

*Financial risks have increased and underlying conditions have worsened since the April 2007 Global Financial Stability Report (GFSR). The period ahead may be difficult, as bouts of turbulence are likely to recur and the adjustment process will take some time. Uncertainty about the final size of losses, and when and where they will be revealed, will likely continue to keep market sentiment and conditions unsettled in the near term. This chapter outlines a number of the causes and consequences of the recent episode of turmoil and offers some initial thoughts on possible responses that the private and public sectors might consider to help improve global financial resilience.*

Following an extended period of exceptionally favorable financial market conditions, international markets have entered a difficult period. The current episode of turbulence represents the first significant test of several categories of innovative financial instruments used to distribute credit risks broadly. Although the dislocations, especially to short-term funding markets, have been large and in some cases unexpected, the event hit during a period of above-average global growth. Credit repricing and the constriction of liquidity experienced to date will likely slow the global expansion. Systemically important financial institutions began this episode with more than adequate capital to absorb the likely level of credit losses. Corporations have, for the most part, been able to secure the financing they need to maintain their operations. However, the adjustment period is continuing, and if the intermediation process stalls and financial conditions deteriorate further, the global financial sector and real economy could experience more serious negative repercussions.

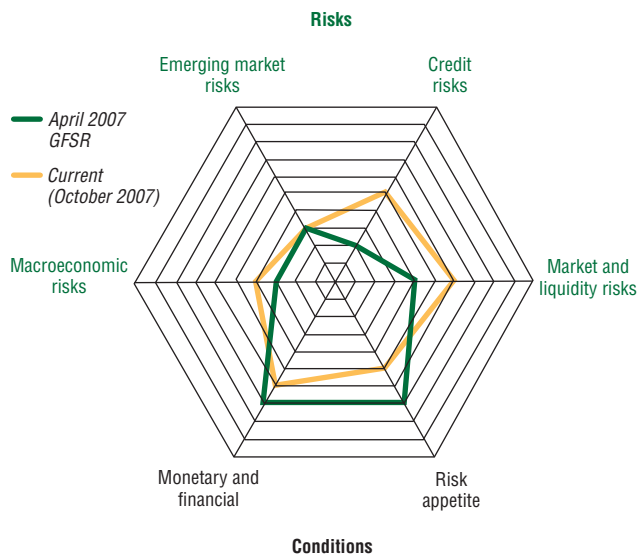
This chapter first summarizes our overall assessment of global financial stability using

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the global financial stability map introduced in the April 2007 GFSR (IMF, 2007a). Although the stability map treats the various risk factors and underlying conditions as separate so as to facilitate their formal analysis, the latest episode highlights their interrelatedness in practice—with liquidity risks, both market and funding liquidity, at the forefront of the current episode of turbulence. What began as a deterioration in credit quality altered the market liquidity of a number of structured credit products. Market illiquidity, in turn, produced uncertainty about those products' valuations, which translated into a disruption in the underlying funding markets. Thus, monetary and financial conditions, as well as the risk appetite of market participants, have been adversely affected.

This chapter delves into some of the relevant areas in more detail, examining how weakening credit discipline in the U.S. mortgage market—especially the subprime market—and the overly rapid expansion of the leveraged buyout market have extended to the broader structured finance sector. The ensuing disruptions in the short-term funding markets are then examined. Global linkages are addressed with particular attention to the impact that investment flows to emerging markets have on financial stability. Lastly, the chapter highlights a number of conclusions that emerge from the analysis.

**Figure 1.1. Global Financial Stability Map**



Source: IMF staff estimates.  
 Note: Closer to center signifies less risk or tighter conditions.

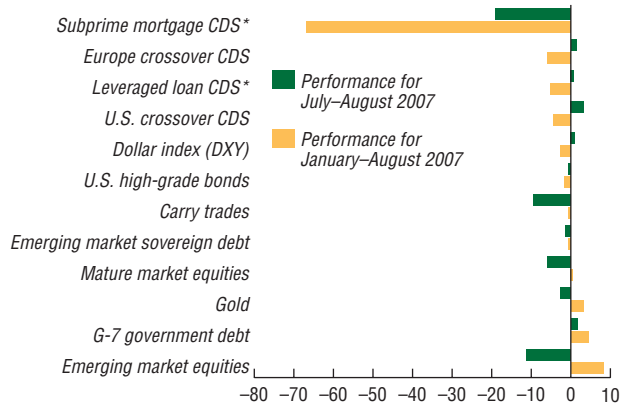
## Global Financial Stability Map

The global financial stability map (Figure 1.1) presents an overall assessment of how changes in underlying conditions and risk factors are expected to bear on global financial stability in the period ahead.<sup>1</sup>

### *Credit risks have increased significantly.*

The largest increase in risks is represented by an increase in our assessment of *credit risks*.<sup>2</sup> The April 2007 GFSR highlighted rising credit risk in U.S. mortgage-related instruments, a loosening of credit standards across a range of markets, and risks of spillovers to other credit markets. Since then, these credit risks have materialized and intensified, with ratings agencies downgrading significant amounts of mortgage-related securities, and spreads on mortgage-related securities widening (Figure 1.2). These risks have been exacerbated by signs of similar credit indiscipline in the leveraged buyout (LBO) sector. Through mid-2007, there had been a marked rise in covenant-lite loans, less credit-worthy deals, leverage, and price multiples on acquisitions. Moreover, now that ratings agencies are revising their model assumptions for structured products collateralized by mortgages, uncertainty has risen about the ratings of the broader structured credit market, including collateralized loan obligations (CLOs) that distribute leveraged loan financing to institutions. Reflecting the broader repricing of credit risk, spreads on high-yield corporate debt have widened from the tight levels reached earlier in the year (Figure 1.3). Although aggregate corporate leverage remains relatively low, its increase over the past year, particularly for those entities that

**Figure 1.2. Selected Asset Class Returns (In percent)**



Sources: Bloomberg L.P.; JPMorgan Chase & Co.; Merrill Lynch; and IMF staff estimates.  
 Note: DXY is a weighted average of the dollar exchange rate vis-à-vis six major world currencies. CDS = credit default swaps; crossover CDS indices consist of mostly speculative grade and some higher yielding investment grade entities.  
 \*From inception date of index.

<sup>1</sup>Annex 1.1 details how indicators that compose the rays of the map are measured and interpreted. The map provides a schematic presentation that incorporates a degree of judgment, serving as a starting point for further analysis. See the April 2007 GFSR for a fuller discussion of indicators and their placement in the map.

<sup>2</sup>Credit risks measure changes in credit quality that have the potential for creating losses resulting in stress in systemically important financial institutions.

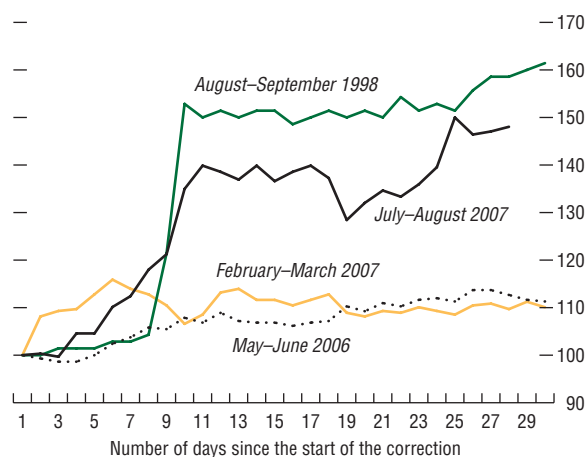
have been the subject of buyouts, has heightened vulnerabilities, especially as financial, and possibly economic, conditions turn less benign.

Meanwhile, mature market financial system default risk, as reflected in credit derivatives referencing large complex financial institutions (LCFIs), has risen sharply (Figure 1.4).<sup>3</sup> The rise was driven mainly by large U.S. investment banks that are especially exposed to the nonprime mortgage and leveraged loan markets. The widening in interest rate swaps and credit default swaps (CDS) referencing some investment banks illustrates market concerns of deeper stress for financial institutions. While potential losses appear to be manageable and banks appear well capitalized to weather more severe stress, there is at present considerable uncertainty regarding the magnitude and distribution of losses stemming from the correction in credit markets, and their possible impact on broader financial stability.

*Uncertainty regarding overall losses and exposure has raised market and liquidity risks, with potentially broader implications for financial institutions.*

Reflecting the potential rise in market losses, we have raised our assessment of *market and liquidity risks*.<sup>4</sup> Uncertainty regarding ultimate losses has increased market risks associated with a wide range of assets, beyond structured credit products. In the face of this uncertainty and higher volatility, lenders have raised margins, even for highly rated borrowers, and lowered the mark-to-market value of collateral. Other indicators also suggest that market risks have risen. For instance, the correlation of returns

**Figure 1.3. U.S. High-Yield Corporate Bond Spreads Index**



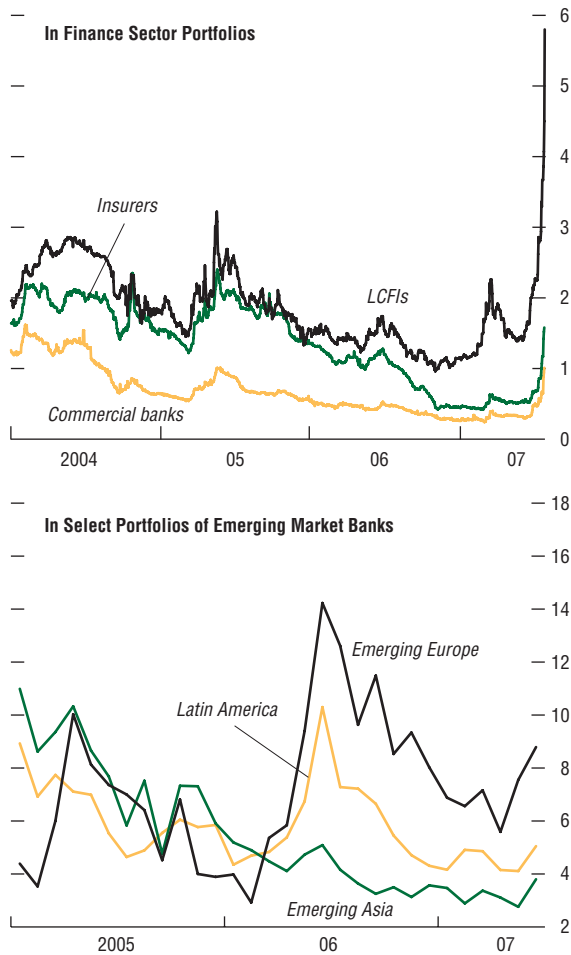
Sources: Merrill Lynch; and IMF staff estimates.

Note: Spreads are normalized to 100 at the beginning of the crisis.

<sup>3</sup>This issue of the GFSR continues to use credit derivatives-based credit risk indicators to review the evolution of market perceptions of default risk in mature market financial systems. The mature market credit risk indicators measure the probability of multiple defaults within three groups of 11 financial institutions, implied from the prices of credit default swaps (IMF, 2005, Chapter II). The three groups are LCFIs, commercial banks, and insurance companies.

<sup>4</sup>Market and liquidity indicators measure the potential for instability in pricing risks that could result in broader spillovers and/or mark-to-market losses.

**Figure 1.4. Probability of Multiple Defaults in Select Portfolios**  
(In percent)



Sources: Bloomberg L.P.; and IMF staff estimates.  
Note: LCFIs = large complex financial institutions.

across asset classes has continued to rise, eroding the benefits of portfolio diversification, while speculative positioning in futures markets has become increasingly concentrated. At the same time, the reduction in market liquidity is evident in a range of indicators, including wider bid-ask spreads, reduced turnover volume, and higher financing rates across a range of typically liquid markets.

The overall deterioration in market and liquidity risks has been partially mitigated by the recent increase in risk premia. Realized and implied volatility has risen across fixed income and equities. There has been an upward shift in the entire swaption volatility curve, suggesting that the rise in risk premia may last longer.

*Risk appetite generally declined, albeit from a high level.*

As investors have become more generally discriminating across the credit spectrum, they have also become more risk averse. From the elevated levels at the time of the April 2007 GFSR, we have reduced our indicator of *risk appetite*, bringing the overall level of risk appetite to neutral. Although recent turbulence has been associated with increased market volatility and an unwinding of positions predicated on a low volatility environment, some broad global indicators still signal a willingness to establish or extend positions in risky assets. We expect continued prospects for global expansion to underpin investor attitudes toward risk.

*Emerging market risks are balanced.*

Our overall assessment of *emerging market risks* represents a delicate balance between slightly lower sovereign risks amid a positive economic background, and rising risks in some economies experiencing rapid credit growth and increasing reliance on flows from international capital markets, with the offsetting pressures canceling each other out in the overall assessment. Reflecting a weakening in credit discipline that has emerged along with the growth in credit, private sector borrowers in certain emerging markets are adopting relatively risky strategies to raise financing, often embedding exchange rate risk or options

and thus increasing their exposure to volatility. Most noticeably, in some countries in Eastern Europe and Central Asia, banks are increasingly using capital market financing to help finance credit growth. Nevertheless, generally benign emerging market banking system default risk indicators continue to reflect market perceptions of healthy capitalization and profitability, as well as diverse earnings sources and sound asset quality (Figure 1.4).<sup>5</sup> These trends warrant increased surveillance, as circumstances vary considerably across countries. Authorities in some emerging markets need to ensure that vulnerabilities do not build to more systemic levels. Across all emerging market countries, policies that support continued resilience should help, as global market conditions are likely to remain volatile.

#### *Financial and monetary conditions have tightened...*

Since the April 2007 GFSR, policy rates have risen further across a number of countries, while the ongoing repricing in credit markets has tightened financing conditions for some segments—specifically, for less creditworthy U.S. households seeking mortgage credit and for highly leveraged corporate borrowers. Reflecting these developments and their likely continuation, we have shifted our assessment of *monetary and financial conditions* to signify slightly tighter conditions.

#### *...posing potential downside risks to the macroeconomy.*

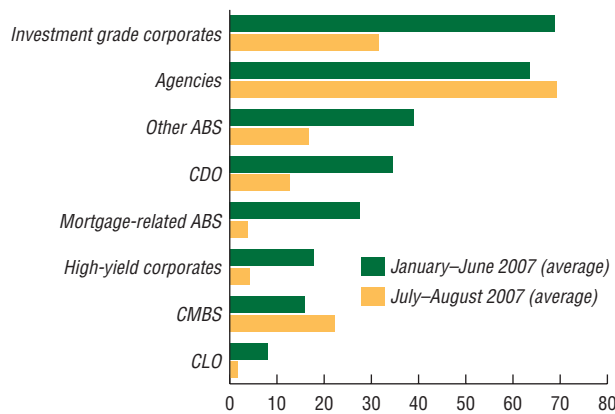
Tighter monetary and credit conditions could reduce economic activity through a few channels. First, a tightening of the supply of credit to

weaker household borrowers could exacerbate the downturn in the U.S. housing market. Second, falling equity prices could reduce spending through the wealth effect and a weakening of consumer sentiment. Third, capital spending could be curtailed owing to a higher cost of capital for the corporate sector. Last, and perhaps most importantly, the dislocations in credit and funding markets during the period of market turbulence could restrict the overall provision and channeling of credit.

