital ratios, this chapter suggests that an estimated $675 billion of additional capital needs to be raised from public markets. With capital markets at present almost shut, governments will likely, in some cases, need to be involved in recapitalization of financial institutions where they are viable and important to the financial

system. Even if recapitalization plans are government-led, they should ensure that incentives remain for private sector capital-raising, including from existing shareholders, and they should also be tied to measures to restructure firms and deal with troubled assets so as to ensure future balance sheet health. In order to protect public interests, any new capital provided by governments should have preferred status. Unviable banks should be closed in orderly fashion. Careful consideration of takeovers of troubled institutions is needed to ensure that the consolidated entity is not unduly weakened nor that it is of a size or results in a level of financial sector concentration that would imply higher systemic risks in the future.

Although restrictions on short sales of shares of financial institutions may provide some temporary support to financial institutions' market capitalization in an environment of uncertainty, such measures do not fundamentally address underlying balance sheet weaknesses. Moreover, their impact may also be vitiated by the ability of market participants to take short positions through other instruments, such as derivatives. They may also have unintended and unhelpful consequences, including on market liquidity. Such restrictions should therefore be temporary and limited in scope to the measures needed to prevent systemic instability under exceptional circumstances while broader measures to restore confidence are being introduced.

Measures to restart funding and improve liquidity management.

Financial institutions that rely on wholesale funding, including in cross-border markets, have been facing severe and mounting refinancing problems and concerns about counterparty risk have risen sharply. Stabilizing institutions' access to funding is essential while progress in improving capitalization and asset quality is made. For the time being, therefore, central banks will need to continue to coordinate to supply liquidity in sufficient scale and with long enough maturities to provide confidence in the stability of banks' funding.

However, if systemic circumstances deteriorate further to a point where the loss of confidence in financial institutions puts their access to sufficient liquidity and capital market funding in doubt, official guarantees may be unavoidable as a temporary measure until confidence returns. Furthermore, a guarantee for the senior and subordinated debt liabilities of financial institutions need not be blanket to all institutions (e.g., guarantees of wholesale market liabilities may not be needed for those institutions that do not rely on such funding). Provision of such guarantees should include safeguards (fees, recourse to the balance sheet of the guaranteed bank, etc.). Alternatively, caps on deposit insurance of retail accounts could be increased beyond normal limits, as a number of countries have already done or are considering. The capacity of the government balance sheet to absorb the extra cost needs to be carefully considered when deciding whether and how to expand guarantees. Actions should be coordinated across countries and should include measures to prevent banks from using the expanded guarantee to gain international market share, so as to avoid transferring pressure to other countries. The U.S. government's actions to temporarily provide guarantees to money market mutual funds are a helpful step to restore investor confidence in that sector. In some countries, support for short-term collateralized funding between banks through triparty repurchase agreements or for money market funds could be provided through a backstop guarantee, while longer-term solutions to reduce counterparty risks in the broader markets are addressed, such as centralized clearing and settlement arrangements.

Cross-border vulnerabilities have been exposed by the crisis.

Many banks have faced persistent difficulty in obtaining cross-border funding of sufficiently long maturity and with sufficient reliability. All banks with significant cross-border activities need to reassess the adequacy and robustness of their cross-border funding plans. In addition, national authorities need plans in place to deal with

banking crises that involve large cross-border funding needs. The Federal Reserve's Term Auction Facility, accessible in several other countries through swap operations, is a useful example of cross-border cooperation, albeit on a temporary basis. Central banks should seek to regularize the procedures for cooperation going forward.

Authorities continue to work on cross-border cooperation and contingency planning for crisis management, but more progress is needed. Further international work is needed to address the difficulties of dealing with cross-border firms under existing bankruptcy laws and insolvency regimes. This includes the need to address national legislation, such as requirements to ring-fence assets, where it acts as an obstacle to internationally cooperative solutions. Authorities should also clarify international arrangements for coordinating the deposit insurance of cross-border institutions. In the meantime, more robust information-sharing arrangements and mechanisms for rapid cooperation need to be put in place. Countries should start by addressing potential vulnerabilities and exposures in financial relationships between particular pairs or small groups of countries where they are systemically important.

Emerging markets should also address risks spread through financial channels.

Financial institutions in emerging markets have been less affected than those in mature markets, in part because the use of structured credit products was largely restricted to the latter. But spillovers have been increasing in recent weeks, sharply in some cases. Many of the policy lessons from the crisis for mature markets are similarly applicable to emerging market authorities in areas such as crisis management, central bank liquidity operations, capital adequacy, supervision of liquidity management, deposit insurance, and the clarity of authorities' roles and responsibilities.

Authorities need to ensure that they have the flexibility in their market operations to address liquidity and other market strains that may suddenly arise. The large foreign exchange reserves buildup in many emerging market countries in recent years means that many have the financial resources to provide foreign currency liquidity or to otherwise lend to their systems if needed; they must also make sure that they have the operational capacity and contingency plans to do so.

With regard to emerging Europe, recent assessments of countries under the IMF's Financial Sector Assessment Program (FSAP) have stressed the need for close cooperation between home and host supervisors. This should, at a minimum, include coordinated inspections of internationally active banks, joint risk assessments, and "war games" to handle stress situations. Cooperative arrangements for the joint management of a major bank failure also need to be further developed. Going forward, FSAPs will continue to stress the need for authorities to improve their contingency plans and take better account of the risk of spillovers across institutions, markets, and regions. Where financial systems are exposed to heightened liquidity risks and loss of market confidence, the IMF can play a role in sharing information and experiences on best practices for policy responses, providing technical assistance on instrument design, strengthening surveillance and, if needed, providing program support.

Alongside short-term measures to stabilize markets, more robust foundations for the global financial system are needed.

Events of the last few weeks have dramatically changed the financial landscape. There can be little doubt that some of these changes in market behavior and functioning will prove to be lasting. This period of change provides an opportunity to rethink the financial architecture with fewer constraints about the need to preserve existing market practices than in the past. Events have shown that problems of measuring solvency, liquidity, and risk are in many cases common across sectoral and national boundaries. Regulation and supervision should be designed according to the type of financial activities being performed by regulated institutions, and less by the type of intermediary—

bank, insurance company, or investment fund. There is an opportunity and a need to move toward a macroprudential and regulatory framework that is more integrated in its approach and uniform in its standards, and that involves closer and more effective cross-border coordination and collaboration among supervisors, regulators, and central banks.

Clarity is needed regarding authorities' roles and responsibilities.

The market turmoil has illustrated how fluid the distinction between liquidity and solvency support becomes during systemic financial crises and has raised questions about the costs of intervention. It is important that decisions to address the turmoil are not hampered by lack of clarity over the roles and responsibilities of authorities. The following actions can help avoid such potential confusion:

- The respective roles of central banks, regulators, supervisors, and fiscal authorities regarding financial stability should be clarified. Central banks should focus on systemic liquidity needs and the lender-of-last-resort function. They should play a central role in maintaining financial stability and should have access to the information on individual financial institutions necessary to perform this task. Regulators and supervisors (whether inside or outside central banks) should focus on prudential issues at individual firms while taking full account of overall financial stability conditions. Fiscal authorities should decide on and meet the costs of resolving solvency problems. There need to be enhanced procedures for these authorities to communicate and cooperate.
- Where costs to the public sector arise from support for problem firms, or where funds or guarantees are provided to address solvency issues, these costs should be reflected directly on the fiscal authorities' balance sheet to provide political accountability.
- Regulatory and prudential regimes should be updated to provide comprehensive financial oversight, allow for prompt responses to risks, and remove adverse incentives and conflicts of interest. In the United Kingdom, following lessons from Northern Rock, reforms are being undertaken to enhance supervision; this would be an opportunity to take a more transparent, rules-based approach. In the United States, the Treasury blueprint for a modernized financial regulatory structure, emphasizing regulatory consolidation, and the recent changes to regulation of GSEs, are useful starting points for reform, but further steps are needed. For instance, the business models of the GSEs need to be clarified, differentiating their public and private sector activities. Their commercial activities should be regulated and capitalized in the same way as fully private-sector institutions, facilitating a level playing field and fostering market discipline. It will be important to ensure that regulatory changes in individual jurisdictions are well aligned in order to avoid regulatory arbitrage.

Monitoring of multiple measures of capital and liquidity by regulators, rating agencies, and markets should be accompanied by transparent risk disclosure.

Going forward, changes to the monitoring of capital adequacy and broader balance sheet health are needed. Risk-based capital measures continue to be the right approach for the regulation of capital, but they require a good risk assessment of the assets. The shortcomings that have been exposed in the ability of even the most sophisticated market participants to value and measure the risks underlying structured products have led to uncertainty about the appropriate capital targets for banks to pursue. Monitoring of multiple measures of capital and liquidity ratios, together with rigorous stress testing, can help in assessing firms' ability to withstand a variety of shocks. The third Corrigan Report (Counterparty Risk Management Policy Group, 2008) provides a number of useful guidelines for financial institutions to improve their management of economic capital. Regulators need to closely examine the lessons from the current crisis to ensure that risk measure-

ment takes a sufficiently long-term perspective and to avoid procyclical elements that allowed capital requirements to be reduced during periods of market calm, but have aggravated the capital shortages during the current downturn. Finally, any changes to capital requirements should be phased in to avoid aggravating the impact of deleveraging.

Disclosure of the risks on (and off) banks' balance sheets needs to be transparent and consistent both across institutions and over time. Supervisors need to examine firms' progress in meeting the recommendations of the Financial Stability Forum on standardized risk disclosures as part of, or alongside, their financial reports. But these recommendations are highly specific to the problem assets that triggered the current turmoil; it is even more important for supervisors, accounting bodies, and markets to search for more timeless standards for general risk disclosures that are consistent across firms and borders.

Globally, differences in regulatory and accounting measures that obscure comparability between institutions' risk, solvency, and liquidity measures need to be eliminated where possible. In the United States, regulatory consolidation would help to achieve this. Global moves to make regulatory practices, measures, and published data more consistent across countries would also be very helpful.

Policies are needed to improve the robustness of liquidity management.

Temporary measures to shore up financial institutions' liquidity need to be backed up by actions to improve the robustness of their liquidity management going forward. This will require a three-pronged approach:

- Banks and securities firms need to improve their liquidity management practices, raising holdings of liquid assets and limiting reliance on central bank term financing as a liquidity backstop.
- Regulators need to devise more rigorous standards for firms' liquidity plans, especially given the potential for major markets to remain illiquid for much longer periods than had previously been considered. The Basel Committee on Banking Supervision's draft revised guidelines on liquidity are a welcome step forward, including the recommendation that national supervisors enforce closer compliance than in the past. Much remains to be done on the specifics to translate these principles into practice.
- At the same time, it is not realistic to expect every firm to be able to hold sufficient liquidity to cope with all possible market-wide problems, without a central bank backstop that can be applied quickly and flexibly in the event of system-wide pressures.

Chapter 2 discusses some specific proposals to enhance liquidity management. In addition, all authorities should review their national deposit insurance schemes and, where needed, strengthen the schemes' funding and ensure that they are appropriately supported by prudential regimes and bank resolution procedures. Authorities should agree on a set of international principles for deposit insurance systems that sets out a common core of objectives while recognizing that there may be different system designs that can achieve them.[53]

Annex 1.1. Global Financial Stability Map: Construction and Methodology[54]

This annex outlines our choice of indicators for each of the broad risks and conditions in the global financial stability map (Figure 1.1). To complete the map, these indicators are supplemented by market intelligence and judgment that cannot be adequately represented with available indicators.

To begin construction of the stability map, we determine the percentile rank of the current

[53]The International Association of Deposit Insurers has developed a set of core principles for effective deposit insurance systems that could provide a possible basis. At the same time, work has been taking place for several years on revising the European Union Directive on deposit insurance to achieve greater harmonization and clearer resolution of cross-border issues.

[54]The main author of this annex is Ken Miyajima.

level of each indicator relative to its history to guide our assessment of current conditions, relative both to the April 2008 GFSR and over a longer horizon. Where possible, we have therefore favored indicators with a reasonable time series history. However, the final choice of positioning on the map is not mechanical and represents the best judgment of IMF staff. Table 1.6 shows how each indicator has changed since the last GFSR and our overall assessment of the movement in each risk and condition.

Monetary and Financial Conditions

The availability and cost of funding linked to global monetary and financial conditions (Figure 1.41). To capture movements in general monetary conditions in mature markets, we begin by examining the cost of short-term liquidity, measured as the average level of real short rates across the G-7. From there, we take a broad measure of excess liquidity, defined as the difference between broad money growth and estimates for money demand. Realizing that the channels through which the setting of monetary policy is transmitted to financial markets are complex, some researchers have found that including capital market measures more fully captures the effect of financial prices and wealth on the economy. We therefore also use a financial conditions index that incorporates movements in real exchange rates, real short- and long-term interest rates, credit spreads, equity returns, and market capitalization. Rapid increases in official reserves held by the central bank create central bank liquidity in the domestic currency and in global markets. In particular, the recycling of dollar reserves in the United States contributes to looser liquidity conditions. To measure this, we look at the growth of official international reserves held at the Federal Reserve. While the above measures capture the price effects of monetary and -financial conditions, to examine the quantity effects we incorporate changes in lending conditions, based on senior loan officer surveys in mature markets.

Table 1.6. Changes in Risks and Conditions Since the April 2008 *Global Financial Stability Report*

Conditions and Risks	Changes since April 2008 GFSR
Monetary and Financial Conditions	↓
G-7 real short rates	↔
G-3 excess liquidity	↓
Financial conditions index	↓
Growth in official reserves	↑
G-3 lending conditions	↓
Risk Appetite	↓
Investor survey of risk appetite	↓
Investor confidence index	↔
Emerging market fund flows	↓
Risk aversion index	↓
Macroeconomic Risks	↑
World Economic Outlook global growth risks	↔
G-3 confidence indices	↑
Economic surprise index	↓
OECD leading indicator	↑
Implied global trade growth	↑
Global break-even inflation rates	↓
Emerging Market Risks	↑
Fundamental EMBIG spread	↔
Sovereign credit quality	↑
Credit growth	↓
Median inflation volatility	↑
Corporate spreads	↔
Credit Risks	↑
Global corporate bond index spread	↑
Credit quality composition of corporate bond index	↑
Speculative-grade corporate default rate forecast	↑
Banking stability index	↔
Loan delinquencies	↑
Market and Liquidity Risks	↑↑
Hedge fund estimated leverage	↓
Net noncommercial positions in futures markets	↔
Common component of asset returns	↑
World implied equity risk premia	↓
Composite volatility measure	↑
Financial market liquidity index	↑

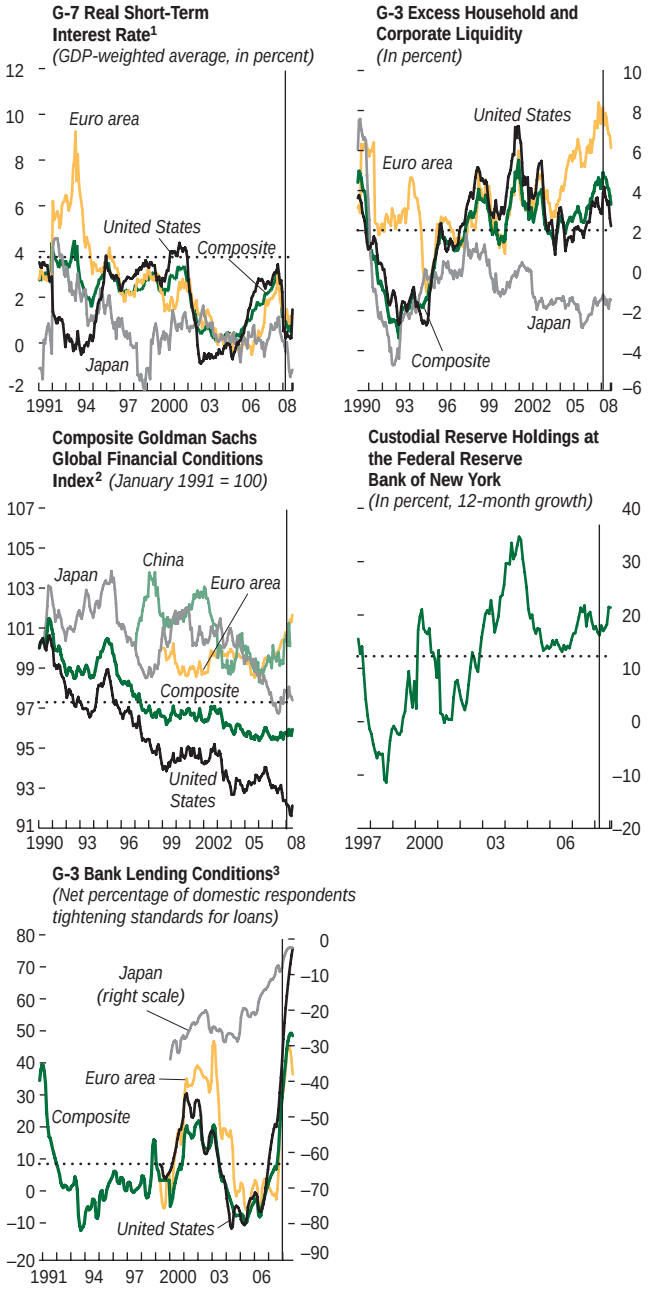
Source: IMF staff estimates.

Note: Changes are defined for each risk/condition such that ↑ signifies higher risk, easier monetary and financial conditions, or greater risk appetite, and ↓ signifies the converse; ↔ indicates no appreciable change. The number of arrows for the six overall conditions and risks correspond to moves on the global financial stability map.