The chances of a more severe tightening of credit conditions cannot be dismissed. Such a tightening could have significant global macroeconomic consequences, with the incidence of such tightening falling most heavily on more marginally creditworthy borrowers. For this reason, the United States may experience a more significant impact given the importance, for instance, of U.S. high-yield corporates as recipients of credit. By August, debt issuance by high-yield corporates and issuance of asset-backed securities (ABS) and collateralized loan obligations had slowed sharply (Figure 1.5). By contrast, high-grade issuance in the month of August rebounded. To some extent, the economic impact of any reduction in borrowing on U.S. capital investment spending may be muted, given that recent borrowing has been focused more on increasing leverage in the capital structure (through share buybacks and LBOs) than on business investment. In Europe, where there is greater reliance on bank lending, debt issuance has been less affected than in the United States. The LBO boom was less advanced in continental Europe than in the United States, so any slowing of buyout activity will have a more modest impact. However, European banks appear to have greater contingent exposures to asset-backed commercial paper (ABCP), suggesting one channel whereby European banks may have to tighten credit conditions more than their U.S. counterparts. Given all these considerations, it is unclear at this point what are the prospects for tightening credit conditions, and the consequent impact, in the United States versus Europe.

<sup>5</sup>This issue of the GFSR introduces a set of equity market-based credit risk indicators to review the evolution of market perceptions of default risk in emerging market financial systems. The emerging market credit risk indicators measure the probability of multiple defaults within three groups of five banks, implied by Moody's KMV Expected Default Frequencies (EDFs<sup>TM</sup>). EDFs<sup>TM</sup> are constructed using balance sheet and equity price data using a Merton-type structural model for estimating the probability of default (Kealhofer, 2003). The three geographic groupings are emerging Asia, emerging Europe, and Latin America.

**Figure 1.5. Gross Debt Issuance by Sector**  
(In billions of U.S. dollars)



Sources: Bloomberg L.P.; Citigroup; and JPMorgan Chase & Co.  
 Note: ABS = asset-backed security; CDO = collateralized debt obligation;  
 CMBS = commercial mortgage-backed security; CLO = collateralized loan obligation.

With respect to the impact of tighter U.S. mortgage credit, although mortgage financing flows to the nonprime segment have slowed and tighter lending standards are likely to restrain housing activity further, strong household income growth, a high ratio of net worth to disposable income, and low unemployment should help households absorb some of the impact of the declines in house prices.<sup>6</sup>

*Despite the continued strength of emerging market economies, global macroeconomic risks have generally increased.*

This view is broadly consistent with the current baseline scenario in the October 2007 *World Economic Outlook*, which continues to forecast solid global growth with mostly limited inflationary pressures (IMF, 2007b). The downside risks to the baseline scenario are mainly related to the knock-on effects of potentially weaker U.S. domestic demand due to the changes in financial risks and market conditions discussed above, and secondarily, to a potential spike in global inflation, which would be lessened under a scenario of slower global growth. A disorderly unwinding of global imbalances is also still a risk, particularly if foreign investors’ preferences for U.S. assets were to diminish as a result of the turmoil in financial markets. Alternatively, slower U.S. growth and a depreciation of the dollar would help to lower the U.S. current account deficit, reducing the amount of financing needed. These risks have increased since earlier in the year, prompting a slight increase

<sup>6</sup>Partly as a result of rising house prices, the ratio of net worth to disposable income rose to around 5¼ times by end-2006. A 10 percent fall in house prices, if that were to occur, would reduce household assets by around 3 percent and lower the ratio of net worth to disposable income to about 5½ times—roughly where it was in 2004. Although household leverage would increase further, in aggregate, declines on this scale appear manageable. However, the minority of borrowers who are overextended and lack home equity accumulation would undoubtedly face financial pain. Mortgage debt as a proportion of total assets, as well as the debt service burden, have both been on a steady upward path in recent years as households extracted equity from their homes, and their “leverage” rose (net worth to assets fell).



in our assessment of *macroeconomic risks*. By contrast, the continued strong performance of emerging market economies provides the potential for further upward surprises to growth.

## Credit Indiscipline in Mature Markets

*The U.S. nonprime mortgage market has experienced significant stress, with further deterioration likely.*<sup>7</sup>

Since the April 2007 GFSR, the U.S. nonprime mortgage market has continued to suffer from rising delinquencies on principal and interest payments.<sup>8</sup> As detailed in that report, the deterioration reflects a combination of lax underwriting standards, “risk layering,” and adverse trends in employment and income in certain regions.<sup>9</sup> Delinquencies on the 2006 vintage of subprime loans have climbed above 13 percent of the original balance, while alt-A loan delinquencies have also risen (Figure 1.6). Subprime delinquencies on the 2006 vintage have exceeded delinquencies on loans originated in 2000 at comparable seasoning (loan age)—the worst performing vintage in the recent past—and are expected to rise further if the historical pattern holds.<sup>10</sup> Loans originated in 2007 do not have sufficient

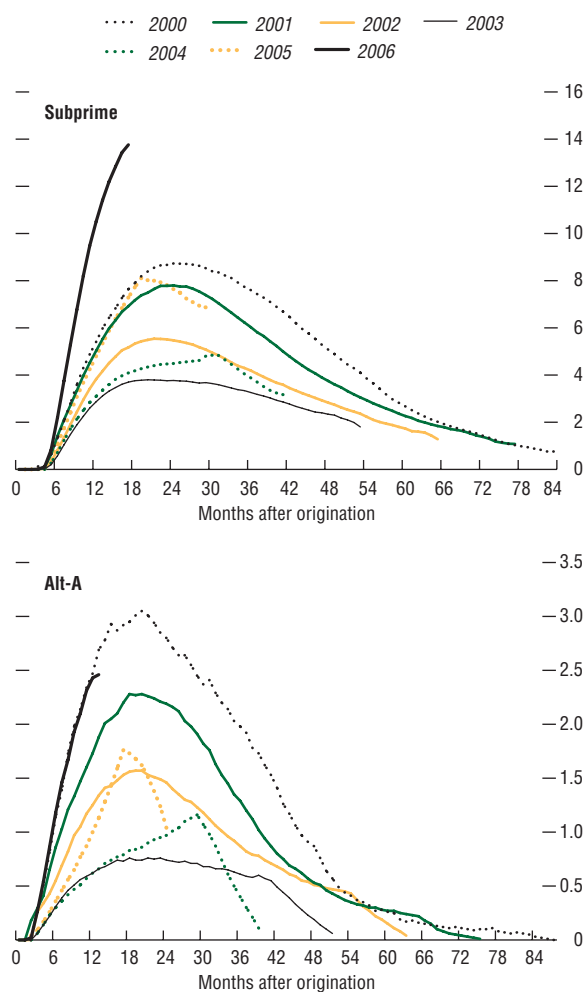
<sup>7</sup>Nonprime refers primarily to subprime and alternative-A (alt-A) mortgages. Subprime loans are typically made to borrowers with one or more of the following characteristics: weak credit histories that include payment delinquencies and bankruptcies; reduced repayment capacity as measured by credit scores or debt-to-income ratios; or incomplete credit histories. Alt-A mortgages, though of higher quality than subprime mortgages, are considered lower credit quality than prime mortgages due to one or more nonstandard features related to the borrower, property, or loan.

<sup>8</sup>Other measures of mortgage credit show a similar deterioration, including early payment defaults (mortgage loans that are more than 30 days delinquent within six months of the start of the mortgage) and foreclosures.

<sup>9</sup>“Risk layering” refers to the practice whereby mortgage lenders combine nontraditional mortgages with weaker credit controls, for instance, by accepting high combined loan-to-value ratios, reduced documentation, and little or no downpayment.

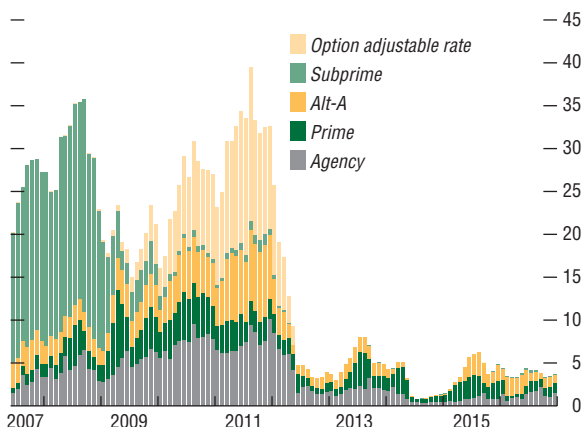
<sup>10</sup>Delinquencies tend to peak roughly at 24 to 30 months after origination. Some market participants estimate that subprime delinquencies on the 2006 vintage will peak at 20 to 25 percent of the original balance during 2008.

**Figure 1.6. Nonprime 60-Day Delinquencies by Mortgage Vintage Year**  
(In percent of original balance)



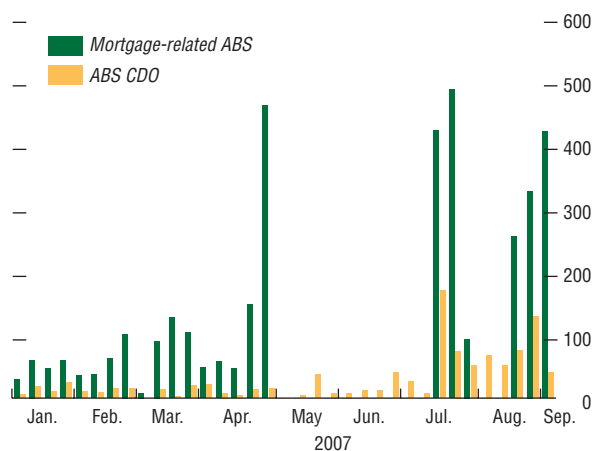
Sources: Merrill Lynch; and Intex.

**Figure 1.7. Monthly Mortgage Rate Resets**  
(First reset in billions of U.S. dollars)



Source: Credit Suisse.

**Figure 1.8. Rising Number of Downgrades of Mortgage-Related Products**



Sources: Bloomberg L.P.; and IMF staff estimates.  
Note: ABS = asset-backed security; CDO = collateralized debt obligation.

seasoning to gauge overall performance, but the loan attributes are similar to those issued on loans in 2006. Thus, some of the same risk layering characteristics endemic to the 2006 vintage appear to have persisted at least through the first half of 2007, despite reportedly tighter underwriting standards.<sup>11</sup>

Regardless of whether collateral quality improves, the effects of previous excesses are likely to continue at least through 2008, as low introductory “teaser” rates on adjustable-rate mortgages (ARMs) reset to higher rates, and as mortgages start to amortize (Figure 1.7).<sup>12</sup> Unlike previous years, borrowers experiencing payment difficulties are expected to have fewer refinancing options, since falling house prices reduce the amount of homeowner equity, while tighter lending standards limit the range of mortgages available to nonprime borrowers.

*A broad reevaluation by ratings agencies triggered a wave of downgrades in mid-2007.*

Following the deterioration in certain subprime and alt-A loans, ratings agencies downgraded an unprecedented amount of ABS collateralized by subprime mortgages, resulting in subsequent downgrades in collateralized debt obligations (CDOs) that use lower-rated ABS tranches as collateral (Figure 1.8).<sup>13</sup> The majority of securities were downgraded three to four notches, mostly from BBB to BB-. Some

<sup>11</sup>For instance, the combined loan-to-value ratios and credit scores on nonprime mortgages originated during the first half of 2007 were little changed relative to loans originated in 2006, and the percentage of loans with second liens actually increased. However, the average credit support required by ratings agencies on the securitized loans also increased, to account for the underlying poorer collateral quality. Reflecting more restrictive lending activity, the Federal Reserve Board’s Senior Loan Officer Survey shows that the percentage of banks reporting tighter lending standards for residential mortgages rose during the first half of 2007 to the highest level observed since the first half of 1991 (Federal Reserve Board, 2007).

<sup>12</sup>Interest-only ARMs often include negative amortization options that expose borrowers to potentially large upward adjustments in loan payments, typically two to three years after origination.

<sup>13</sup>See the April 2007 GFSR for a discussion on subprime mortgage securitization (IMF, 2007a).



AAA-rated tranches were downgraded multiple notches as well. Market participants expect further downgrades as the underlying loans continue to age, resets take effect, and delinquencies convert to foreclosures.

The ratings agencies cited various factors that contributed to the weaker-than-expected performance of mortgage loans, especially those issued in recent years, and noted, in particular, the impact of risk layering and poor data quality. These problems may have been compounded by a high incidence of fraud, resulting at least in part from limited borrower income documentation, and aggressive lending practices, such as offering short-term, below-market interest rates so as to qualify borrowers.

In response, the ratings agencies revised their methodologies to include higher loss severity assumptions, more severe stress tests, and increased monitoring of fraud prevention by lenders, thus effectively increasing the default risk of ABS and ABS CDOs. The agencies now estimate that home prices will fall more significantly than previously anticipated. Higher estimates of the magnitude of home price declines suggest lower recovery and higher losses from foreclosures. The agencies are also increasing loss estimates on loans that are not yet delinquent and are assuming lower prepayments from underlying mortgage loans, and therefore lower protection for subordinated securities.

Even with these changes, there remain broader problems with the structured credit product rating methodologies and processes.

First, structured credit products are likely to suffer more severe, multiple-notch downgrades relative to the typically smoother downgrade paths of corporate bonds, which calls into question the use of corporate bond rating scales.<sup>14</sup>

Second, the assumptions regarding the default correlations on mortgages in the ABS and CDO collateral pools can significantly

affect their value.<sup>15</sup> The higher the correlation, the more likely defaults are to impact senior tranches, so if the correlation assumption is too low, the AAA and AA tranches could be over-rated. While ratings agencies typically assume higher correlations for subprime mortgages than for other typical CDO assets (e.g., corporate bonds and loans), some analysts question whether they are high enough. Little empirical work has been done on this issue, largely because the market is too young to provide sufficient data.

Third, in the case of ABS CDOs, the ratings agencies assess credit risk based on default probabilities and loss severities associated with the rated ABS rather than the underlying mortgages. Thus, the CDO rating reaction to deteriorating underlying mortgage performance may be delayed by the need to await the downgrades of the component ABS and an analysis of the CDOs' often complex cash flow dynamics.

Finally, credit ratings evaluate only default risk, and not market or liquidity risks, and this seems to have been underappreciated by many investors.

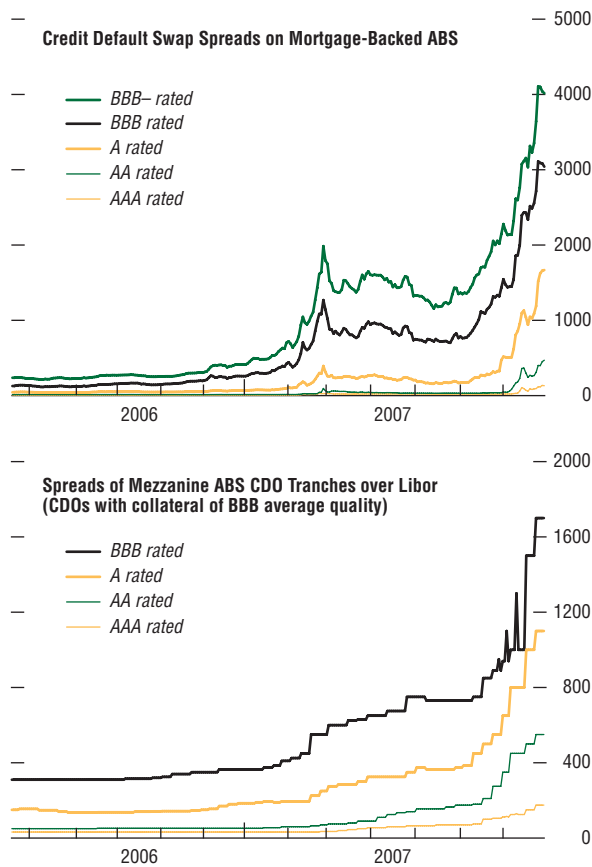
#### *Loss estimates are highly uncertain.*

Even before the series of ratings downgrades occurred, market participants began to increase their expectations for nonprime mortgage-related losses. This was reflected in a pronounced widening in cash and CDS spreads on ABS and CDOs backed by recently originated subprime mortgages, beginning in early 2007. Spreads have since widened across the capital structure, especially on lower-rated ABS and ABS CDO tranches, but also on AAA-rated senior tranches (Figure 1.9). Implied losses based on these spreads total roughly \$200 billion, exceeding the high end of estimated realized losses by roughly \$30 billion—an indication that market uncertainty and liquidity concerns may have pushed down prices further than warranted by fundamentals (Box 1.1). While many structured

<sup>14</sup>See Violi (2004) for an analysis of structured credit product credit rating migration risk, and Fender and Mitchell (2005) for a discussion of how CDO structural risk increases the potential for multi-notch downgrades.