Risk Appetite

The willingness of investors to take on additional risk by increasing exposure to riskier asset classes, and the consequent potential for increased losses (Figure 1.42). We aim to measure the

Figure 1.41. Global Financial Stability Map: Monetary and Financial Conditions



Sources: Bloomberg L.P.; Goldman Sachs; OECD; lending surveys by Bank of Japan, European Central Bank, and Federal Reserve Board for households and corporates; and IMF staff estimates.

Note: Dashed lines are period averages. Vertical lines represent data as of the April 2008 GFSR.

[1]Only G-3 subindicators are shown.

[2]A GDP-weighted average of China, euro area, Japan, and the United States. Each country index represents a weighted average of variables, including interest rates, credit spreads, exchange rates, and financial wealth.

[3]Monthly interpolated GDP-weighted average. Euro area 1999:Q1 to 2002:Q4 based on values implied by credit growth.

extent to which investors are actively taking on more risk. A direct approach to this exploits survey data. The Merrill Lynch Fund Manager Survey asks an estimated 200 fund managers what level of risk they are currently taking relative to their benchmark. We then track the net percentage of investors reporting higher-than-benchmark risk-taking. An alternative approach is to examine institutional holdings and flows into risky assets. The State Street Investor Confidence Index uses changes in equity holdings by large international institutional investors relative to domestic investors to measure relative risk tolerance.[55] The index extracts relative risk tolerance by netting out wealth effects and assuming that changes in fundamentals symmetrically affect all kinds of investors. We also take account of flows into emerging market bond and equity funds, as these represent another risky asset class. Risk appetite may also be inferred indirectly by examining price or return data. As an example of this approach, the Goldman Sachs Risk Aversion Index measures investors' willingness to invest in risky assets as opposed to risk-free securities, building on the premises of the capital asset pricing model.[56] By comparing returns between government debt and equities, the model allows the level of risk aversion to move over time. Taken together, these measures provide a broad indicator of risk appetite.

Macroeconomic Risks

Macroeconomic shocks with the potential to trigger a sharp market correction, given existing conditions in capital markets (Figure 1.43). Our principal assessment of the macroeconomic risks is based on the analysis contained in the

[55]The estimated changes in relative risk tolerance of institutional investors from Froot and O'Connell (2003) are aggregated using a moving average. The index is scaled and rebased so that 100 corresponds to the year 2000.

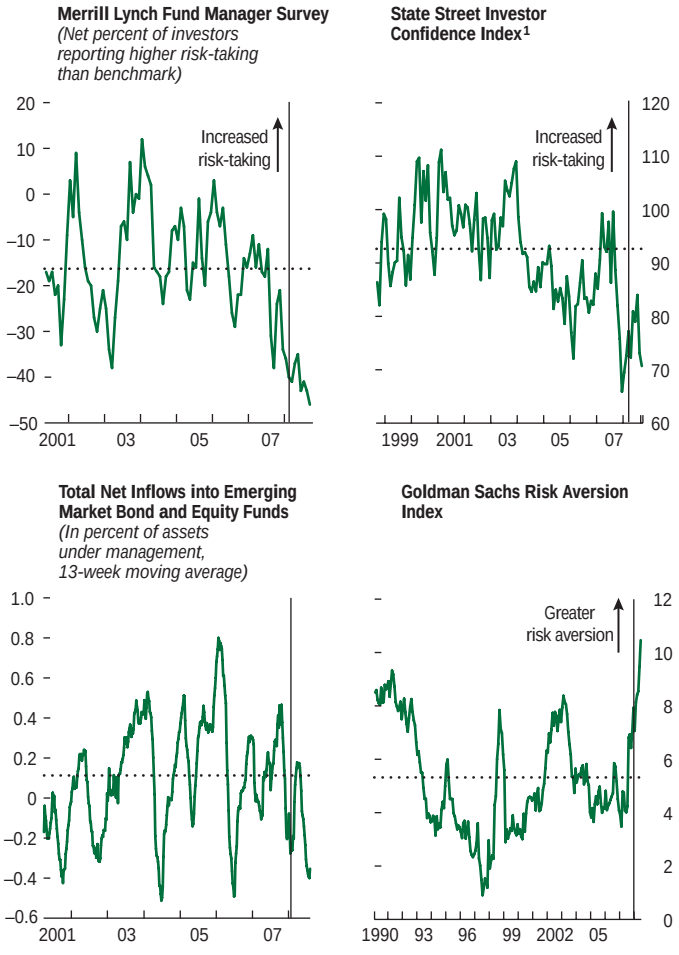
[56]The index represents the value of the coefficient of risk aversion, constrained to values between 0 and 10.

WEO and is consistent with the overall conclusion reached in that report on the outlook and risks for global growth. We complement that analysis by examining various economic confidence measures. The first of these is a GDP-weighted sum of confidence indices across the major mature markets to determine whether businesses and consumers are optimistic or pessimistic about the economic outlook. A second component is a "surprise" index that shows whether data releases are consistently surprising financial markets on the upside or downside. The aim is to capture the extent to which informed participants are likely to have to revise their outlook for economic growth. Third, recognizing the importance of turning points between expansions and slowdowns of economic activity, we incorporate changes in the Organization for Economic Cooperation and Development's composite leading indicator. Fourth, in order to gauge inflection points in global trade, we include global trade growth estimates implied by the Baltic Dry Index, a high-frequency indicator based on the freight rates of bulk raw materials that is commonly used as a leading indicator for global trade. Finally, market-implied break-even inflation rates, based on estimates of intermediate-dated yield differentials between nominal and inflation-linked domestic bonds, proxies expectations of inflation.

Emerging Market Risks

Underlying fundamentals in emerging markets and vulnerabilities to external risks (Figure 1.44). These risks are conceptually separate from, though closely linked to, macroeconomic risks, except insofar as they focus only on emerging markets. Using an econometric model of emerging market sovereign spreads, we identify the movement in Emerging Market Bond Index Global (EMBIG) spreads accounted for by changes in fundamentals, as opposed to the movement in spreads attributable to other factors. Included in the fundamental factors are changes in economic, political, and financial

Figure 1.42. Global Financial Stability Map: Risk Appetite

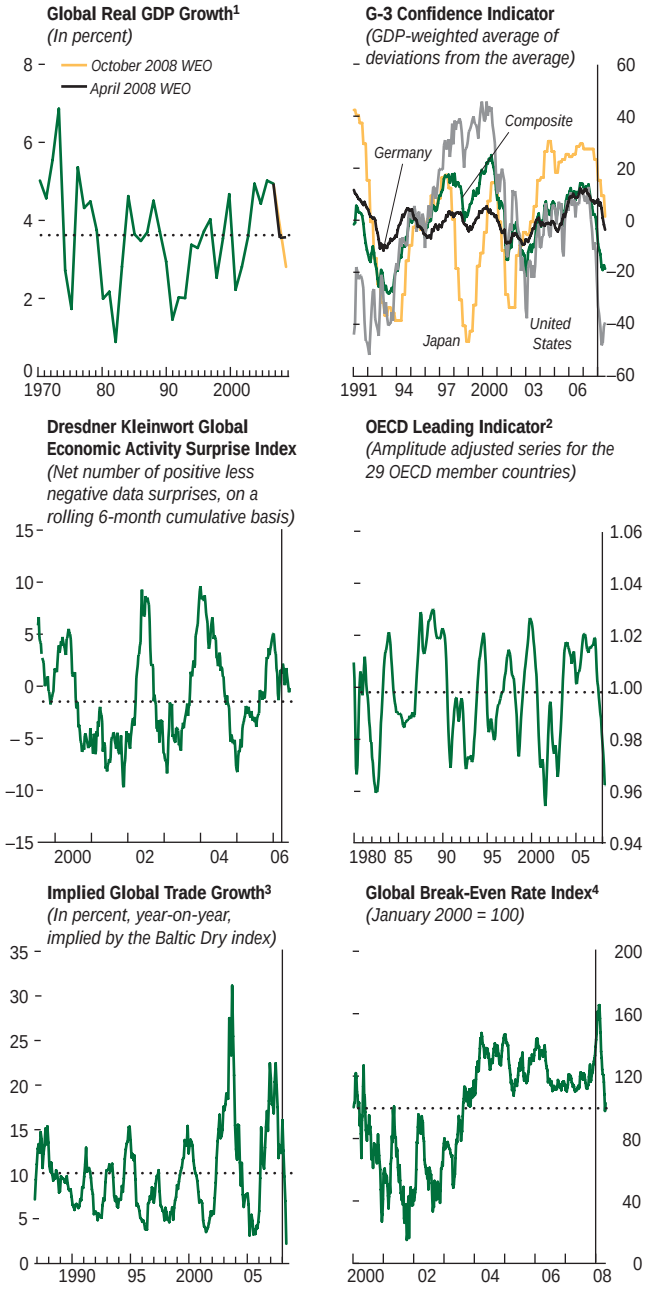


Sources: Emerging Portfolio Fund Research, Inc.; Goldman Sachs; Merrill Lynch; State Street Global Markets; and IMF staff estimates.

Note: Dashed lines are period averages. Vertical lines represent data as of the April 2008 GFSR.

[1]The estimated changes in relative risk tolerance of institutional investors from Froot and O'Connell (2003) are integrated to a level, scaled, and rebased so that 100 corresponds to the average level of the index in the year 2000.

Figure 1.43. Global Financial Stability Map: Macroeconomic Risks



Sources: IMF, *World Economic Outlook*; Bloomberg L.P.; Dresdner Kleinwort; OECD; The Baltic Exchange; Barclays Capital; and IMF staff estimates.

Note: Dashed lines are period averages. Vertical lines represent data as of the April GFSR, except for "Global Real GDP Growth".

[1]2008 and 2009 data points account for skewness in the distribution of risks to the baseline forecast.

[2]Amplitude adjustment is carried out by adjusting mean to unity and the amplitude of the raw index to agree with that of the reference series by means of a scaling factor.

[3]The Baltic Dry Index is a shipping and trade index measuring changes in the cost of transporting raw materials such as metals, grains, and fuels by sea.

[4]Tracking GDP-weighted basis point-changes of estimated longer-term breakevens for Australia, Brazil, Canada, Colombia, France, Germany, Greece, Italy, Japan, Korea, Mexico, Poland, South Africa, Sweden, Turkey, the United Kingdom, and the United States.

risks within the country.[57] This is complemented with a measure of the trend in actions by sovereign rating agencies such as Moody's and Standard & Poor's, to gauge changes in the macroeconomic environment and progress in reducing vulnerabilities arising from external financing needs. We also measure fundamental conditions in emerging market countries that are separate from those related to sovereign debt, particularly given the reduced need for such financing in many emerging market countries, by including an indicator of growth in private sector credit. Other components of the subindex include a measure of the volatility of inflation rates, and a measure of corporate credit spreads relative to sovereign counterparts.

Credit Risks

Changes in, and perceptions of, credit quality that have the potential for creating losses resulting in stress to systemically important financial institutions (Figure 1.45). Spreads on a global corporate bond index provide a market-price-based measure of investors' assessment of corporate credit risk. We also examine the credit-quality composition of the high-yield index to identify whether it is increasingly made up of higher- or lower-quality issues, calculating the percentage of the index comprised of CCC or lower rated issues. We also incorporate forecasts of the global speculative default rate produced by Moody's. Another component of the subindex is a Banking Stability Index, which represents the expected number of defaults among large

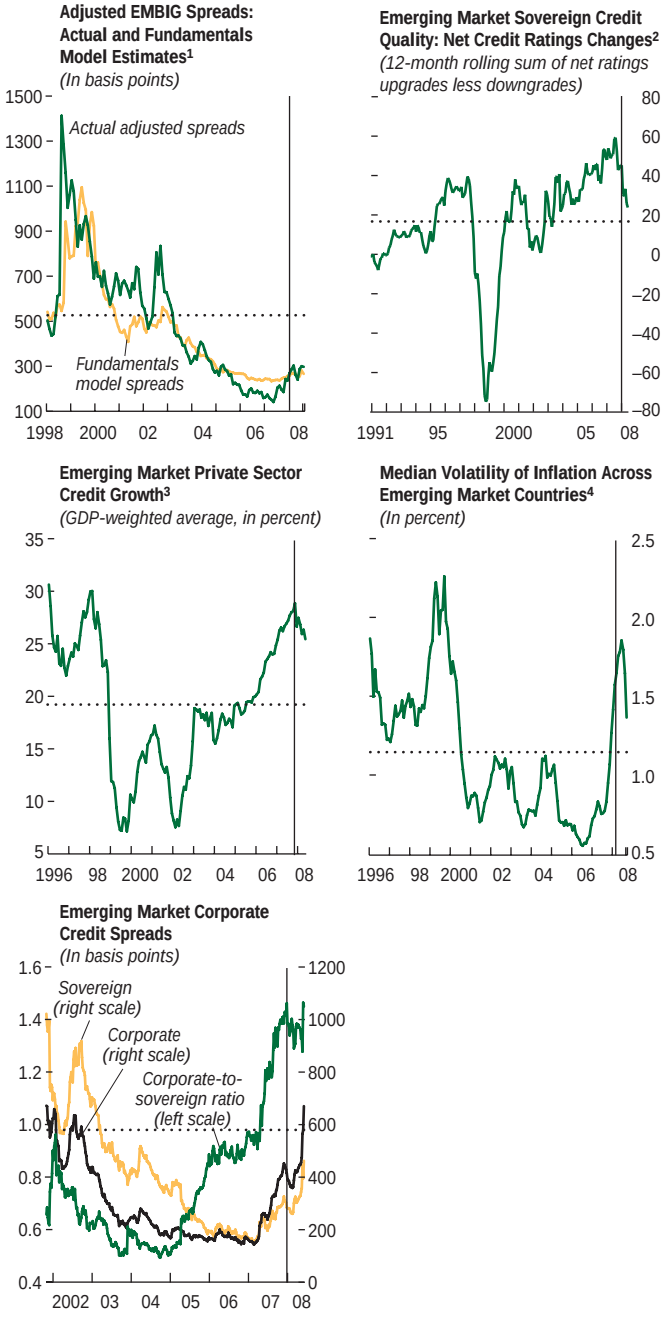
[57]The model uses three fundamental variables to fit EMBIG spreads: economic, financial, and political risk ratings. The economic risk rating is the sum of risk points for annual inflation, real GDP growth, the government budget balance as a percentage of GDP, the current account balance as a percentage of GDP, and GDP per capita as a percentage of the world average GDP per capita. The financial risk rating includes foreign debt as a percentage of GDP, debt service as a percentage of GDP, net international reserves as months of import cover, exports of goods and services as a percentage of GDP, and exchange rate depreciation over the last year. The political risk rating is calculated using 12 indicators representing government stability and social conditions.

complex financial institutions (LCFIs), given at least one LCFI default (see, for example, Goodhart and Segoviano, forthcoming). This index is intended to highlight market perceptions of systemic default risk in the financial sector. To capture broader credit risks, we also include delinquency rates on a wide range of noncorporate credit, including residential and commercial mortgages and credit card loans.

Market and Liquidity Risks

The potential for instability in pricing risks that could result in broader spillovers and/or mark-to-market losses (Figure 1.46). An indicator attempting to capture the extent of market sensitivity of hedge fund returns provides an indirect measure of institutional susceptibility to price changes. The subindex also includes a speculative positions index, constructed from the noncommercial average absolute net positions relative to open interest of a range of futures contracts as reported to the Commodity Futures Trading Commission. These typically rise when speculators are taking relatively large positional bets on futures markets, relative to commercial traders. Also included is an estimation of the proportion of return variance across a range of asset classes that can be explained by a common factor. The higher the size of a common factor across asset-class returns, the greater the risk of a disorderly correction in the face of a shock. An additional indicator is an estimate of equity risk premia in mature markets using a three-stage dividend discount model. Low ex ante equity risk premia may suggest that investors are underestimating the risk attached to equity holdings, thereby increasing potential market risks. There is also a measure of implied volatility across a range of assets. Finally, to capture perceptions of funding, secondary market trading, and counterparty risks, we incorporate the spread between major mature market government securities yields and interbank rates, the spread between interbank rates and expected overnight interest rates, bid-ask spreads on major mature market currencies, and daily return-to-volume ratios of equity markets.

Figure 1.44. Global Financial Stability Map: Emerging Market Risks



Sources: Bloomberg L.P.; JPMorgan Chase & Co.; The PRS Group; IMF, *International Financial Statistics*; Credit Suisse; and IMF staff estimates.

Note: Dashed lines are period averages. Vertical lines represent data as of the April 2008 GFSR.