<sup>15</sup>Default correlation measures the extent to which defaults are expected to occur in clusters.

**Figure 1.9. Representative Spreads of Mortgage-Backed ABS and ABS CDOs**  
(In basis points)



Source: JPMorgan Chase & Co.  
Note: ABS = asset-backed security; CDO = collateralized debt obligation.

credit products were bought under the assumption that they would be held to maturity, those market participants who mark their securities to market have been (and will continue to be) forced to recognize much higher losses than those who do not mark their portfolios to market. So far, actual cash flow losses have been relatively small, suggesting that many highly rated structured credit products may have limited losses if held to maturity.

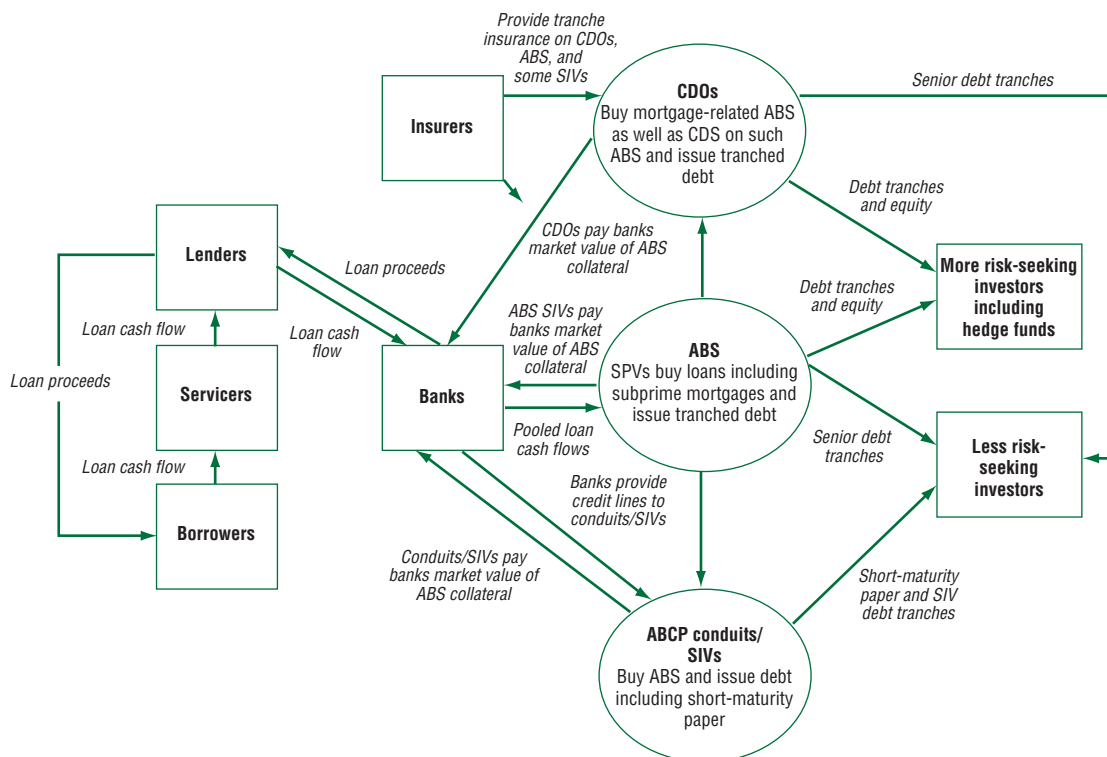
*Losses across the mortgage supply chain—who holds the risk?*

Mark-to-market losses and uncertainty about future cash flow losses have started to impact various segments of the mortgage supply chain. The peripheries of the supply chain have been most visibly affected, including, in particular, a number of poorly capitalized specialty finance companies.<sup>16</sup> While there has been limited impact on mortgage servicers thus far, their ability to manage losses is likely to be tested as delinquencies continue to rise.

Financial intermediaries active in the mortgage market have complex webs of exposure, but the largest such institutions—the core commercial and investment banking groups—are viewed by IMF staff and private sector analysts as sufficiently capitalized, diversified, and profitable to absorb direct losses (Figure 1.10).<sup>17</sup> While total exposures are difficult to gauge,

<sup>16</sup>Originators that have either consolidated or exited the industry through bankruptcy represent roughly 40 percent of the subprime market.

<sup>17</sup>The large capital buffers built up in recent years are expected to help insulate core U.S. commercial and investment banks. By way of illustration, if losses from nonprime mortgages rise to \$200 billion and these banks were exposed to one-quarter of that amount, then losses would represent less than one-twentieth of their capital and the ratio of their regulatory capital to risk-weighted assets (CRAR) would drop to 12.5 percent from the current 13 percent. If, in addition, banks were forced to provision for an average 5 percent markdown on all the roughly \$300 billion of leveraged loans in the pipeline, their CRARs would edge down to 12.4 percent, still higher than it was in 2000, and well above its longer term average level. The impact on European and Asian banks would likely be less due to their lower exposures to ABS and ABS CDOs.

**Figure 1.10. Mortgage Market Flows and Risk Exposures**

Source: IMF staff estimates.

Note: ABS = asset-backed security; ABCP = asset-backed commercial paper; CDO = collateralized debt obligation; CDS = credit default swap; SIV = structured investment vehicle; SPV = special purpose vehicle.

aggregate real estate-related losses on commercial banks' loan books have been minor thus far; with net chargeoffs on residential loans totaling a mere 0.04 percent of Tier 1 capital. Going forward, analysts expect a number of banks to incur revaluation losses from wider spreads; credit losses from their securities holdings; reduced revenues from trading, securitizing, and structuring mortgages; and additions to their balance sheets from conduits drawing on contingent credit lines, raising associated regulatory capital. The negative impact is expected to be manageable for the industry as a whole. Smaller, less diversified institutions are viewed as more vulnerable.

Among nonbank investors, hedge funds have the greatest risk exposure to ABS CDOs (Fig-

ure 1.11).<sup>18</sup> A few specialized mortgage hedge funds have already closed or are under redemption pressures stemming from losses in trading mortgage-related securities. However, thus far, these losses have been limited relative to total outstanding assets under management, and in fact some funds with ample liquidity are actively seeking to acquire distressed assets.

Some financial guarantors—especially monoline insurers that provide credit enhancement to senior ABS and CDO tranches and insurance to securitizations of mortgage originators and ser-

<sup>18</sup>In some cases banks have reportedly encouraged hedge funds to buy the equity tranche of CDOs they have structured by offering attractive terms that enable hedge funds to leverage up their investments.

### Box 1.1. Estimates of Nonprime Mortgage Losses

*This box presents the loss estimates on U.S. subprime and alt-A mortgages based on two approaches. The first estimates losses over the lifetimes of the mortgages, and the second estimates mark-to-market losses.*

Loss estimates on mortgages vary considerably, in part due to the different assumptions about inputs and differences in valuation methods. The top panel of the table estimates lifetime losses based on a scenario in which house prices decline by 5 percent over the first year and then stabilize.<sup>1</sup> In this scenario, 25 percent of the subprime mortgages and 7 percent of the alt-A mortgages are assumed to eventually default, and average loss severities (amounts ultimately not received) are assumed to be, respectively, 45 and 35 percent. Of the resulting \$170 billion of estimated losses, about 25 percent would be directly absorbed by the banking system, and the other \$130 billion by ABS and ABS CDOs.

The lower panel estimates the mark-to-market losses since February 2007 on all outstanding nonprime mortgage-related securities. Admittedly, they might represent worst-case devaluations, because they assume that all ABS and ABS CDOs issued in 2004 through 2006 remain outstanding, ignoring the impact of prepayments and defaults. Also, the securities are priced off ABX indices (for the ABS) and TABX tranches (for the ABS CDOs), which may

Note: This box was authored by John Kiff and Mustafa Saiyid.

<sup>1</sup>Potential losses on nonprime mortgages tend to be highly correlated with the path of future house prices, so assumptions on house prices are a key input to forecasted losses.

represent worst-case prices.<sup>2</sup> On the other hand, the estimates do not include potential losses on nonprime mortgage-backed synthetic CDOs, which are difficult to estimate given the opacity of these markets. However, keeping all of this in mind, the table estimates mark-to-market losses of about \$200 billion.

In addition to differences in input assumptions and valuation methods, other factors increase the uncertainty of the magnitude and timing of estimated losses. The magnitude of losses is uncertain because delinquencies on recently originated nonprime loans significantly exceed the prior trend, making historical relationships of limited use. The proliferation of various derivations of mortgage securities, including ABS CDOs, CDOs of CDOs, CDS on CDOs, etc., each with unique cash flow distribution rules, further complicates the process of calculating the impact of collateral losses on securities.<sup>3</sup> The timing of cash flow losses is similarly uncertain, since structured securities tend to delay the transmission of losses from the underlying collateral, and cash flow distribution

<sup>2</sup>The ABX is an index of credit default swaps linked to 20 underlying subprime mortgages. The TABX is an index that tranches synthetic CDOs based on the BBB- and BBB ABX indices. The TABX is fairly illiquid, and does not reflect the impact of collateral management on the cash ABS and ABS CDOs being priced in the table. In fact, analysis has shown that ABS CDO collateral managers have minimized exposure to the worst-performing 2006 vintages.

<sup>3</sup>For instance, the impact of loan losses on cash flows to these securities is reduced by credit enhancement mechanisms, such as subordination of securities, excess servicing, over-collateralization, and credit insurance.

vicers—are also exposed to the downturn in the mortgage market. While the net par exposure of the industry as a whole to mortgage originators' and servicers' assets appears to be limited, and capital sufficient, financial guarantor exposure could have important implications for broader

structured credit markets and the market for municipal bonds.<sup>19</sup>

<sup>19</sup>See Fitch Ratings (2007a) and Standard & Poor's (2007a). There is a high concentration of financial guarantors referenced in synthetic corporate CDOs. Financial guarantors also play a key role in U.S. municipal bond markets through the provision of default insurance.

### Loss Estimates for ABS and ABS CDOs Since February 2007

	Outstanding (Billions of U.S. dollars)	Percent of Total Mortgage Debt	Assumed Default (Percent of Origination)	Assumed Loss Severity (In percent)	Estimated Cash Flow Loss (Billions of U.S. dollars)	Estimated Mark-to- Market Loss (Billions of U.S. dollars)
Subprime total	1,300	15	25	45	~145	
Alt-A total	1,000	11	7	35	~25	
Nonprime Total	2,300				~170	
ABS						~65–70
ABS CDOs						~120–130
Total ABS and ABS CDOs						~200
	AAA	AA/A		BBB/BBB–		Not Rated
	Mortgage ABS Issuance (Billions of U.S. dollars)					
2004	258	41		9		13
2005	283	57		13		11
2006	281	54		14		28
	Estimated ABX Implied Mark-to-Market Losses of Mortgage ABS Tranches (Percent of outstanding par)					
2004	2–3	5–10		8–10		n.a.
2005	4–5	10–20		20–22		n.a.
2006	7–8	20–40		48–50		n.a.
	ABS CDO Issuance (Billions of U.S. dollars)					
2004	35	3		1		6
2005	61	8		3		23
2006	135	15		5		11
	Estimated Tranched ABX (TABX) Implied Mark-to-Market Losses of CDO Tranches (Percent of outstanding par)					
2004–06	40–70	40–60		40–45		n.a.

Sources: Lehman Brothers; Merrill Lynch; and IMF staff estimates.

Note: Estimated mark-to-market losses are issuance times estimated tranche losses. Aggregate loss numbers for ABS, ABS CDOs, and the overall total shown above are computed using five different tranches (AAA, AA, A, BBB, and BBB–); for the sake of simplicity and to highlight the wide range of pricing, the table has combined tranches rated AA and A, BBB, and BBB–. ABS = asset-backed security; ABX = synthetic asset-backed security; CDO = collateralized debt obligation; TABX = tranched asset-backed security.

rules may change in the event of a rating downgrade. Uncertainty regarding the extent of loan modifications, or the process of renegotiating

terms on delinquent loans, further complicates the timing and magnitude of foreclosures and losses.

*Losses extend beyond U.S. borders, highlighting the benefits of spreading risk, but also the global reach of the credit deterioration.*

Direct exposure extends beyond the United States, with European and Asian investors active in the ABS and related markets (Figure 1.11). A handful of European institutions have already reported difficulties or closed owing to their exposure to U.S. mortgage markets and the

withdrawal of their short-term funding, and still more are believed to be exposed to indirect mark-to-market losses stemming from their credit lines to conduits and structured investment vehicles.<sup>20</sup> Within the Asia Pacific region,

<sup>20</sup>European banks have been significant providers of funding to third-party vehicles, and a reduction in that funding could potentially threaten such vehicles' business models.

**Table 1.1. Weakening Discipline in Subprime Lending Mirrored in Leveraged Buyouts**

Subprime	Leveraged Buyouts
Higher loan-to-value ratios	Higher debt/EBITDA
Interest-only, negative amortizing loans	Covenant-lite and pay-in-kind toggle notes
Cash-out refinancing	Dividend re-cap
Zero percent down	Lenders providing equity bridges
Home price appreciation	Purchase multiple expansion

Source: IMF staff estimates.

Note: EBITDA = earnings before interest, taxes, depreciation, and amortization.

various market analyses suggest that exposure to mortgage-related products is concentrated in Japan, Australia, Taiwan Province of China, and Korea, but their overall exposure has been characterized as manageable and that region appears to be insulated from default risk.<sup>21</sup>

*There has been a parallel weakening of credit discipline in the corporate segment...*

There are similarities between the credit weakening in the nonprime mortgage market and that in the leveraged loan market (Table 1.1). This weakening, by extension, affects the market for CLOs, structured finance vehicles managed to invest primarily in senior leveraged loans (Figure 1.12).<sup>22</sup> The current leveraged buyout boom entered a new, more aggressive phase in 2006 that intensified in early 2007.

Underwriters and debt markets continued to increase leverage. Leverage levels rose to eight to 10 times EBITDA and purchase price-to-earnings ratios were in excess of 10.<sup>23</sup>

<sup>21</sup>See Standard & Poor's (2007b); and Moody's (2007).

<sup>22</sup>A leveraged loan is typically defined as any loan that has a debt rating below Baa3/BBB– from Moody's and Standard & Poor's, respectively, has a debt-to-EBITDA ratio of 3.0 times or greater, and tends to be priced at least 125 basis points over LIBOR at issue. (EBITDA stands for earnings before interest, taxes, depreciation, and amortization.) As detailed in the April 2007 GFSR, the expansion in the leveraged loan market has been in part driven by the maturation of the CLO market. Instead of retaining leveraged loans to fund buyouts on its balance sheet, a bank can sell such loans into the CLO market, thus freeing up capital to extend new loans to other private equity firms.

<sup>23</sup>Previously, leverage levels averaged about 4.5 times and average purchase price multiples were about 7.5 times. By late 2005, many observers thought such levels had gone as high as they safely could.