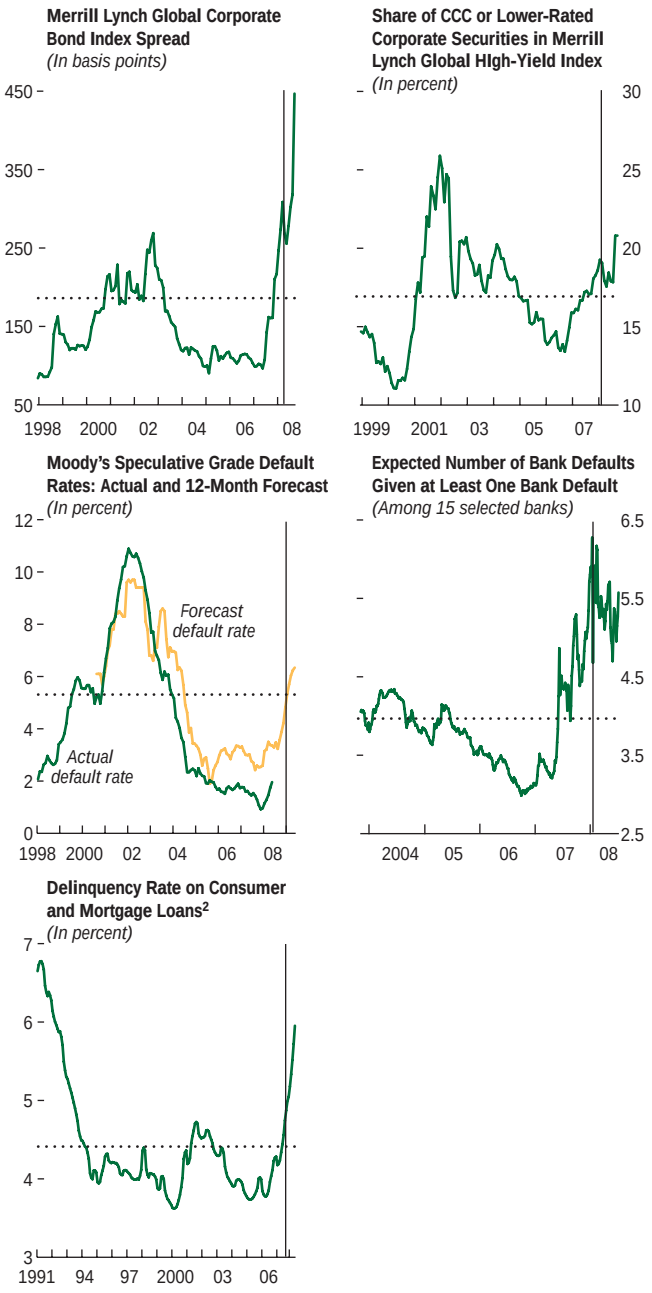
[1]EMBIG = Emerging Market Bond Index Global. The model excludes Argentina because of breaks in the data series related to debt restructuring. Owing to the short data series, the model also excludes Indonesia and several smaller countries. The analysis thus includes 32 countries.

[2]Net actions of upgrades (+1 for each notch), downgrades (–1 for each notch), changes in outlooks (+/– 0.25), reviews and creditwatches (+/–0.5).

[3]44 countries.

[4]Average of 12-month rolling standard deviations of consumer price changes in 36 emerging markets.

Figure 1.45. Global Financial Stability Map: Credit Risks



Sources: Merrill Lynch; Moody's; Bloomberg L.P.; Mortgage Bankers Association; Federal Reserve; and IMF staff estimates.

Note: Dashed lines are period averages. Vertical lines represent data as of the April 2008 GFSR.

[1]Measuring the largest probability of default among the sampled 15 banks each day.

[2]30-, 60-, and 90-day delinquencies for residential and commercial mortgages, and credit card loans in the United States.

Annex 1.2. Financial Investment in Commodities Markets[58]

This annex addresses the possible causal relationships between increased financial market participation and commodity prices. Using investor positioning data, the findings suggest it is difficult to establish a causal relationship for the six commodities studied, though numerous caveats should lead to caution in interpreting the econometric results.

Commodity Investing

Commodities have attracted increasing financial interest in recent years, owing to low or negative correlations with other major asset classes and hedging properties against inflation (Table 1.7).[59] The case for commodities investment has been buttressed by strong returns, with the Goldman Sachs Commodity Index (GSCI) returning an annual average of 9 percent in U.S. dollar terms from 1990 through July 2008, and more than 40 percent since early 2007 (Table 1.7). While difficult to verify, private sector estimates suggest that commodities assets under management totaled $270 billion in the second quarter of 2008, $175 billion of which were institutional investor flows linked to commodity indices (Cooper, Norrish, and Sen, 2008). These figures do not fully capture investments from more specialized asset managers. Commodity-trading advisers (CTAs) may

[58]The main authors of this annex are Sergei Antoshin, Elie Canetti, and Ken Miyajima.

[59]Views are mixed on the effectiveness of commodities as a hedge against U.S. dollar depreciation. IMF (2008c, Box 1.4) and other studies have found that commodity prices in dollar terms tend to increase as the dollar depreciates. However, measured in a currency basket, commodity prices are generally less correlated with the dollar and the sign is reversed (Table 1.7), suggesting negative correlations between the prices of dollar-denominated commodities and the dollar may partly reflect changes in the value of the dollar against other currencies. Also, commodity prices have been significantly more volatile than the dollar, prompting some to argue that commodities are a poor dollar hedge.

Table 1.7. Asset Class Characteristics

(Based on monthly change during January 1990–July 2008)

	GSCI TR	GSCI TR in SDRs	Global Equities	EM Equities	US$ NEER	U.S. CPI
			(Correlations)			
GSCI TR	1.00					
GSCI TR in SDRs	0.97	1.00				
Global Equities	–0.03	–0.06	1.00			
EM Equities	0.06	0.07	0.71	1.00		
US$ NEER	–0.11	0.06	–0.18	–0.08	1.00	
U.S. CPI	0.14	0.11	–0.17	–0.09	–0.16	1.00
			(Annualized average change and volatility, in percent)			
Average change	9.0	7.8	5.1	8.7	–1.4	3.0
Volatility	19.7	19.7	13.9	23.2	5.6	0.8

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

Note: All assets are in dollar terms, unless otherwise specified. GSCI TR signifies the S&P Goldman Sachs Commodity Total Return Index, which reflects spot, roll, and cash yields; SDRs signifies special drawing rights; NEER signifies the nominal effective exchange rate, where a higher value signifies the dollar's appreciation; EM = emerging markets; CPI = consumer price index.

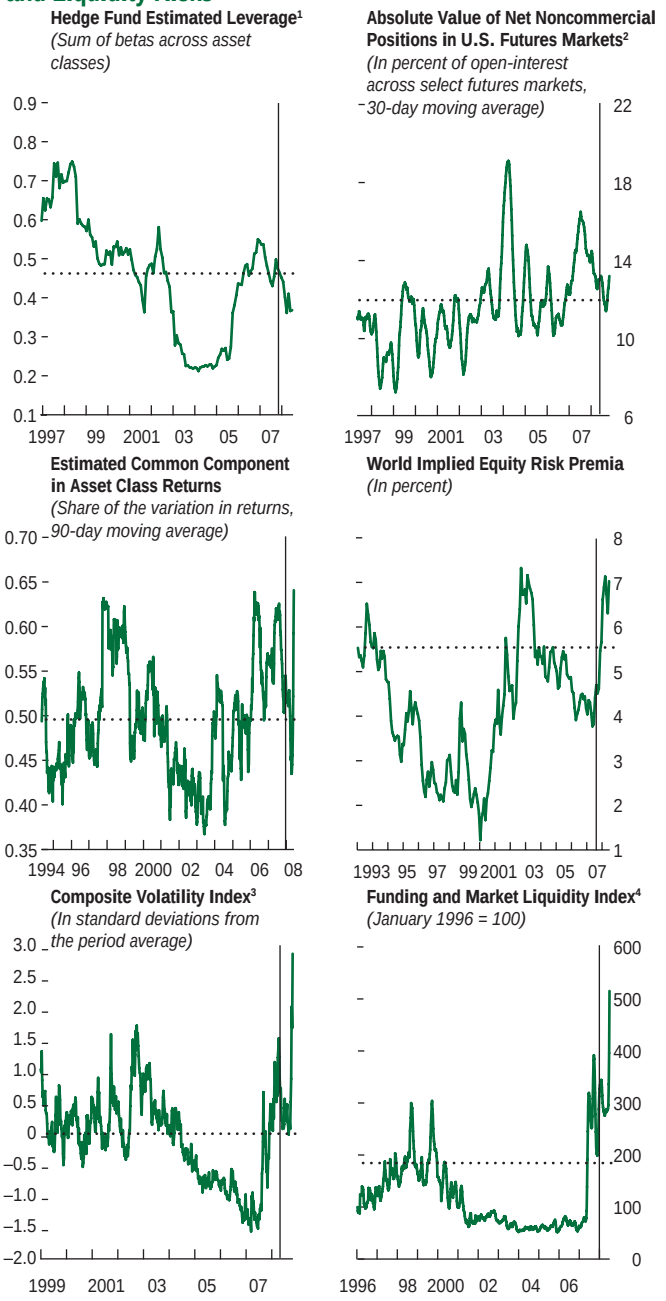
have as much as $40 billion to $60 billion in assets under management, while hedge funds may have as much as $80 billion in commodity investments, much of it, however, in "spread" trades that do not impart a directional bias to prices.[60]

Commodity-indexed funds have attracted attention because of their aggregate size and rapid growth in recent years, and because, unlike many other investments, they represent a long-only investment in commodity futures. The two largest indices are the GSCI and the Dow Jones' AIG Commodity Index, which together account for well over three-quarters of total indexed investments. The funds generally gain exposure to commodities through over-the-counter (OTC) total return swaps (primarily from major broker-dealers) that replicate the performance of the key commodity indices. The dealers, in turn, hedge their exposure, in part through exchange-traded futures.

At least two arguments are commonly advanced suggesting that financial invest-

[60]See Tesar (2008). CTAs use a wide variety of trading models, including simple technical trading rules that can amount to trend-following strategies that are independent of fundamentals.

Figure 1.46. Global Financial Stability Map: Market and Liquidity Risks



Sources: Credit Suisse Tremont Index LLC; Bloomberg L.P.; JPMorgan Chase & Co; IBES; Morgan Stanley Capital International; and IMF staff estimates.

Note: Dashed lines are period averages. Vertical lines represent data as of the April 2008 GFSR.

[1]36-month rolling regressions of hedge fund performance versus real asset returns.

[2]Data represent the absolute value of the net position taken by noncommercial traders in 17 selected U.S. futures markets. High values are indicative of heavy speculative positioning across markets, either net-long or net-short.

[3]Represents an average *z*-score of the implied volatility derived from options from stock market indices, interest, and exchange rates. A value of 0 indicates the average implied volatility across asset classes is in line with the period average (from 12/31/98 where data are available). Values of +/–1 indicate average implied volatility is one standard deviation above or below the period average.

[4]Based on the spread between yields on government securities and interbank rates, spread between term and overnight interbank rates, currency bid-ask spreads, and daily return-to-volume ratios of equity markets. A higher value indicates tighter market liquidity conditions.

ment in commodities, particularly in index funds, does not have a material impact on commodity prices. First, index investors do not take physical delivery, a fact supported by the lack of evidence from inventory data of commodity hoarding, though the quality and coverage of such data are questionable. Many observers have questioned whether financial investors can influence commodity prices in the absence of physical demand. The second justification argues that some commodities without significant financial market participation have exhibited price rises and volatility equal to or greater than commodities with liquid futures markets, suggesting a limited role for financial investors.[61] Other observers, however, argue that large increases in financial investment in commodities futures and the fact that near futures prices and spot prices generally converge provide a prima facie case that increased financial investment may influence commodity prices, at least in the short run.

Causality Study

Whatever the merits of these arguments, if financial market participation influences commodity prices, increases in investment should precede price increases. This annex examines such temporal causality between investor positions and prices of oil, copper, wheat, corn, soybeans, and rice.[62] Positioning data comes from the publicly available *Commitment of Traders Report* from the U.S. Commodities and Futures Trading Commission (CFTC). Investors are classified as "commercial" if they are hedging an existing exposure and "noncommercial" if they are not. Swaps dealers are classified as commercial investors, since they use futures markets to offset their OTC positions. However, since those OTC positions sometimes have as their counterparties the commodity index funds, which generally invest with a return motive (rather than to hedge), the CFTC started to publish the positions of commodity index traders (CITs) separately from 2006.[63,64]

While there clearly are periods and commodities where positions and prices move together, there are other times when positions were not rising during periods of rapid price appreciation (Figure 1.47). For example, wheat index positions were fairly flat while noncommercial positions were declining, even as prices rose rapidly from mid-2007 through the first quarter of 2008. Corn index positions were the same at the end of the second quarter of 2008 as two years earlier, during which time the spot price more than tripled. Noncommercial positions in corn and soybeans peaked in February 2008, while prices kept rising through the end of the second quarter. Noncommercial positions in oil were quite volatile, even as oil prices rose almost continuously from the beginning of 2007 through the second quarter of 2008, by which time net oil positions had dropped roughly to zero. Noncommercial copper positions were declining through the period of the sharpest price increases, roughly from the beginning of 2004 through mid-2006.

Granger causality tests can evaluate whether changes in investor positions precede price changes. Earlier work has generally failed to find

[61]The WEO (IMF, 2008d) studies the relationship between commodities that are heavily traded in financial markets and those that are not. It finds that while financialization may have led to increased co-movements between some commodities, no apparent connection is found to either price volatility or price changes (see Box 3.1 in Chapter 3).

[62]The CFTC does not publish index positions on rice, another agricultural commodity of interest.

[63]In addition to swaps with indexed funds, dealers also tailor swaps to individual investors or commercial entities, involving both long and short positions, especially in oil markets. Thus, swap dealers generally hedge only net positions, which may be much smaller than their aggregate gross positions.

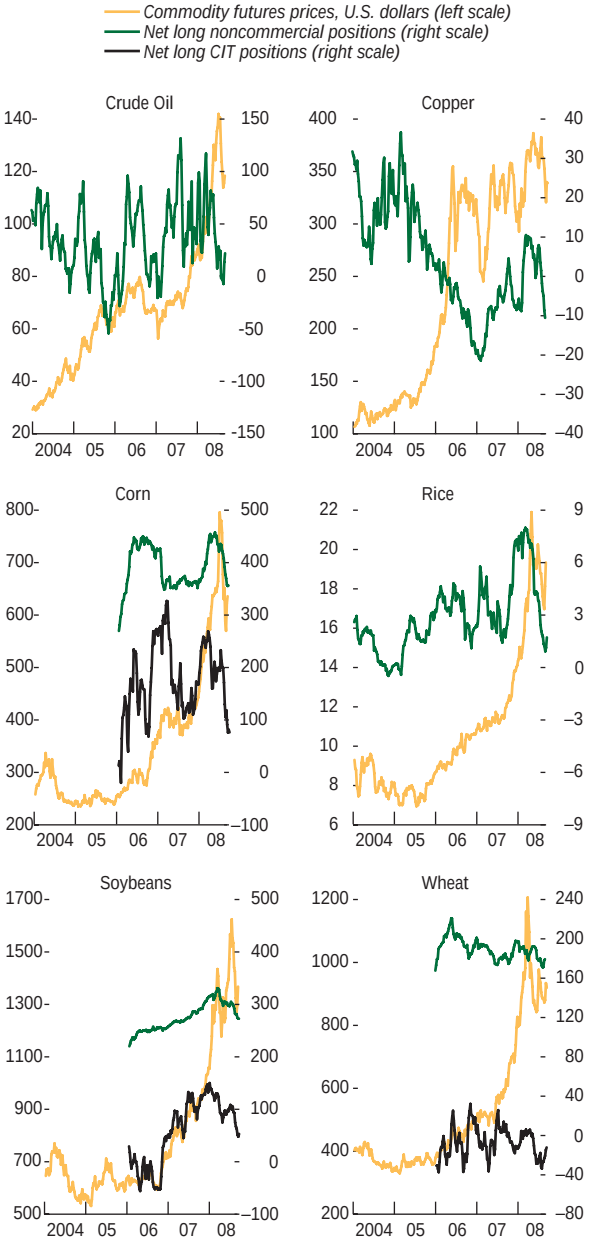
[64]Prices are as reported by U.S. commodities exchanges. The spot price is defined as the price of the futures contract closest to expiration, while the futures price is the price of the contract expiring in 12 months.

such a temporal relationship, concluding that causality runs from prices to positions.[65] This annex extends those earlier studies to encompass the most recent period during which commodity prices rose particularly sharply, and also tests whether the new CIT positions data can explain prices.

However, there are a few shortcomings that limit the power of the statistical tests and that require that caution be taken in interpreting these results. First, the CFTC only publishes traders' positions aggregated across maturities. It would be preferable to use only the positions in the maturity of the contract for which prices are being tested. Second, the data are weekly, which may hamper the identification of very short-run effects, given that transmission from positions to prices may happen at a higher frequency. Indeed, some market participants anecdotally suggest there are short-run effects that may last only a matter of days.[66] Third, as the CFTC acknowledges, traders sometimes may be misclassified between commercial and noncommercial positions, and some traders classified as commercial may have speculative motives.[67]

For tests on financial positions, we used data over the entire period for which CIT positions are available (since January 2006). For corn, soybeans, and wheat, the hypothesis that CIT positions and noncommercial (excluding CIT) positions lead prices is tested. For rice, crude oil, and copper, for which CIT positions data are not available, noncommercial positions are used to test whether they lead (or

Figure 1.47. Commodity Futures Prices and Financial Positions



Sources: Bloomberg L.P.; and the U.S. Commodities Futures Trading Commission, *Commitment of Traders Report*.
Note: CIT = commodity index traders.

[65]Box 5.1 in the September 2006 WEO did not find strong evidence of the influence of speculative positions as a driver of commodity prices (IMF, 2006). See also Haigh, Hranaiova, and Overdahl (2007) and Interagency Task Force on Commodity Markets (2008).

[66]However, using formal statistical tests, the report by the Interagency Task Force on Commodity Markets (2008) failed to find any significant causality from position changes to price changes using nonpublic daily data.

[67]The CFTC reviews, and occasionally revises, the classifications of futures market traders on an ongoing basis.

Table 1.8. Test for Causality Between Commodities Prices and Financial Positions

	Correlation between Prices and Positions[1]	Causality from Positions to Prices[2]	Causality from Prices to Positions[3]
Crude oil			
Noncommercial traders	No	No	No
Copper			
Noncommercial traders	No	Yes	No
Corn			
Index traders	Yes	No	No
Noncommercial traders	Yes	No	No
Soybeans			
Index traders	Yes	No	No
Noncommercial traders	No	No	No
Rice			
Noncommercial traders	Yes	No	Yes
Wheat			
Index traders	No	No	No
Noncommercial traders	Yes	No	No

Sources: Commodities Futures Trading Commission, *Commitment of Traders Report*; and IMF staff estimates.