Analogous to the innovation in the nonprime mortgage market, financing innovations—such as covenant-lite loans and incurrence covenants<sup>24</sup>—allowed more marginal firms to be considered as targets, and encouraged deal sponsors to buy companies at higher earnings multiples. By the second quarter of 2007, more than a third of the companies that were the subject of buyout deals were rated split-B or below (rated B or lower by two ratings agencies), and around 30 percent of leveraged loans were covenant-lite (Figure 1.13).

*...exposing banks to increased underwriting, marketing, and syndication risks, as short-term risks and uncertainty have increased and the pipeline of LBO deals has swelled.*

As credit market strains emerged over the summer of 2007, lenders began to demand better terms, and spreads on leveraged loans, high-yield bonds, and related derivative indices widened sharply, prompting the postponement of several pending deals. Secondary market trading of leveraged loans weakened, with many deals trading at a significant discount to their issue prices (Figure 1.14). An estimated \$300 billion of leveraged loans was planned

<sup>24</sup>Unlike traditional covenants (called "maintenance covenants"), incurrence-only loans are similar to those in high-yield bonds in that the company is only in default if it breaches the set threshold *and* takes some deliberate corporate action that exacerbates the situation. For example, a company could have fallen below the minimum cash set out in its cash interest cover ratio covenant, but, were it an incurrence covenant, would only be in breach if it subsequently issued a dividend, or raised additional borrowing.



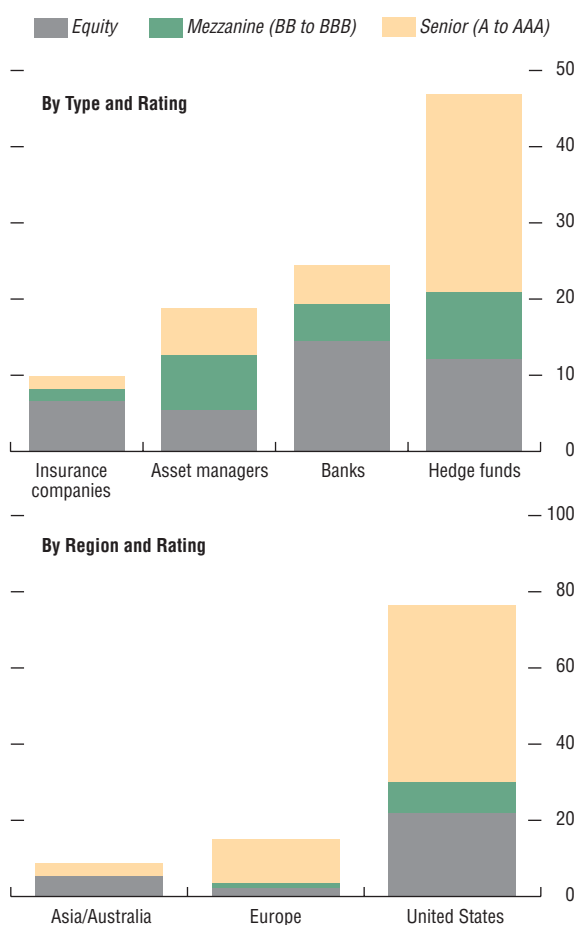
to come to the market in the second half of this year, equivalent to around one-third of the total shareholder equity of the top 10 banks most involved in financing leveraged buyouts. But overall demand for the loans from CLOs and other market participants is now uncertain. The shift in credit conditions is helping to impose greater discipline on the buyout market—as evidenced in higher bid premia for private equity deals and increased repo terms. However, in the near term, financial institutions are exposed to potential syndication risks, with unsold bridge commitments contributing to an overhang in the market. Mitigating this to some extent, banks sometimes have clauses in their financing agreements with deal sponsors that allow them to turn all or part of the deal back to the sponsor if financing conditions become difficult, thus limiting their downside risks. In addition, banks can attempt to manage some of the shock from potential hung bridges by temporarily expanding their balance sheets, increasing their loan loss reserves, opting to pay a break-up fee, or selling their residual equity or loans directly to hedge funds, though it is unclear whether such funds will fully absorb the outstanding loans and mortgage positions.

*The sensitivity of recent LBO targets to business and economic shocks has also increased...*

At higher leverage and price multiples, LBO targets are subject to greater business and economic risks. To illustrate this, Table 1.2 shows how a stylized private equity deal reacts to a number of possible scenarios. The example shows that deals are most sensitive to stagflation.<sup>25</sup>

Events have shown that, as LBO deals push toward extremes, rising interest rates present

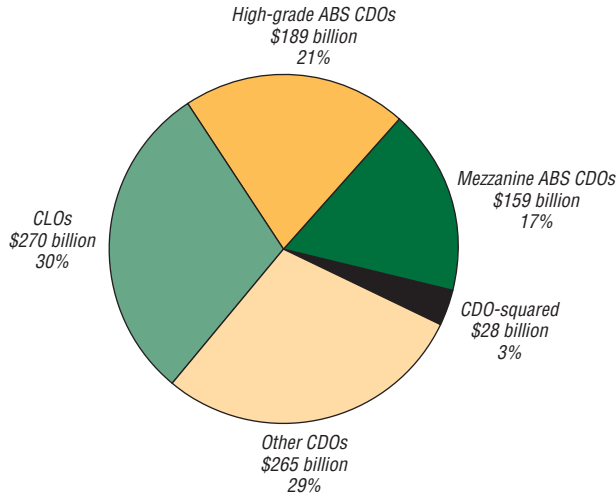
**Figure 1.11. Buyers of ABS CDOs**  
(In percent, delta-adjusted basis)



Source: Citigroup.  
Note: ABS = asset-backed security; CDO = collateralized debt obligation. Delta adjustment multiplies the holdings by the delta (i.e., leverage) of the tranche. Hence, it magnifies more junior tranches (i.e., equity) and thus gives a better picture of risk appetite.

<sup>25</sup>This assumes an initial debt multiple of annual cash flows of seven, and a price multiple of cash flows of 10—both broadly in line with the current overall market average, but low compared with more aggressive deals. An initial debt multiple of nine times leads to losses for the deal sponsor under all states of the world.

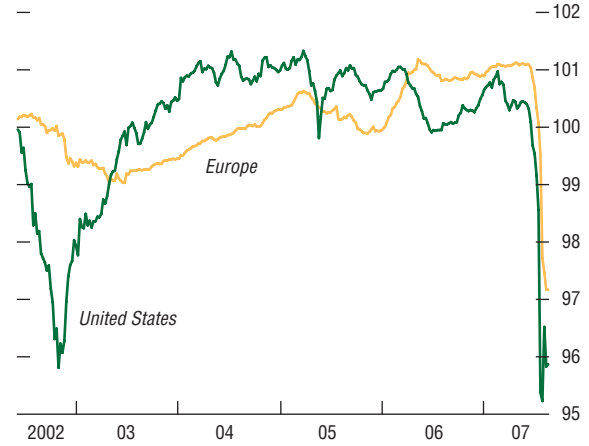
**Figure 1.12. U.S. CDO Outstanding Volume**  
(\$900 billion through July 2007)



Source: Credit Suisse.

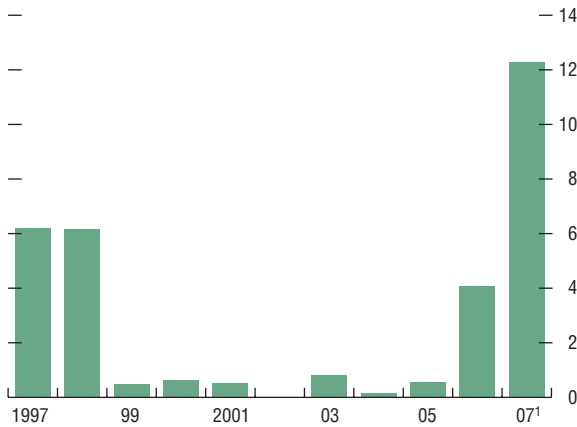
Note: CDO = collateralized debt obligation; ABS = asset-backed security; CLO = collateralized loan obligation. CDOs are defined as high-grade or mezzanine on the basis of the average rating of the underlying collateral. The collateral of high-grade CDOs is usually rated AA/A while that of mezzanine CDOs is BBB. CDO-squared entities are those CDOs whose collateral includes tranches of other CDOs.

**Figure 1.14. Average Bid Price for U.S. and European Leveraged Loans**



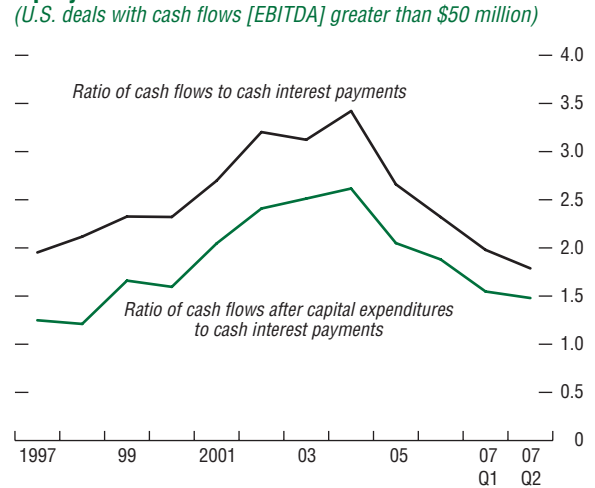
Sources: Markit Loans; and Standard & Poor's Leveraged Commentary & Data.  
Note: Pricing for commonly traded loans.

**Figure 1.13. Number of Covenant-Lite Loans to Total Number of Institutional Term Loans**  
(In percent)



Source: Standard & Poor's Leveraged Commentary & Data.  
¹First half of 2007.

**Figure 1.15. Interest Coverage Statistics on Private Equity**  
(U.S. deals with cash flows [EBITDA] greater than \$50 million)



Source: Standard & Poor's Leveraged Commentary & Data.  
Note: EBITDA = earnings before interest, tax, depreciation, and amortization.

**Table 1.2. Private Equity Deal Scenarios**

	Positive Conditions	Slow Growth	Higher Inflation	Higher Yields	Slow Growth and Higher Yields
<b>Assumptions</b>					
Sales growth (percent)	10	0	10	10	0
Profit margin to sales (percent)	15	10	10	15	5
Debt service cost (percent)	8	8	10	12	12
<b>Results (at end of year seven)</b>					
Enterprise value (US\$ millions)	441.0	80.8	229.0	390.0	-62.4
Return on firm equity at time of exit (percent)	33.0	6.0	15.1	22.6	-3.6
Capital gain on private equity (percent)	1,135.0	126.0	543.0	992.0	-274.8
Capital gain on public company (US\$ millions)	341.0	-19.2	129.0	290.0	-162.4

Source: IMF staff estimates.

Note: Example based on a public company with enterprise value of \$100 million, gross profit of 10 percent, and debt service cost of 7 percent. Firm is assumed to be sold at end of year seven.

a challenging environment. This can be seen in the interest coverage ratios (that is, cash flows relative to cash interest payments) in recent deals—which rose steadily through 2004, but which have since dropped sharply to levels last observed at the start of the decade (Figure 1.15). Any subsequent rises in interest rates, cash dividends, or unplanned expenditures will squeeze this ratio further. Gains to private equity holders on LBO targets are increasingly reliant on earnings growth, as valuation multiples and leverage rise, and as leveraged loan rates have increased. It appears that private equity has picked most of the “low hanging fruit,” potentially straining the viability of targets in the period ahead.

*...raising questions about LBO refinancing risks in the medium term.*

Even if the LBO market weathers this initial storm, medium-term prospects appear challenging. The most recent deals will likely face refinancing difficulties. The analogy with resets in the mortgage market suggests some firms may struggle to secure financing on attractive terms, and may therefore have to carry a more demanding debt service burden than anticipated. Defaults are therefore likely to rise—though, barring a significant economic downturn, they appear unlikely to reach previous cyclical peaks.

*Near-term contagion—the proximate source being uncertainty of losses and repricing of credit—has been transmitted to broader markets through several channels.*

While the shift in financial conditions is helping to restore credit discipline, the correction has also magnified vulnerabilities that extend beyond the mortgage and leveraged loan sectors. Tangentially related markets are being affected through second- and third-order effects, as concerns in structured finance markets trigger a broad-based increase in risk premia and induce a reluctance to lend, a reduced distinction across investments, and other changes in market psychology. These effects are difficult to gauge, and will depend on the duration and extent of the market correction. As additional information is released, the market will likely be able to distinguish among risks with greater accuracy, helping to contain the effects of contagion.

Negative knock-on effects, though, have already been felt by other entities, including hedge funds, structured investment vehicles (SIVs), and other ABCP conduits—where investors are demanding wider spreads to compensate for the uncertainty about how risks are allocated and managed (Box 1.2). In some cases, ABCP programs’ inability to roll over maturing paper has forced banks to provide funding support, which, in turn, has increased market-wide

### Box 1.2. Concerns in the Asset-Backed Commercial Paper Market

*The deterioration in the mortgage market has magnified funding difficulties in the short-term credit market. This box discusses the key entities that issue asset-backed commercial paper and the vehicles most vulnerable to the reduction in liquidity in that market.*

Similar to asset-backed securities (ABS), asset-backed commercial paper (ABCP) programs repackage pools of assets into special purpose vehicles that are funded by issuing short-maturity debt. These vehicles use the proceeds from the debt to fund purchases of financial assets. The three most common vehicles are traditional conduits, which generally use the debt to finance receivables, leases, and loans; structured investment vehicles (SIVs), which buy mainly longer-maturity corporate bonds and lower-rated structured credit products; and security arbitrage conduits (SACs), which use the debt proceeds to invest in highly rated structured credit. Unlike conduits, SIVs and SACs are tranching: any losses are first absorbed by equity holders, and only subsequently by holders of medium-term notes and commercial paper.

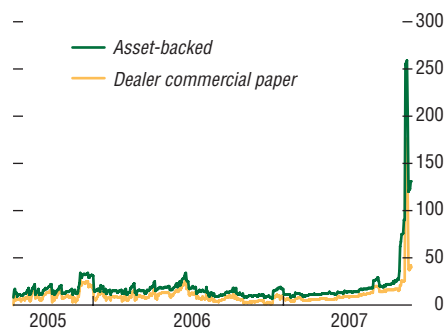
As of early September 2007, the size of the U.S. dollar-denominated ABCP market was around \$1 trillion, representing more than one-half of the outstanding commercial paper market, though outstandings dropped in the weeks that followed. ABCP-funded conduits and SIVs have been especially popular among banks in North America and Europe, in part due to the potential reduction in required regulatory capital on highly rated instruments.<sup>1</sup>

Most ABCP programs have well-diversified assets, but some have significant mortgage-related exposure. Conduits have about an 11 percent exposure to mortgage loans and a further 11 percent exposure to ABS securities, some of which are mortgage-related securities.

Note: This box was authored by John Kiff and Mustafa Saiyid.

<sup>1</sup>Vaguely defined clauses governing funding arrangements for some ABCP vehicles were partly responsible for recent rollover failures in Canada. At issue was the definition of a “general market disruption” that resulted in bank funding requests of some Canadian ABCP issuers being denied.

**Commercial Paper Spreads**  
(30-day paper, in basis points over repo rate)



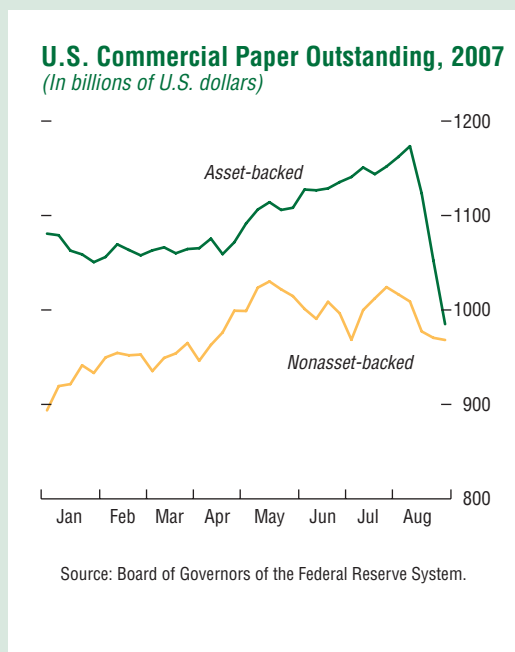
Source: Bloomberg L.P.

SIVs and SACs have about a 20 to 25 percent exposure to residential mortgage-related securities and an 11 percent exposure to collateralized debt obligations (CDOs), some of which may be mortgage-related CDOs. A subset of SIVs—SIV lites—are almost entirely invested in mortgage-related securities. The mortgage-related exposure is diversified globally, including the United States, United Kingdom, Germany, Australia, and the Netherlands.

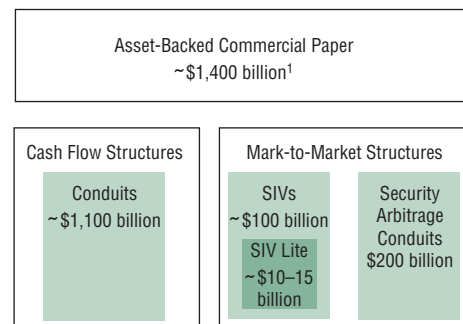
ABCP programs face important liquidity risks.<sup>2</sup> If an ABCP program cannot roll over or extend commercial paper coming due, it must achieve some sort of short-term financing or else dissolve itself and sell the underlying assets. In some cases, this risk is mitigated by having backstop funding arrangements. The availability of a liquidity provider does not prevent the assets from being sold, but it gives time to achieve an orderly liquidation.

A loss of market liquidity in the market for U.S. mortgage-related credit was largely to blame for difficulties in rolling maturing ABCP, prompting a sharp widening in spreads. Downgrades and lower mark-to-market valuations of the underlying collateral further compounded

<sup>2</sup>The maturity of such short-term debt averages 45 days but can be as long as 364 days (or more in the case of “extendible” commercial paper).



### Key Types of Asset-Backed Commercial Paper Vehicles



Sources: Bank for International Settlements; JPMorgan Chase & Co.; and IMF staff estimates.

Note: Outstanding par of global asset-backed commercial paper. SIVs (structured investment vehicles) are short-term liabilities only.

<sup>1</sup>Approximately, United States, \$1,000 billion; Europe, \$300 billion; and Canada, \$100 billion.

difficulties. SIVs and SACs tend to be more vulnerable to losses resulting from forced liquidation of assets than conduits. First, any losses from forced liquidation of underlying assets are magnified to holders of equity in SIVs and SACs as a result of leverage.<sup>3</sup> In this respect, they are similar to CDOs, though with lower leverage. Second, SIVs and SACs are more heavily exposed to mortgage-related collateral—the key source of market concern—compared with other types of vehicles.

<sup>3</sup>Any losses from liquidation are first absorbed by equity holders of the SIV and subsequently by subordinated notes before they reach the commercial paper, the most senior liability.

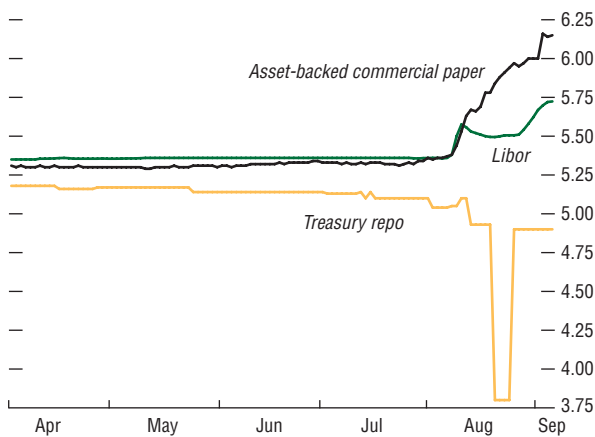
Difficulties in the ABCP market have the potential to impact capital markets broadly, as has been amply demonstrated by recent bank liquidity problems. Bank exposure to some CDOs may have been transferred to off-balance-sheet conduits, but bank credit lines to those conduits will likely put risk back onto bank balance sheets. As a result of short-term illiquidity, some banks could become insolvent, requiring bailouts. In addition, market uncertainty about the size of potential losses for holders of commercial paper could lead to redemptions from money market funds that hold mostly commercial paper. The market for super-senior tranches of corporate CDOs could be affected, as these securities are typically purchased by conduits.

funding pressures, calling for a broadening of allowable collateral and extraordinary liquidity injections from central banks (Figure 1.16). To some extent, these legal structures have transformed credit risk into counterparty and funding risk. For example, some of the risk that is transferred out of the banking system to

hedge funds could return to the system as prime broker counterparty risks. Similarly, risks transferred to SIVs and other conduits are returning to the banking system via funding support facilities.

In addition, concerns regarding “ratings migration” have channeled uncertainty to a

**Figure 1.16. U.S. Money Market Interest Rates, 2007**  
(90-day rates, in percent)



Source: Bloomberg L.P.

broad range of rated products. The ratings agencies acknowledged significant failures in their ABS and ABS CDO models, assumptions, and methodologies, and this sparked concern that such failures may extend to the broader structured finance market, introducing uncertainty regarding the validity of other ratings.

The forced unwinding of leverage in an environment of reduced market liquidity represents another means through which volatility is transmitted across markets (see Chapter 2). A modest decline in value can have a dramatic impact on a portfolio that layers leverage on top of products that already have embedded leverage. For instance, in the simple hypothetical example in Table 1.3, a small loss in value can force funds to sell large amounts of assets as liquidations to meet margin calls and, simultaneously, their redemptions, increase.<sup>26</sup> Such “fire sales” could lead to vicious circles of forced sales, as the widening of spreads forces hedge funds and others who mark portfolios to market to post losses, possibly sparking investor withdrawals and further forced sales. Already, the liquidations of several hedge funds with high concentrations of exposure to mortgage credit have increased the risk of further margin calls, in turn sparking a spiral of widening spreads across other markets.<sup>27</sup> Such episodes highlight the reliance of funds holding illiquid structured products on

<sup>26</sup>The initial drop in value reduces equity in the fund, which automatically pushes up leverage. The broker (or repo desk) makes a margin call that forces the fund to sell assets to bring leverage back to its initial level. However, in addition, the prime broker (or repo desk) now imposes a higher margin (or “haircut”) to reflect the fact that the assets are now riskier. This requires the fund to reduce borrowing further. Last, redemptions require further asset sales. This example is liberal in that it assumes the maximum use of available leverage, but it is conservative in that it considers only first-round effects, not second-round declines in value from the sale of the collateral.

<sup>27</sup>Similar scenarios apply to other investor types. For instance, downgrades of ABS CDO tranches could force some investors (e.g., pension funds, insurance companies) that face credit ratings-based constraints to sell the downgraded securities.



**Table 1.3. Stylized Example of a Forced Unwind of Leverage**

	Asset Value	Equity	Borrowing	Leverage	Margin (%)
At start	100.0	15.0	85.0	5.7	15.0
After loss of value	95.0	10.0	85.0	8.5	10.5
After margin call	66.7	10.0	56.7	5.7	15.0
After increase in margin	40.0	10.0	30.0	3.0	25.0
After sales to meet redemptions	36.0	9.0	27.0	3.0	25.0

Initial margin 15%  
Loss in value 5%  
New margin at lower value 25%  
Redemptions 10%

Modest loss of value and higher haircuts generate large forced sales

Source: IMF staff estimates.

their ability to obtain continuous liquidity for funding their leveraged positions.<sup>28</sup>

In a similar vein, uncertainty has led to concerns regarding a further reduction in market liquidity through “haircut contagion,” increasing funding rates in a broader range of markets beyond structured credit products.<sup>29</sup> This could create a cycle of declining asset values, withdrawal of market liquidity, forced sales, and further valuation declines in unrelated markets until some market participants with ample cash and a willingness to buy step in to provide a floor (Table 1.4). Participants such as pension funds, insurance companies, and sovereign wealth funds with longer investment horizons and little if any leverage could be expected to help put a lower bound on price declines (see Annex 1.2 on characteristics of sovereign wealth funds.)

Strains in the mortgage market have also revealed the importance of reputational risk

<sup>28</sup>For instance, when liquidity dried up, Bear Stearns provided a back-up facility for its asset management arm, and the other affected funds were pushed into forced liquidations and deleveraging. The Bear Stearns-managed funds quickly lost value within a few weeks.

<sup>29</sup>A “haircut” refers to the deduction from the market value to account for the risk that the asset will be worth less if it needs to be sold when the investor pledging the security has difficulties. The size of a haircut changes depending on the class of a security, its market risk, and the time to maturity. For instance, haircuts fluctuate from 0 to 30 percent (on equities) to 100 percent (for securities with past-due delivery). A higher haircut lowers the value of the asset being financed.

as a transmission mechanism. Firms may feel obligated to support legally separated entities financially in order to maintain their reputation as viable firms. Thus, risk can be transmitted from a peripheral unit to, perhaps, a systemically important institution. Given the large number of separate asset management companies, special purpose vehicles, and conduits, this is an important consideration, particularly for the boards of directors of the sponsoring institutions, where oversight of these entities needs to be based on accurate and relevant information about their risks and returns.<sup>30</sup>

The rapid deterioration in the U.S. nonprime mortgage sector has also led to concerns about dislocations in non-U.S. mortgage markets, especially in the U.K. nonconforming mortgage sector and, to a lesser extent, the Australian subprime sector. A number of other countries have overvalued housing markets and are vulnerable to a downturn in house prices but have small nonconforming mortgage sectors.<sup>31</sup> The U.K. nonconforming mortgage market is significantly smaller than the U.S.

<sup>30</sup>For instance, Bear Stearns Cos Inc. had only very small direct stakes in the hedge funds that collapsed under Bear Stearns Asset Management. Even so, when the funds were on the point of collapse, Bear Stearns Cos Inc. provided back-up financing to the funds that carried its name.

<sup>31</sup>See Box 1.2 in the October 2007 *World Economic Outlook* (IMF, 2007b).

**Table 1.4. Typical Haircuts: Bond, Leveraged Loan, and ABS and CDO**  
(In percent)

Rating	January–May 2007	July–Aug 2007
	Bond	
Investment grade	0–3	3–7
High-yield	0–5	10+
	Leveraged Loan	
Senior	10–12	15–20
2nd lien	15–20	20–30
Mezzanine	18–25	30+
	ABS and CDO	
AAA	2–4	8–10
AA	4–7	20
A	8–15	30
BBB	10–20	50
Equity	50	100

Source: Citigroup.

Note: ABS = asset-backed security; CDO = collateralized debt obligation.

subprime market and there is limited evidence to suggest that U.K. loans shared the same combination of risk layering, poor underwriting standards, and declining home prices as in the United States. Nonetheless, these concerns (together with higher domestic interest rates) have pushed U.K. mortgage rates higher on more recent vintages and reportedly led lenders to withdraw their more risky mortgage products.<sup>32</sup>

<sup>32</sup>For instance, the average combined loan-to-value ratios on U.K. nonconforming loans in 2006 (76 percent) is significantly lower than those for U.S. 2006 subprime loans (85 percent), and there is minimal adverse credit lending in the U.K. market, reflecting tighter underwriting standards. Expectations of loss severity in the United Kingdom are around one-third of those in the United States, mainly due to lower foreclosure costs. Meanwhile, in contrast to the U.S. market, the underlying performance of recently-originated U.K. nonconforming loans has been stronger compared with prior vintages. The Australian subprime market is small, and Australian real estate loans give the lender greater structural protection than U.S. lenders enjoy.

## Weaker Credit and Market Discipline Warrants Increased Surveillance in Emerging Markets

Overall, emerging market risks remain low relative to historical experience, with many countries benefiting from improved macroeconomic fundamentals and strong external balances. Nonetheless, developments in mature markets raise concerns that vulnerabilities may be growing in emerging markets related to a weakening of credit and market discipline in global markets, with some emerging market countries more exposed than others. This section highlights five such concerns.

First, it considers the growing market of privately placed syndicated loans to emerging markets, which shares similar evidence of credit indiscipline as in the leveraged loan segment.

Second, in some regions, emerging market banks—both domestic and foreign banks acting on behalf of subsidiaries—are relying increasingly on international borrowing to finance rapid domestic credit growth. This development—flagged in the April 2007 GFSR—is a growing vulnerability.

Third, emerging market corporates appear increasingly engaged in carry-trade-style external borrowing that could pose losses if carry trades rapidly unwind.

Fourth, emerging market financial institutions in some countries are increasingly using structured and synthetic instruments to increase returns, potentially exposing them to losses as volatility rises.

Finally, the section explores whether foreign investors in emerging market equities increase the risks for volatility or the mispricing of emerging market equities.

*Emerging market corporations have enjoyed easy access to international markets for some time, and credit discipline appears to be weakening.*

The private placement loan market has experienced rapid growth in emerging Europe, the Middle East, and Africa (EMEA) and, to a lesser extent in Asia, partly at the expense of

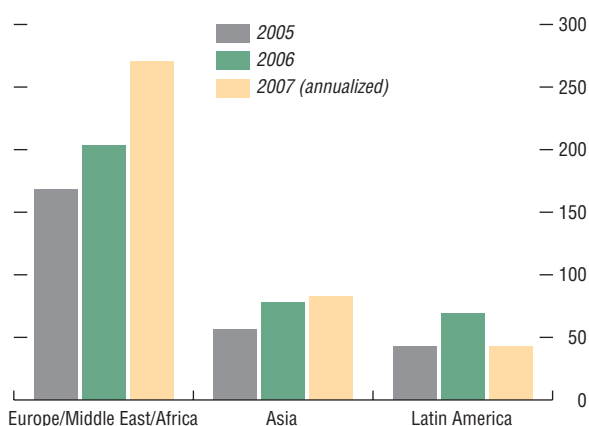
public bond and equity markets (Figure 1.17).<sup>33</sup> In some cases, private placements may allow issuers to avoid the more extensive disclosures required by public listings, since such placements are not subject to the same contractual protection as in public markets. Weaker credits and more first-time issuers—some of which may be inadequately covered by analysts and ratings agencies—are becoming involved in the high-yield debt market. On the demand side, many hedge funds are attracted to the high yield offered by some borrowers, as well as the lack of mark-to-market accounting on such loans, as these private placements have fitted well into the broader trend of hedge funds seeking credit exposure. While such loans have found strong primary market demand, their secondary market liquidity is likely to be very limited in the event of a downturn or when credit difficulties arise.