[1]"Yes" means cointegration exists between prices and positions at 5 percent significance. "No" means no cointegration.

[2]"Yes" means the short-run coefficient on the first lag of positions in the price equation is significant and positive. "No" means the coefficient is insignificant or negative.

[3]"Yes" means the short-run coefficient on the first lag of prices in the positions equation is significant and positive. "No" means the coefficient is insignificant or negative.

Granger-cause) price movements. Time series vector models and Granger causality tests are used to address causality between positions and prices.

The results of our study are summarized in Table 1.8. In four of six commodities, there is a strong correlation between financial positions and commodities prices. However, tests for causality yield much weaker results. The second column demonstrates that financial positions lead prices only in the case of copper. Moreover, the significance of this finding is limited by the fact that net long noncommercial positions are negative most of the time (Figure 1.47). Causality from prices to positions is established only for rice.

Overall, there is correlation between prices and positions in some commodities markets. However, we are unable to detect causality from financial positions to prices for major commodities used in the study.

Annex 1.3. Loss Estimates on U.S. Credit Instruments[68]

This annex updates the methodology for estimating losses on U.S. credit instruments, and highlights the main revisions.

In light of further developments in delinquencies and charge-offs as well as a repricing in securitized debt, we have updated the loss estimates laid out in the April 2008 GFSR as shown in Table 1.9. Our estimate of total near-term global losses on U.S. credit-related debt has been raised to $1.4 trillion (from $945 billion). The upward revision mostly reflects increased loss estimates on corporate debt and prime residential mortgages.[69] Our loss estimates for corporate debt, including loans and securities, have risen significantly to reflect the deterioration in the debt of financial institutions that has taken place since April. Higher loss estimates for the prime mortgage market reflect a more negative base case home price scenario.

For the corporate sector, our estimate of losses on securities debt has risen to $210 billion, while that on loans has increased to $110 billion, reflecting a more negative base case assumption about the credit cycle over the next few years (Box 1.6). Loss estimates for collateralized loan obligations (CLOs) are unchanged.[70]

[68]The main authors of this annex are Mustafa Saiyid and Sergei Antoshin.

[69]Loss estimates have also been published by the Bank of England (BoE) and the Organization for Economic Cooperation and Development (OECD), but they are not fully comparable to those of the IMF due to differences in the size and variety of asset classes considered. The IMF's April loss estimate of $945 billion related to U.S. residential and commercial mortgages, consumer credit, and corporate debt. In contrast, the BoE loss estimates of $317 billion to $380 billion applied to U.S. subprime residential mortgage securities only; while the OECD's loss estimate of $422 billion was only for U.S. residential mortgage-related securities.

[70]Like the CMBX, the LCDX (the leveraged loan credit default swap index) was reportedly shorted extensively by speculators seeking to profit from deterioration of the leveraged loan market, and index pricing used earlier may have exaggerated loss estimates.

Table 1.9. Comparison of Financial Sector Loss Estimates, October 2008

(In billions of U.S. dollars)

Base-Case Estimates of Losses on U.S. Loans

	Outstanding	Estimated loss April 2008 GFSR	Estimated loss October 2008
Subprime residential	300	45	50
Alt-A residential	600	30	35
Prime residential	3,800	40	85
Commercial real estate	2,400	30	90
Consumer loans	1,400	20	45
Corporate loans	3,700	50	110
Leveraged loans	170	10	10
Total for loans	12,370	225	425

Base-Case Estimates of Mark-to-Market Losses on Related Securities

	Outstanding	Estimated mark-to-market loss April 2008 GFSR	Estimated mark-to-market loss October 2008
ABS	1,100	210	210
ABS CDOs	400	240	290
Prime MBS	3,800	0	80
CMBS	940	210	160
Consumer ABS	650	0	0
High-grade corporate debt	3,000	0	130
High-yield corporate debt	600	30	80
CLOs	350	30	30
Total for securities	10,840	720	980
Total for loans and securities	23,210	945	1,405

Sources: Goldman Sachs; JPMorgan Chase & Co.; Lehman Brothers; Markit.com; Merrill Lynch; and IMF staff estimates.

Note: ABS = asset-backed securities; CDO = collateralized debt obligation; CLO = collateralized loan obligation; CMBS = commercial mortgage-backed security; MBS = mortgage-backed security.

Losses on prime residential mortgage loans has increased to $85 billion, and we are now estimating mark-to-market losses on prime securities of $80 billion. The increase for loans reflects higher-than-expected delinquencies on prime loans and losses for government-sponsored enterprises (GSEs) on loans pooled into guaranteed securities.[71] The increase for prime securities is mostly coming from mark-to-market losses on prime nonconforming ("jumbo") mortgage loans packaged into securities.

Another contribution to the change in loss estimates since April is due to a $50 billion increase in the valuation of subprime mortgage-related CDOs. The TABX (tranched ABX index) used as a benchmark for these securities now shows no distinction in pricing between senior and junior tranches, which are all marked at around 3 to 4 cents on the dollar, reflecting the erosion of any protection from relative subordination of securities in the capital structure. Estimated losses on subprime mortgage-related asset-backed securities (ABS) are little changed since April, with realized delinquencies on 2006–07 subprime vintages higher than projected, but those on the 2004–05 vintages lower than projected.[72] As a result, prices of 2006–07 vintage subprime ABS have continued to fall, but those of 2004–05 vintages have risen.

Our earlier estimate of the distribution of losses between various types of market participant has been modified to reflect the impact of credit derivatives in transferring risk from one type of market participant to another. We continue to estimate that some 50 to 60 percent of losses will be borne by banks, 10 to 20 percent by insurance companies, 10 to 15 percent by pension funds and savings institutions, 5 to 10 percent by the GSEs, and the remainder by hedge funds and other participants.

Looking ahead, the market pricing of various U.S. securities, including prime mortgage securities, consumer ABS, and corporate debt, could deteriorate further if realized cash flow losses come out higher than market expectations. Over the past year, wider spreads on these types of securities have been partially, if not completely, offset by falling U.S. Treasury yields on a total return basis. This may not be the case in the future.

[71]Losses on loans pooled into guaranteed securities are expected to accrue only to the GSEs, since the GSEs guarantee timely principal and interest payments.

[72]This may reflect the fact that the earlier vintages are more seasoned, or that the relaxation of underwriting standards intensified after 2005.

Box 1.6. Forecasting Loan Charge-Off Rates

This box provides technical details on the baseline and stress scenario for bank charge-off rates on various types of loans.

To forecast bank charge-off rates for each bank loan type, a distributed lag model was used to accommodate the highly autocorrelated time series. The following potential explanatory variables for individual and joint significance were tested: bank lending conditions; financial and real estate assets, liabilities, and net worth from both household and corporate balance sheets; drivers of households' net worth (housing prices and equity prices); measures of households' debt obligations (the mortgage obligation ratio, bank loans); measures and drivers of income (disposable personal income, corporate profits, personal consumption); and business-cycle variables (GDP, industrial production, the purchasing managers index, employment, the unemployment rate). The sample was comprised of quarterly data from 1991 to 2008 so as to incorporate the last two recessions.

Corporate Loans

In estimating charge-offs on commercial and industrial (C&I) loans, bank lending conditions and business-cycle variables were strongly significant. After running various specifications we adopted the following representation:

$$C\_CI(t) = 0.292 + 0.589*C\_CI(t-1) + 0.194*C\_CI(t-2) + 0.004*L\_CIL(t) - 0.059*GDP(t),$$

where $C\_CI(t)$ is the charge-off rate for C&I loans at time t, $L\_CIL(t)$ is bank lending conditions for C&I loans, and GDP(t) is gross domestic product.

The baseline scenario relied on WEO estimates for GDP, where GDP growth troughs at –0.33 percent in the second quarter of 2009 before rising to 2.81 percent in 2010. Lending standards are assumed to peak at 70 percent in the fourth quarter of 2008 and revert to their long-run equilibrium level by end-2010. Under these assumptions, the charge-off rate rises from the current 0.82 percent to a high of 1.69 percent in the third quarter of 2009, before leveling off at 1.27 percent in 2010. In the stress scenario, GDP declines 1.35 percent in the third quarter of 2009 and then recovers to 2.51 percent by the end of 2010. Lending standards remain at 75 percent for two quarters and then take 1.5 years to normalize. Under this scenario, the charge-off rate reaches 2.06 percent in the fourth quarter of 2009.

Commercial Real Estate (CRE) Loans

Forecasting CRE charge-off rates is complicated by structural breaks during the estimation period and the variation within the sector.[1] Several variables were significant, including retail sales, consumption, employment, and bank lending standards, resulting in the final estimated model specification of:

$$C\_CRE(t) = 0.200 + 0.917*C\_CRE(t-1) - 0.054*C(t),$$

where $C\_CRE(t)$ is the charge-off rate for CRE loans and $C(t)$ is private consumption.