*In some countries in emerging Europe and central Asia, external funding is supporting rapid domestic credit growth...*

To date, abundant global liquidity has funded rapid credit growth in emerging Europe and central Asia—credit in these regions now absorbs nearly half of all international bank and bond financing. In many cases, banks' growing use of external financing has provided a large proportion of funding for overall credit growth (Figure 1.18). Private sector credit growth has been correlated with foreign funding of local banking systems over the last few years as foreign financing has enabled

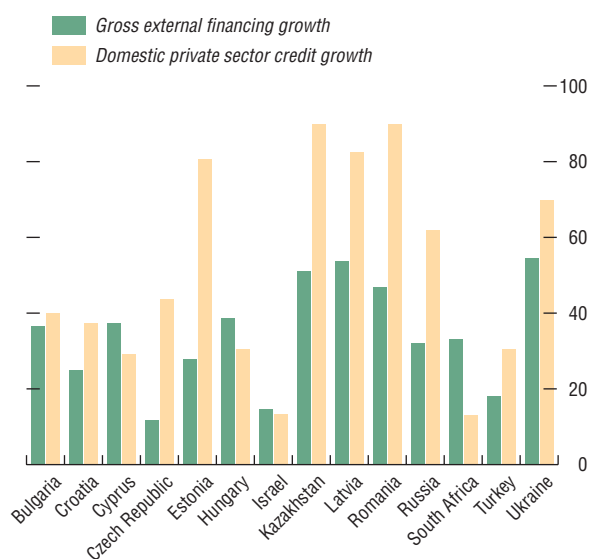
<sup>33</sup>In contrast, corporate borrowing in Latin America has been growing strongly in traditional local equity and debt markets. Large pools of domestic savings, primarily a result of the development of private pension funds, and often with restrictions on foreign asset holdings, encourage corporate issuers to tap the domestic market. At the same time, international investors are reportedly buying up to 80 percent of new initial public offerings in Brazil. International debt issuance tends to be by large multinational corporations, and is both in U.S. dollars and increasingly in domestic currency. There appears to be no significant Latin American corporate borrowing in the low-yielding currencies.

**Figure 1.17. Emerging Market Private Loan Placements**  
(In billions of U.S. dollars)



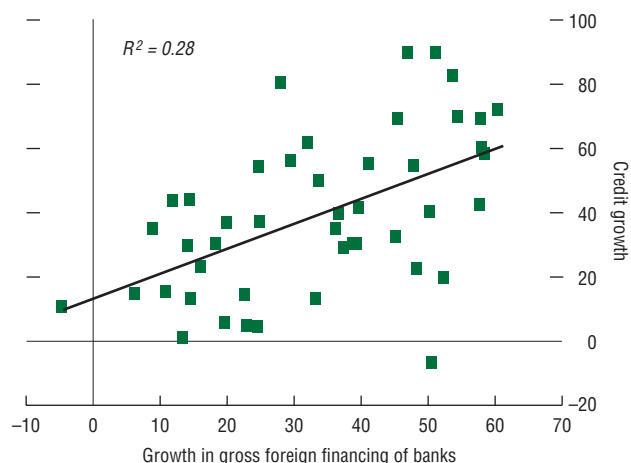
Source: Thomson Financial.

**Figure 1.18. Growth in External Funding of Banks and Private Sector Credit in 2006**  
(In percent)



Sources: Bank for International Settlements; and IMF staff estimates.  
Note: Private sector credit growth converted into U.S. dollars before computing growth rates.

**Figure 1.19. Correlation of Credit Growth with Growth in Foreign Financing of Banks, 2004–06**  
(In percent)



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

banks to increase liabilities more rapidly than the expansion of local deposits would allow (Figure 1.19).

*...but lower-rated banks are at risk if appetite from international investors suddenly declines, potentially raising the systemic risks for some banking systems.*

Bond financing has increasingly gone to banks with low credit ratings and countries where credit is expanding rapidly (Table 1.5), suggesting an adverse selection problem. International banks are often unwilling to lend to such banks through the interbank market owing to the difficulty of assessing their true financial condition, but these same banks can still issue international bonds, though the risk is reflected in wider spreads. Banks that rely predominantly on bond financing are more vulnerable to a sudden drop in demand for bonds—either due to a rise in domestic loan defaults or an increase in global risk aversion—triggering funding difficulties for the banks. The drop-off in capital inflows could, in turn, pose challenges for countries reliant on these inflows to finance large current account deficits. Less at risk are the stronger banking systems in emerging Europe that rely more on relatively stable foreign interbank financing, reflecting better transparency and the funding of foreign bank subsidiaries by their parent.

*Emerging market firms—particularly in Asia—appear to be increasingly engaged in carry-trade-style external borrowing, warranting increased surveillance of such exposures.*

Firms in Asia increasingly have established or extended positions that offer long exposure to foreign currencies (Figure 1.20). Although many countries restrict foreign borrowing by domestic institutions, in some cases firms use loopholes to borrow directly in low-yielding funding currencies or to swap liabilities using cross-currency swaps. For instance, in India, firms with a multinational presence borrow directly in yen, or use cross-currency swaps (as can national firms) to convert foreign exchange exposure. External borrowing by Indian corporations—both nonfinancial and financial—is increasingly in yen and left largely

**Table 1.5. Structure of External Financing and Banking System Soundness and Ownership**  
(In percent)

Country	Share of Bonds in External Bank Financing	Fitch Stand-Alone Bank Soundness Rating	Private Credit Dollarized Growth in 2006
Kazakhstan	62	D	90
Russia	53	D	62
South Africa	47	B	13
Bulgaria	33	D	40
Poland	30	D	...
Hungary	27	D	30
Ukraine	26	D	70
Cyprus	23	D	29
Turkey	22	D	30
Estonia	19	D	81
Czech Republic	16	B	44
Croatia	6	B	37
Slovak Republic	6	D	...
Romania	5	D	90
Latvia	4	C	83

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

Note: Lowest Fitch rating is E; Highest Fitch rating is A.

unhedged.<sup>34</sup> Nevertheless, debt-to-equity ratios are not particularly high, so even though Indian firms may be taking on greater foreign exchange exposure, they remain at low leverage levels. In Korea, yen-linked loans have also reportedly become more common, particularly among small and medium-sized importers (Figure 1.21). The extent of this yen exposure appearing on domestic bank balance sheets is now about \$15 billion—still moderate when scaled to the size of the domestic banking sector.<sup>35</sup> In addition, some borrowing occurs off-balance sheet or through derivatives markets. On balance, it appears that there has been a significant uptick in foreign currency-denominated borrowing in India and Korea, much of which reflects firms seeking nominally cheaper sources of funding than is available in local currency. The authorities in both countries have recently introduced

measures to limit such foreign currency exposure and to slow the buildup in (short-term) external borrowing.<sup>36</sup>

*The search for yield and duration has spurred issuance of synthetic and structured credit products.*

In addition to currency risk, emerging markets have also grown more vulnerable to a rise in volatility. Amid low domestic interest rates, tight credit spreads, and underdeveloped bond markets, some investors are increasingly turning to structured products and hybrid derivatives markets for yield enhancement and duration extension.<sup>37</sup> Losses emanating from such volatility-based strategies will likely be revealed as the environment becomes less benign. The structured products market in Asia totals more than \$100 billion by some estimates, reportedly with Korea and Taiwan Province of

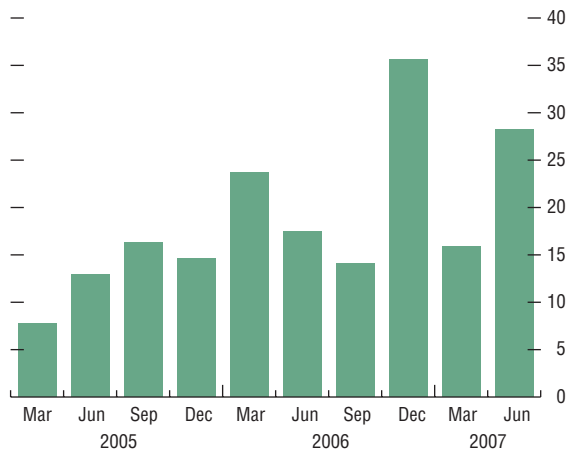
<sup>34</sup>Market intelligence estimates that Indian firms hedge only 50 percent of their exchange rate risk, and that positions are especially exposed to tail risk.

<sup>35</sup>The total gross liabilities of Korean commercial banks amounted to \$888 billion as of March 31, 2007.

<sup>36</sup>See Chapter 3 for a discussion of various approaches to limit the effects of rapid capital inflows.

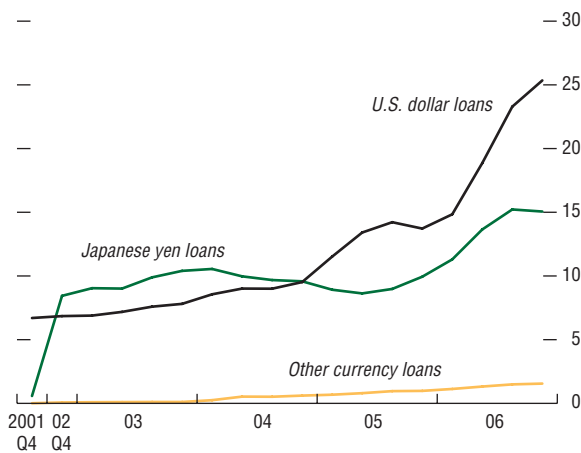
<sup>37</sup>About 60 percent of structured products involve a view on rates, 30 percent are equity-linked, and the remainder are foreign exchange-linked products.

**Figure 1.20. Emerging Asia: Short-Term Foreign-Currency-Denominated Borrowing**  
(In billions of U.S. dollars)



Sources: Bloomberg L.P.; and IMF staff estimates.  
Note: Includes borrowing in Japanese yen, U.S. dollars, euros, or British pounds, with maturities up to 12 months.

**Figure 1.21. Korea: Foreign-Currency-Denominated Loans of Commercial, Special, and Foreign Banks**  
(In billions of U.S. dollars)



Source: Bank of Korea.  
Note: Includes loans of commercial, special, and foreign banks. Data for 2007 are not publicly available.

China having the largest markets.<sup>38</sup> A range of investors—including retail investors—are involved in the market, but Taiwanese insurance companies and, to a lesser extent, Korean companies appear particularly exposed to such structures.<sup>39</sup> Taiwanese insurance companies are subject to asset allocation limits of 5 percent on structured products and 45 percent on foreign currency products, though some market participants have suggested that these requirements can be circumvented. The Taiwanese Financial Supervisory Commission recently increased the ceiling on foreign investment for insurance companies and is considering further liberalization, including lifting allowable overseas investments to 50 percent of total assets and allowing insurers to raise debt as well as more actively manage investment-linked accounts.<sup>40</sup>

In Korea, life insurance companies, banks, pension funds, and retail investors are the largest consumers of structured products, generally demanding yields of 7 percent with a preference for local currency-denominated structures and an average maturity of 10 years. In practice, many of these instruments are callable by the issuing banks, and this limits their yield-enhancing potential. The most popular trades include power spread notes and various types of range accrual

<sup>38</sup>Taiwan Province of China was among the first markets in the region to authorize investment in ABS, including residential mortgage-backed securities, commercial mortgage-backed securities, and collateralized fixed-income products. More recently, Taiwanese investors have turned to more exotic products and are applying greater leverage.

<sup>39</sup>Range accrual instruments are especially popular among Taiwanese life insurance companies that are experiencing a mismatch in duration and depressed profitability. With such products, an enhanced payoff is received if an asset remains within a predetermined range during the life of the note. If the rate moves outside the range, no payout is received through maturity. Such products originated in dollar-denominated markets, but have started to migrate into local currency markets.

<sup>40</sup>There are no official statistics on Taiwanese life insurers' structured product holdings, but the average CDO exposure of two of the top three insurers is reported to be around 2 percent of funds invested.



notes.<sup>41</sup> Domestic insurers and pension funds requiring duration have also sought structures, such as 20-year synthetic bonds.<sup>42</sup> Korean insurance companies have also invested in credit-linked notes based on a basket of Korean credits rather than on single names, as a way to generate a slightly higher yield than single names. Korean investors also tend to buy AAA/AA-rated CDOs (mostly collateralized with U.S. and European debt) with a tenor of seven years or higher. Almost all are managed deals, with most purchases treated as buy-and-hold positions. These investments offer leveraged returns and tend to involve the selling of options to increase yield. Investors in these products are thus exposed to a rise in volatility. In fact, losses may already have occurred, but the lack of mark-to-market accounting may have camouflaged the impact on balance sheets. To the extent that Asian investors are invested in CDOs, they are also exposed to the volatility from ratings downgrades.

### Investment Inflows into Emerging Markets—Do They Destabilize Local Markets?

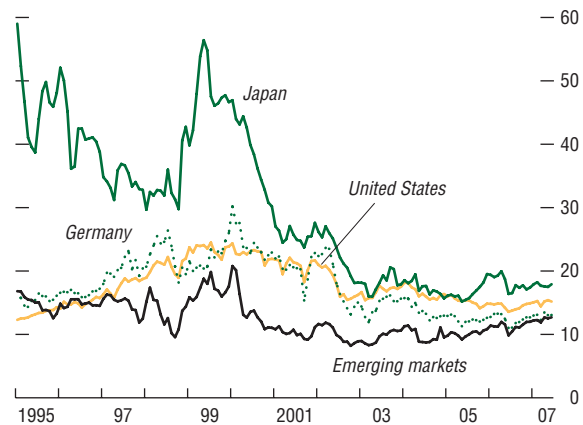
After two years of stellar performance, the average price-to-earnings ratio of emerging market equities is comparable to mature markets, at about 14 (Figure 1.22).<sup>43</sup> Driven in part by carry traders engaging in interest rate arbitrage, emerg-

<sup>41</sup>Power spread structures exploit the arbitrage offered by the abnormal circumstance in which the government yield is higher than the interest rate swap rate. The issuing bank borrows dollars in the offshore market (since there are limits on onshore funding), swaps dollars to won, and uses the won to buy government securities. Such structures average \$50 million to \$100 million per transaction, but are leveraged as much as eight times. Since power spreads involve large purchases of government securities, such products have the effect of flattening the government yield curve (since most structures are 10-year tenors), while dollar borrowing in the offshore market appears to have increased short-term bank borrowing.

<sup>42</sup>The longest duration available on local currency Korean debt is 20 years, but demand tends to outstrip supply, as reflected in frequently oversubscribed auctions.

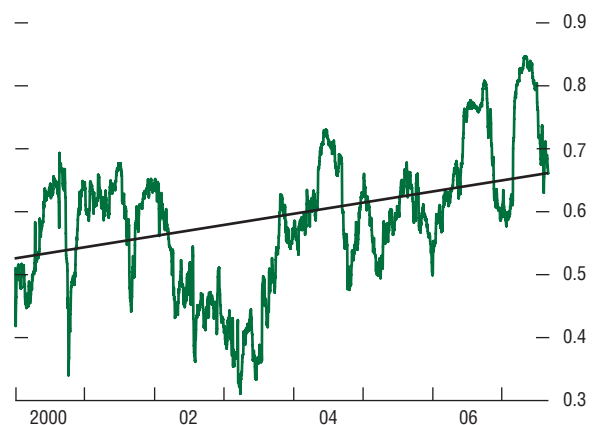
<sup>43</sup>It has been argued that the greater volatility of some such markets may imply a lower long-term price-to-earnings ratio, as prices are lower to compensate for increased risk.

**Figure 1.22. Price/Earnings Ratios**  
(12-months forward)



Source: I/B/E/S.

**Figure 1.23. Correlation of Emerging and Mature Market Equities**  
(90-day rolling window)



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

ing market bond yields have also converged with mature market levels. Not surprisingly, over the same period, correlations between the returns on emerging market assets and other assets have increased (Figure 1.23). The confluence of higher correlation with lower expected returns suggests that some global investors may be inclined to reassess the diversification benefits available from emerging market investments. The corollary is that emerging markets may become more sensitive to global developments as the “cushion” of excess returns is reduced.

Against this backdrop and strong inflows from global investors over the last several years, this section presents preliminary work on the potential for the behavior of foreign institutional and hedge fund investors to destabilize emerging market equities.

A study of high-frequency data on equity flows into emerging markets supplied by the Bank of New York (BONY) points to some useful conclusions about the nature and short-term impact of emerging market inflows.<sup>44</sup> The data largely reflect the activities of institutional investors such as pension funds, mutual funds, and insurance companies, and can therefore be used to study the behavior of some types of foreign flows on prices. This section examines the impact of these foreign flows on local equity price levels, as well as coincident changes in local equity prices and their relation to “herding” across countries within a region by foreign institutional investors. The positions of institutional investors versus leveraged investors during a market correction are then compared.

*Surprisingly, institutional inflows appear to have little impact on equity prices...*

Contrary to what might be expected from reports of foreign investors crowding into small local markets, the measurable effect of foreign inflows on domestic equity price levels is not

readily apparent (Box 1.3). Reinforcing the finding, tests performed on markets grouped by region show little or no indication of the net effect of inflows on prices. One explanation is that local markets may have become deeper and better able to absorb flows over time as domestic investors have increased their trading activity and their role in price determination (see Chapter 3).

*...but there are indications of “imported” volatility.*

At the same time, there is support for the widely held perception that foreign investors are sometimes inclined to herd into individual markets, in some cases switching from one country to another within a specific region. Foreign investors’ position changes are also correlated with higher volatility, a potentially undesirable characteristic for an asset market. Even so, as suggested above, the evidence suggests that foreigners are not feeding local equity bubbles, since they have no appreciable effect on price levels.

*Foreign institutional investors appear to behave differently from hedge funds in times of stress.*

During recent periods of market turbulence in May–June 2006 and February–March 2007, evidence suggests that sales by some foreign investors did have a strong effect on the prices of several types of assets, including equities. The activities of hedge funds, which are sometimes seen as market bellwethers, appear to fall into this category. Leveraged investors, such as hedge funds and bank proprietary desks, often need to operate positions with stops to limit excessive capital losses as a result of the leverage that they employ (see Chapter 2). This tends to force liquidations when prices move sharply down. Indirect evidence of this is found by comparing the behavior of institutional and foreign investors during the May–June 2006 correction. Institutional investors were less likely on average to exit equity market positions than foreign investors were as a whole (Figure 1.24).<sup>45</sup> This

<sup>44</sup>With the proliferation of markets open to foreign inflows and new financial products for investing in those markets, it is difficult to make universal claims about the nature of other inflows.

<sup>45</sup>Figure 1.24 uses data for those emerging market countries that have both BONY and official foreign equity

### Box 1.3. Equity Inflows and Emerging Markets

This box makes use of high-frequency data supplied by the Bank of New York (BONY) on equity flows into 16 major emerging markets over a period of more than five years in order to provide insights into these flows and their effects.<sup>1</sup>

The findings here suggest that the effect of foreign inflows on domestic equity price levels is not statistically apparent. Impulse response functions calculated from panel vector autoregressions employing scaled equity inflows and percentage changes in equity prices as the two endogenous variables show either an insignificantly positive or a zero net cumulative response of prices to inflows for the full panel of 16 emerging markets (see figure).<sup>2</sup> Reinforcing the finding, there is no significant regional variation in the results, with impulse response functions calculated for each of the three main emerging market regions (Asia; Latin America; and Europe, the Middle East, and Africa) also indicating little or no net effect of inflows on prices. That stands in contrast to the findings of the study by Froot, O’Connell, and Seasholes (2001), pointing to a change in investor behavior between the earlier 1990s and the most recent five-year period.

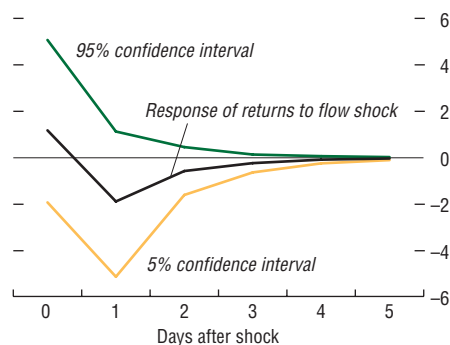
Persistence—a possible sign of herding behavior—is one prominent and readily observable feature of the BONY flows. Variance ratio tests, which are widely used in analysis of financial time series, show clear autocorrela-

Note: The main author of this box is Chris Walker.

<sup>1</sup>Daily data over a period of five years for 16 countries, yielding about 22,000 individual observations. In many cases, the BONY data provide more detail on flows into a given market than is available from public or national sources. Where aggregate daily data on overall foreign net flows into a given market are available, the pattern of the BONY flows broadly matches that of the aggregate foreign inflows, accounting, on average, for about 1 to 5 percent of the flows into the given market. Correlation coefficients are all positive, ranging from 0.05 in the case of Indonesia to 0.38 for Korea. Correlation coefficients range from -1 (full negative correlation) to +1 (full positive correlation).

<sup>2</sup>In the orthogonalization of error terms, the time  $t$  shock to flows is assumed to precede the time  $t$  price shock.

#### Impulse Response of Returns to a One Standard Deviation Increase in Foreign Inflows (Percentage change)



Source: IMF staff estimates.

Note: Panel vector autoregressions are run over 16 emerging market countries (a total of 9,779 observations).

tion in flows at both short and long lags (see table).<sup>3</sup> Moreover, the substantially higher rates of autocorrelation at the longer lags indicate that herding of investors into a given market is a process that takes place over several days, weeks, or even months. This is notably the case for Latin American markets, for which the 20-day variance ratio exceeds seven. Previous studies of flows into emerging markets also identified clear persistence of approximately the same degree as that reported here (Froot, O’Connell, and Seasholes, 2001).

Investors also show some inclination to chase returns. Making use of the same panel vector

<sup>3</sup>In the simplest, single-period lag case the variance ratio statistic  $VR(2)$  is equivalent to  $VR(2) = \text{Var}(r_t + r_{t+1}) / 2\text{Var}(r_t) = (2\text{Var}(r_t) + 2\text{Cov}(r_t, r_{t+1})) / 2\text{Var}(r_t) = 1 + \rho$ , where  $\rho = \sigma_{xy} / \sigma_x^2$  is the coefficient in a first-order autoregression of  $r$ . Note that a  $VR(2)$  statistic greater than 1 indicates persistence/autocorrelation at a single lag. At longer lags (e.g.,  $VR(5)$ ), the statistic is equivalent to summing across autocorrelations at the intermediate lag intervals, and will yield higher values than the  $VR(2)$  statistic if the true underlying process is autoregressive ( $AR(n)$ ) at an order higher than 1.

**Box 1.3 (continued)**

autoregressions used to assess the impact of flows on prices, impulse response functions were calculated to measure the impact of price changes on flows. This impact turned out to be significant and persistent over a period of several days, implying that an unexpected positive movement in equity prices leads to higher-than-average foreign inflows over a period of several days. These results are also similar to those obtained by Froot, O’Connell, and Seasholes (2001).

Volatility tests provide some support for occasional claims by policymakers of a connection between volatile foreign inflows and volatility in domestic markets. The tests performed here, however, using the popular generalized autoregressive conditional heteroscedasticity (GARCH) model, cannot assign a direction of causation. That is, they show a strong, statistically significant, positive correlation between the contemporaneous volatility of flows and that of returns. But they do not, on their own, provide a way of determining where the volatility shock originates, or, indeed, if it originates with a third omitted variable. However, assuming that prices respond more quickly to shocks than do flows (i.e., quantities), an observer might infer that it is volatility in foreign flows that leads to asset price volatility, rather than the converse.

Market reports of investment flows sometimes cite a tendency of foreign investors to shift focus from one emerging market to a neighboring market, as assets become fully valued or economic policies are adjusted. Examples include a shift away from Korean equities in the latter part of 2005, following strong inflows into that market over the previous two years, even as capital

inflows to other Asian nations remained robust. There are also accounts of switching among European, Middle Eastern, and African markets as specific problems arise in individual markets. To test for such activity, variance ratio statistics for entire regions were computed by summing across flows into each of the markets within that region. The results provide some modest evidence of switching behavior within regions, notably in Latin America, where the persistence of flows to the region as a whole exceeds that of flows to the constituent economies. Significantly, the exercise also showed persistence of flows to emerging markets overall as being greater than that of flows to the separate regions.<sup>4</sup>

Contrary to an earlier study, it does not appear that foreign inflows have regularly driven up equity prices in recent years (Froot, O’Connell, and Seasholes, 2001). However, the tests here suggest that equity flows into emerging markets are consistent with a herding pattern, with periods of above-normal inflows persisting for many days at a time. There is also evidence that foreign investors chase returns and switch between markets. In addition, the study finds some evidence of “volatility contagion,” with volatility of inflows reflected in contemporaneous equity price volatility.

A key point is that foreign flows do not necessarily represent a shift in foreign demand in and of itself. For example, an increase in domestic demand could result in foreign outflows (as foreigners sell shares to domestic investors), together with a domestically driven increase in equity prices—the opposite combination to what would be expected if the flows only result from an increase in foreign demand for domestic equities. If, as suggested in Chapter 3, equity

**Relationship of Flow Variance to the Variance of Returns (GARCH model)**

Coefficient	Coefficient Value	Standard Error	T-Statistic
$\beta_2$ (flow variance)	6.12	2.0	3.06
$\alpha$	0.06	0.02	3.25
$\beta_1$	0.90	0.03	26.94

Model:  $\sigma^2_{msci,t} = w + \alpha \varepsilon^2_{t-1} + \beta_1 \sigma^2_{msci,t-1} + \beta_2 \sigma^2_{flow,t}$

<sup>4</sup>In the two-market case, switching should arise only if there is a positive correlation between flows into market 1 at time  $t$  and flows into market 2 at time  $t+1$  that is not fully explained by contemporaneous time  $t$  correlations between the two flow series, after controlling for the autocorrelations of each series. In other words, there must be some tendency of investors to move funds from one market to another within the group.

**Box 1.3 (concluded)**

markets have become deeper and more liquid in recent years, that could explain why the estimated impact from foreign flows to prices has declined or disappeared. Importantly, the Chapter 3 analysis does not apply to short-term equity

price volatility. Regardless of whether foreign or domestic demand becomes more volatile, the model suggests that this volatility is transmitted directly to equity prices, and that this impact is likely to be detectable.

**Persistence in Daily Bank of New York Portfolio Flows: Variance Ratio (VR) Tests, January 2002 to May 2007**

	VR(2)		VR(5)		VR(20)	
	Ratio	Standard error	Ratio	Standard error	Ratio	Standard error
<b>Asia</b>	<b>1.26</b>	<b>0.004</b>	<b>3.75</b>	<b>0.011</b>	<b>5.88</b>	<b>0.032</b>
India	1.20	0.010	3.70	0.024	7.72	0.060
Indonesia	1.32	0.005	3.86	0.013	5.28	0.039
Hong Kong SAR	1.24	0.004	3.60	0.010	5.96	0.029
Korea	1.16	0.005	3.21	0.013	4.18	0.034
Malaysia	1.28	0.004	3.87	0.012	6.76	0.043
Philippines	1.32	0.012	4.13	0.028	6.71	0.059
Singapore	1.20	0.011	3.41	0.023	5.57	0.050
Thailand	1.30	0.022	3.71	0.047	5.70	0.076
Taiwan Province of China	1.23	0.004	3.32	0.010	5.21	0.029
<b>Latin America</b>	<b>1.39</b>	<b>0.021</b>	<b>4.09</b>	<b>0.049</b>	<b>7.16</b>	<b>0.094</b>
Brazil	1.37	0.025	3.92	0.055	6.61	0.106
Mexico	1.22	0.009	3.16	0.021	4.99	0.049
<b>Europe, Middle East and Africa</b>	<b>1.38</b>	<b>0.011</b>	<b>4.07</b>	<b>0.025</b>	<b>6.19</b>	<b>0.061</b>
Turkey	1.38	0.035	4.12	0.075	5.30	0.119
Poland	1.30	0.008	3.63	0.019	5.65	0.051
Hungary	1.15	0.097	2.84	0.189	3.60	0.260
Czech Republic	1.25	0.011	3.54	0.024	5.10	0.066
South Africa	1.32	0.009	4.07	0.022	7.45	0.048
<b>Emerging Markets Total</b>	<b>1.39</b>	<b>0.005</b>	<b>4.29</b>	<b>0.012</b>	<b>7.71</b>	<b>0.038</b>

Source: IMF staff estimates.

Note: Variance ratio test using 1, 4, and 19 lags for VR(2), VR(5), VR(20), respectively. Regional flows are based on the sum of country flows in that region.

is consistent with the often-reported view that institutional investor flows tend to be more sticky than hedge fund flows.

*However, the line between hedge funds and institutional investors is becoming more blurred.*

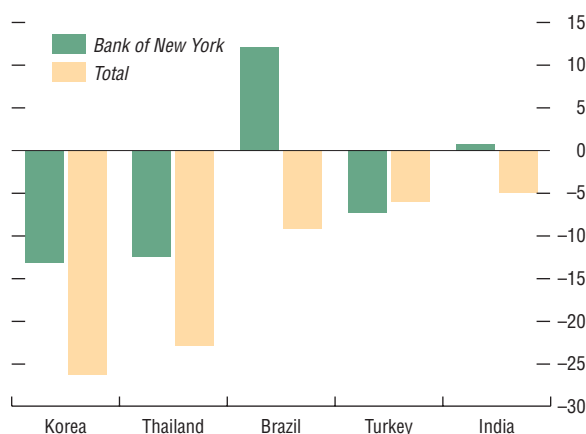
On the one hand, institutional investors are increasingly allowed to invest in derivatives,

such as CDS, and many now have some flexibility within their mandate to sell short. In addition, some institutional investors can also now leverage their positions through structures, such as so-called 130/30 funds.<sup>46</sup> On the other hand, hedge funds have increasingly refocused their investment strategies in emerging markets away from traditional fixed-income investments,

flow data that appear broadly consistent, and where there was a significant outflow of foreign money in the equity market during the May–June 2006 correction.

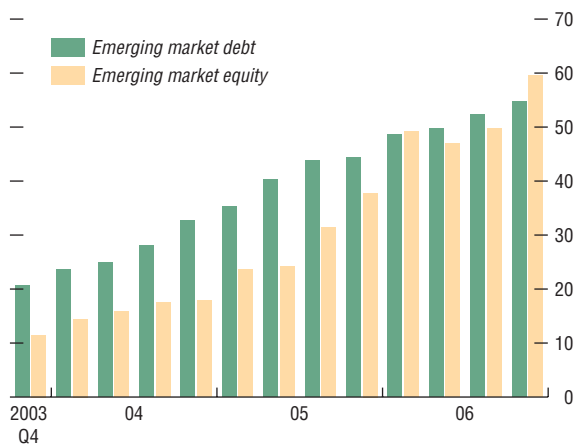
<sup>46</sup>130/30 funds allow a maximum 30 percent short position, the proceeds of which can be used to fund up to a 130 percent long exposure.

**Figure 1.24. Net Flows into Emerging Market Equities, May–June 2006**  
(In percent of prior 4-year cumulative flow)



Sources: Bank of New York; CEIC database; and IMF staff estimates.

**Figure 1.25. Emerging Market Hedge Fund Allocations**  
(In billions of U.S. dollars of assets under management)



Source: Hedgefund.net/II News 2006–2007 Hedge Fund Asset Flows and Trends Report.

seeking other higher-yielding assets—both in equity markets and in structured products. The shift toward emerging market equity from debt is shown in Figure 1.25. Some hedge funds are also seeking seemingly uncorrelated risk by moving into illiquid products, such as more exotic equity markets (e.g., Vietnam, Sri Lanka) and real assets (e.g., private equity, real estate) and are becoming active in providing financing via structured products to local firms that have difficulty in accessing credit markets.<sup>47</sup> Other examples of structured trades include the direct purchase of nonperforming loan portfolios from commercial banks in Latin America. Some hedge funds are operating with much wider tolerance for losses than would be the case with more traditional liquid instruments such as external bonds. These hedge funds have attempted to increase lock-in periods in an effort to reduce redemption risk on investments with longer maturation periods, better matching their asset and liability maturities and mimicking more institutional investor commitments. The commonly used distinction between hedge funds and other leveraged investors, such as proprietary trading desks, and institutional investors is breaking down as a consequence.