Under the baseline scenario for this model, we assumed that private consumption growth troughs at –1.62 percent in the second quarter of 2009 before picking up to 2.83 percent in 2010, consistent with the WEO. The charge-off rate rises from the current 0.93 percent to 1.71 percent by end-2009, and then declines to 1.51 percent in 2010. In the stress scenario, consumption contracts by 2.59 percent in the second quarter of 2009 but recovers to grow at 2.65 percent by end-2010. The charge-off rate peaks at 1.90 percent by the end of 2009.

Residential Real Estate (RRE) Loans

We estimated delinquency rates instead of charge-offs, using bank lending standards and

[1]Since the nature of the current cycle is somewhat similar to the 1990–91 recession, in the sense that the banking sector comes under significant pressure, we ran the estimation over the entire period of 1991–2008.

home prices as explanatory variables.[2] The model specification is:

$$D\_RRE(t) = 0.366 + 0.851*D\_RRE(t-1) + 0.008*L\_RRE(t) - 0.008*HP\_RRE(t),$$

where $D\_RRE(t)$ is the delinquency rate for RRE loans, $L\_RRE(t)$ is bank lending standards for RRE loans, and $HP\_RRE(t)$ is the Case-Shiller 10 house price index.

Under the baseline scenario, the tightening in bank lending standards peaks at 90 percent in the fourth quarter of 2008 and then declines relatively quickly in 2009–10. House prices based on historical and future data have troughed at –17 percent in 2008:Q2 and will continue to decline through 2010. Under these assumptions, residential real estate loan charge-offs are expected to rise from the current 1.13 percent to a peak of 1.89 percent in the second quarter of 2009, but then decline to 1.32 percent by the end of 2010. The stress scenario assumes that bank lending standards remain at 90 percent for two quarters and then take 2.5 years to normalize, house prices decline by 22 percent by the end of 2008, and recovery rates remain at 61 percent, on average, through 2010. In this case, charge-off rates peak at 2.32 percent in end-2009.

[2]Due to the nature of the historical charge-offs series (which show little variability and thus cannot be used for forecasting), we instead used delinquency rates (which show a greater variability). In addition, since the episode of severe house price deterioration is unique in the United States, the effect of house price depreciation could be nonlinear, pushing delinquencies higher and depressing recovery rates. Using delinquencies instead of charge-offs and an assumption about future recovery rates help model a nonlinear effect of house price appreciation. Forecasted delinquencies are then converted into charge-offs assuming that 23 percent (30 percent) of delinquent loans will be charged off under the baseline (stress) case scenario. The assumptions on the default and recovery rates are consistent with dealers' estimates.

Consumer Loans

We combined data on credit cards and other consumer credit into a single category for "consumer loans."[3] The final model was estimated as:

$$C\_CL(t) = 1.187 + 0.608*C\_CL(t-1) + 0.007*L\_CL(t) - 0.072*GDP(t),$$

where $CL\_L(t)$ denotes the charge-off rate for consumer loans. $L\_CL(t)$ is lending standards for consumer loans, and $GDP(t)$ is gross domestic product.

Under the baseline scenario, charge-off rates rise from the current 3.37 percent to 3.92 percent in the second quarter of 2009 and then decline to 2.83 percent by end-2010. Under the stress scenario, charge-offs climb to 4.16 percent in the second quarter of 2009.

[3]Credit card charge-offs exhibit clear cyclical behavior, whereas other consumer credit (mostly auto loans) tends to be highly autocorrelated and has a low sensitivity to its key driver, GDP.

Annex 1.4. Factors Influencing the Pace and Level of Bank Capital Rebuilding[73]

This annex describes the approach taken in preparing an illustration of how global banks may delever to raise capital ratios, and outlines some of the factors that have to be taken into account in such an exercise. The task of assessing how much capital banks need is made more complex by different objectives and time scales over which they are to be achieved.

[73]The main author of this annex is Christopher Morris.

The simulation in this annex endeavors to derive both the demand and supply of credit for 2008–14 (Table 1.10). The demand for credit is driven by the nominal GDP growth forecasts projected by the WEO (IMF, 2008d). The supply of credit is driven by the various factors that will lead banks' balance sheets to expand or contract, and by bank profitability. Underlying this adjustment is a need to achieve higher capital adequacy for investors, regulators, and policymakers.

Table 1.10. Deleveraging Illustration: Key Assumptions

Asset growth	Driven by October 2008 WEO growth forecasts.
Bank income	Driven by returns on assets that dip as growth is weak to 2009, but rebounds to historical norms as growth returns to trend.
Bank charge-offs	For the United States, driven by our model for defaults; for Europe, by charge-offs as estimated by Merrill Lynch Research.
Taxes	At rate relevant for the country, tax losses reclaimed immediately.
Dividends	Drop rapidly to below historical norm payout ratios and stay there until 2011 before returning to historical norms.
New capital-raising	None until 2009:Q1, then a total of $675 billion spread evenly over the next eight quarters.
Drawdown of committed credit lines	$2.5 trillion in 2008–09, trailing off toward the end.
Lack of securitization	$3 trillion of assets build up on bank balance sheets until securitization market gradually reopens in 2010.
Financial Accounting Standard 140	Brings $3 trillion of U.S. bank QSPEs onto balance sheets during 2010–12.
Asset maturities	$7.6 trillion during 2008–13, front loaded tailing off at the end.
Asset sales	$2.4 trillion during 2008–12.

Source: IMF staff estimates.
Note: GSE = government-sponsored enterprise; QSPE = qualifying special-purpose entity.

First, it is necessary to make some judgment on what proportion of the more than $7.6 trillion or so of committed corporate credit lines globally will be drawn down (King, 2008; Malhotra and Henriques, 2008). These credit lines were negotiated when liquidity risk was seriously underpriced, and are therefore at highly attractive rates for the borrower. However, some customers do not need the funds, and may be wary of increasing their debt at this point. The committed credit lines will expire in a year or so. For these reasons, we assume that only around $2.4 trillion of these credit lines will be drawn down.

Strains in the securitization market also complicate the calculations. The securitization market has been seriously impaired for over a year now, and there are few signs of any imminent rebound. For the purposes of these calculations, we surmise that the securitization market will remain closed until well into 2009, and that, as a result, some $3 trillion of assets that would otherwise be securitized will remain on bank balance sheets.[74] We assume that the securitization market will revive gradually starting at the end of 2008.

The introduction of an accounting rule in the United States—FAS 140—also complicates the picture. Having already been delayed by a year, this new rule is scheduled to come into effect in 2010, and will likely require a significant amount of assets that were previously off-balance-sheet by U.S. banks to be brought onto the balance sheet. This is a pure accounting change that will have no direct economic or financial impact, but it will cause the capital and leverage ratios of U.S. banks to change, perhaps with some indirect financial impact (King and others, 2008). We assume FAS 140 is introduced on schedule, but in a milder form, and with some phasing in. As a result, some $2 trillion of assets will transfer onto U.S. bank balance sheets during 2010 through 2012.

We also provide a projection of the new levels of capital that authorities, regulators, ratings agencies and investors will demand, and how patient they are prepared to be. Our base case is that the new standards of capital adequacy are 8 percent common equity to risk weighted assets ratios, and 4.5 percent Tier 1 capital to total assets ratios (equivalent to 22 times leverage) (King, Samuels, and Harrison, 2008; Rams-

[74]U.S. securitization net issuance in the first half of 2008 was around half the $2 trillion issued a year earlier, reflecting the sharp fall in issuance of collateralized debt obligations and asset-backed securities. A similar decline can be seen in the European market.

den and others, 2008; and Steenis, Helby, and Hayne, 2008). We assume that regulators will be tolerant in giving banks time to achieve these new levels.

As mentioned in the main text, we assume that banks shed some $10 trillion of assets from their balance sheets compared with those they would have otherwise retained if there were no need to delever.[75] This is assumed to be split into $7.6 trillion of assets that are simply allowed to mature and not be replaced, and $2.4 trillion of assets that are sold. The former are assumed to reduce credit growth; the latter are assumed not to do so.

It is assumed that banks are unable to raise fresh capital for the remainder of 2008, but in 2009 some appetite for bank capital is assumed to return, enabling banks in the United States, United Kingdom, and the rest of Europe to raise roughly $675 billion collectively over the next few years.

Bank revenues are assumed to dip to below historical norms as growth weakens into 2009, but then to pick up to historical norms as growth rebounds. Bank charge-offs for U.S. banks are in line with the estimates described in Annex 1.3. For European banks they reflect a combination of a joint exercise undertaken with Merrill Lynch's research department, and our own estimates described in Annex 1.3.

Assets brought on-balance-sheet as a result of committed credit lines or impaired securitization markets are assumed to come on with 40 percent risk weightings. Taxes are charged at the corporate income tax rate for the country, and any tax losses are assumed to be reclaimed immediately. Dividends are assumed to move swiftly down from the current high payout ratios to historical norms by the end of 2008 and then fall below historical norms until March 2010, after which they gradually return to historical norms.

[75]This is mathematically the amount banks need to remove from their balance sheets to achieve the new ratios given the other assumptions. See also Graham (2008).

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