*Hedge funds are increasingly setting up in emerging market countries, raising important regulatory questions.*

Onshore hedge funds have grown rapidly in a number of emerging markets, forcing policymakers to confront new financial stability issues. In Brazil, there has been a rapid rise in the assets under management of local hedge funds in the last few years. These funds are regulated both by the securities regulator and by the central bank as “multi-market” mutual funds. Individual investor protection is likely to be a key focus for regulators, as it has been in mature markets that have an established hedge fund sector. At the same time, authorities in a number

<sup>47</sup>Such financing is usually structured to provide some protection to more senior tranches, with the hedge funds purchasing more mezzanine and equity tranches.



of countries are actively planning to change the regulatory structure that onshore hedge funds face as part of plans to develop the financial sector. Asia, in particular, has seen a rapid expansion of the local hedge fund industry (Box 1.4). In response to this expansion, Hong Kong SAR has simplified licensing procedures to encourage hedge funds to set up or relocate to their jurisdiction, while Korea has recently unveiled a road map that envisages allowing onshore hedge funds as of 2012 as part of its plan to transform the country into a financial hub.

## Policy Challenges

*Policymakers need to better detect and understand how risks develop within the modern financial system...*

The turbulence in global credit markets has been rooted in the weakening of credit discipline, a buildup of leverage in segments of the financial system, and investor complacency that had developed during the period of ample liquidity and benign financial conditions. Features of the modern financial landscape make it difficult to detect the location of these risks. When losses materialized, leverage and a lack of transparency in some segments made the impact worse. Structured products have spread those losses, but some market participants were ill equipped to handle the risks they assumed.

Overseers of financial stability need to strengthen their tools to identify such situations and prevent them from recurring. Stronger systems for monitoring and analyzing both the direct and embedded leverage that systemically important financial institutions are using or granting would help to anticipate challenges to financial stability.<sup>48</sup> Also, to reduce the financial transmission of disturbances, it is particularly important to have a degree of diversity in terms

of investor bases, markets, strategies, investment horizons, risk management systems, counterparties, and returns among market participants. Long periods of stability should sensitize regulators and private institutions to the dangers of complacency. The trend toward transferring risks should be a focus, and regulators and those responsible for financial stability could probe further how credit risk transfer techniques may have reshaped stability risks.

In all of this analysis, regulators and supervisors should look at both on- and off-balance-sheet exposures of the institutions they are regulating and evaluate the array of risks that might eventually migrate to these institutions during a time of market strain. If these linkages were known, market discipline could function better, counterparty risk assessments could be improved, and policymakers and central banks would be better prepared.

*...and help sustain market discipline by ensuring that financial intermediaries have adequate risk management capabilities to assess risks associated with complex structured products.*

Many investment products are much more complex than in the past, especially in credit markets. Regulators need to renew efforts to test the capacity of their regulated institutions to manage the risks they are assuming. Regulated financial institutions should thoroughly explore the dynamics and sensitivities of the assets they hold and use as collateral, particularly if they are hard to value and have illiquid secondary markets, being aware of various “tail-risk” scenarios. Supervisors can better audit the risk management systems employed by such institutions to verify that they are appropriately tailored to their individual risks (see Chapter 2).

Supervisors will want to check that counterparty risk is being given high priority. In particular, the relationship between prime brokers and the hedge funds they service should remain in focus. The financial system relies heavily on that relationship working properly to ensure that hedge funds do not borrow to assume

<sup>48</sup>Metrics should include mortgage loan-to-value ratios, buyout debt levels and price multiples, prime brokerage margins and repo haircuts, and embedded leverage and over-collateralization levels in credit derivatives and funding vehicles.

### Box 1.4. The Role of Hedge Funds in Emerging Asia

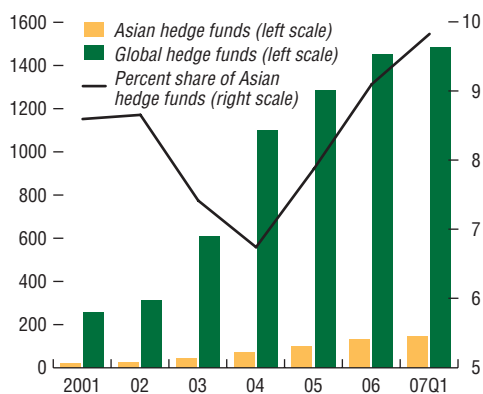
*This box discusses the expansion and key characteristics of hedge funds with investment mandates in emerging Asia.*

Growth in Asia-focused hedge funds has outpaced the rapid expansion of the global hedge fund industry in recent years (see first figure). Assets under management (AUM) of Asian hedge funds—broadly defined as hedge funds with a predominant investment mandate in Asia and/or managers located in Asia—have increased almost sevenfold, from \$22 billion in 2001 to \$146 billion at the end of the first quarter of 2007, compared with a sixfold increase of the global industry to about \$1.5 trillion.<sup>1</sup> Within Asia, the main impetus for growth has come from emerging markets, in part reflecting reinvestments of relatively high returns, while the size of Japan-focused hedge funds has remained broadly stable since 2005. With AUM of some \$100 billion at end-2006, emerging Asia

hedge funds accounted for nearly 60 percent of emerging market funds worldwide.<sup>2</sup>

Yet, the United States and the United Kingdom remain the centers for Asian hedge funds, with Hong Kong SAR the leader inside the region (see second figure). A favorable regulatory environment, ease of cross-border capital transactions, a large human talent pool, and a deep trading infrastructure are all factors helping to explain the locational preferences of hedge funds in Asia.<sup>3</sup>

**Assets Under Management of Asian and Global Hedge Funds**  
(In billions of U.S. dollars)

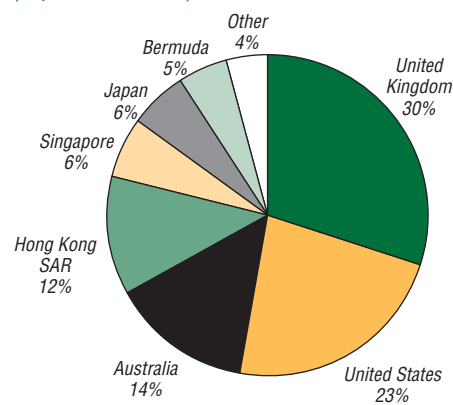


Source: Alternative Investment Management Association.

Note: This box was authored by Olaf Unteroberdoerster.

<sup>1</sup>Following Ryback (2007), hedge funds are understood to be privately organized investment vehicles managed by professionals for a performance-based fee. Hedge funds operate under a flexible mandate in pursuit of alternative investment strategies.

**Asian Hedge Funds: Assets Under Management by Location**  
(In percent; 2007 Q1)



Source: Eurekahedge.

Equities are the focus of most Asian hedge fund strategies and investment allocations (see third figure)—some 60 percent of hedge funds employ long-short equity strategies, a share that has declined only slightly in recent years. This, in part, reflects the dominance of equity trading in Asian capital markets, while bond markets remain fragmented and underdevel-

<sup>2</sup>Laurelli (2007) estimates that emerging market hedge funds totaled \$174.5 billion at end-2006.

<sup>3</sup>According to Baddepudi (2007), somewhat surprisingly, hedge funds based in Asia do not necessarily perform better than those focused on Asia, but based elsewhere.

oped. Regarding leverage, 40 percent of the self-described hedge funds in Hong Kong SAR do not use any leverage, while the majority (85 percent) of other funds report leverage of less than 200 percent of the reported net asset value.<sup>4</sup> AUM of Asian-focused hedge funds only represent a very small fraction of asset markets in Asia, often less than 1 percent in selected markets. Relative to debt securities in emerging Asia, the ratio increases to over 2½ percent, reflecting the slower development of bond markets in the region.

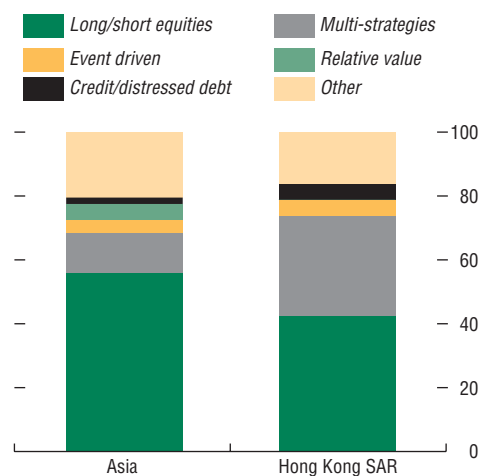
However, one factor that is not easily captured by available data is the capacity of hedge funds to take leveraged positions and employ derivatives. Their active trading also implies a much higher share in market turnover than is suggested by their size alone. In 2006, hedge funds globally were estimated to account for nearly 60 percent of trading volume in credit derivatives, and nearly half of the trading volumes in distressed debt and emerging market debt (Fitch Ratings, 2007b).

In line with global trends, the hedge fund industry is moving away from its traditional role in identifying pricing anomalies and exploiting arbitrage opportunities. Hedge funds are becoming increasingly like merchant banks, offering syndicated loans (Irvine, 2007), asset-backed finance and structured products (such as collateralized debt obligations), or entering “specialty situations” as co-investors with

<sup>4</sup>According to the Hong Kong SAR Securities and Futures Commission, various calculations of leverage were reported, with the more common definition applied being: (long market value + short market value)/net asset value. Still, these figures do not account for the leverage embedded in assets bought by hedge funds.

more risk than is prudent. Parties lending against hard-to-price collateral should verify that adequate mechanisms are in place for limiting the buildup of leverage. The hedge fund deleveraging seen in July and August 2007 brings

### Distribution of Investment Strategies (In percent of number of hedge funds)



Sources: Eurekahedge; and Hong Kong SAR, Securities and Futures Commission.

traditional private equity firms. Asia, Australia, Japan, Singapore, and Hong Kong SAR are the only jurisdictions that offer a legal framework for structured products and hence growth in this area. Amid the abundance of capital flowing into the region, funds’ financial strength continues to grow and their lock-in periods are becoming longer, thereby facilitating the trend into credit derivatives and less liquid markets. Increasingly hedge funds have been able to negotiate directly as capital providers building on their own structuring capability, and thus bypass investment banks. At the same time, mutual funds and other institutional investors are beginning to emulate hedge fund strategies by setting up funds with limited leverage and with performance-based fees.

into question the adequacy of repo collateral requirements. Lenders that applied unusually small haircuts for repo financing in an effort to win business suffered greater losses than those that imposed more traditional levels of haircuts.

Some of the risk is thereby transferred to prime brokers from hedge funds.

*Greater transparency is needed with regard to the links between on- and off-balance-sheet entities.*

Off-balance-sheet entities play a key role in modern finance. They can be a useful tool for managing risks and for ensuring that risk capital is used efficiently. However, the firms themselves and their investors need to be able to see the full range of links between the parent institution and the other entities with which it is involved. Regulators will need to consider the issue of providing greater clarity than at present as regards the links between various investment entities and institutions that sponsor them, benefit from them, provide services to them, or stand to offer support to them under certain circumstances. Banks and regulators alike need to assess the contingent draws on funding channels that can occur and assess the risks that such funding might result ultimately in credit exposure where collateral is hard to price. Consideration might also need to be given to whether capital charges on such standby credit lines are sufficient. The relevant perimeter of risk consolidation for banks may need to be reconsidered, as the usual accounting and legal perimeters appeared to be insufficient to guarantee adequate risk controls.

Although the collapse of a major hedge fund is not likely to pose a systemic threat (unless the failure impairs systemically important institutions), recent developments have shown that confidence can easily be shaken in a situation where losses are unknown and conduits and off-balance-sheet commitments are not transparent. One lesson of this experience, therefore, is the need for greater disclosure of relationships and potential exposures of major banks with SIVs and other conduits to funding difficulties.

*It is especially important to examine short-term funding markets for potential risks from liquidity mismatches.*

The short-term money markets used for wholesale funding, including, in particular, commercial paper and asset-backed commercial paper, play a vital role in the global finan-

cial system, but are often overlooked. Signs of market strains often show up in these markets before they materialize elsewhere, and it is frequently the loss of access to funding that moves an institution from illiquidity to insolvency. The authorities should therefore continue to intensely monitor the functioning of the repo and money markets for any signs of distress and be ready to raise a warning flag when signs of strain emerge. They will also want to verify that systemically important entities operating in the wholesale funding business have adequate controls and practices for assessing collateral.

One dimension of the recent episode of turbulence was the degree to which funding markets have been linked globally, as problems were transmitted and amplified because of, for instance, the extent to which banks in one country/continent required access to short-term offshore markets. This was evident when some banks had difficulty accessing foreign currency swaps to channel liquidity in the currency where liquidity demands had increased. As well, the broad mismatch of liquidity of ABCP conduits and SIVs should be assessed as a source of systemic concern where confidence in such structures became challenged, and where in some cases credit lines served as false insurance (to the vehicle) or as a channel of credit contagion. It was also clear that investors in money market funds were surprised to find the degree to which they were subject to losses on portfolios promising higher returns.

*The need for a differentiated scale of credit ratings has again been made apparent.*

The fallout in the mortgage market has drawn attention to the role of credit ratings agencies in structured credit markets. Less sophisticated investors, who were content to delegate the risk assessment of their positions to the credit ratings agencies, were negatively surprised by the intensity of downgrades. Previous GFSRs have pointed out that structured credit products are likely to suffer more severe, multiple-notch downgrades relative to the typically smoother downgrade paths of corporate bonds (IMF, 2006). The

experience of the past year has underscored the need for further efforts to inform investors of these risks, but better still would be the introduction by ratings agencies of a more differentiated scale for structured credit products. For example, a special rating scale for structured credits could be introduced to highlight to investors that they should expect a higher speed of migration between ratings than on a traditional corporate bond.

On a related point, in the case of structured credit products that reference other structured credit products (e.g., ABS CDOs, ABCP, and “CDO-squareds”), investors should be mindful of the compounding effect of downgrades. Moreover, when ratings agencies are slow to recognize the deterioration of the performance of assets that underlie some structured credit products, investors should be aware that downgrades could be delayed and more severe.

Institutional investors, as buyers of structured credit products, must ensure that their investment mandates do not lead to an over-reliance on agency letter ratings, and that they do not (implicitly) delegate the job of examining complex assets to ratings agencies. Due to their embedded leverage, the prices of CDOs tend to be more volatile than similarly rated corporate bonds, which is reflected in higher spreads on the former. Hence, investors and brokers should delve beneath the published credit ratings to understand the price dynamics of the instruments. They should seek to understand the likely speed and intensity by which the value of the asset can change. Where possible, they should undertake their own analysis to verify their understanding of the main drivers of the value to the asset, and its sensitivity to changes in those variables, including scenario tests for extreme values. Investors should also seek to understand the liquidity of the market for the asset, both in good times and bad, and the likely ease or difficulty they might have in exiting the position. Ideally, investors should use real-time price quotations of the underlying collateral to mark the assets to market.

*At the same time, regulators should seek to strike a balance between protecting consumers and facilitating innovation.*

Although new origination and funding technology appears to have made the financial system more stable for the United States, it has exposed holes in the U.S. consumer protection regulatory framework—and other countries could usefully take note. Policymakers need to tighten lending standards and restrictions on aggressive lending, while preserving a model that successfully disperses exposure to higher-risk mortgages away from the banking system. For example, supervisory agencies have tightened their guidance on appropriate subprime lending practices and how to better oversee mortgage originators that are not under the usual bank supervision umbrella. However, some proposals suggest that banks involved in securitization, and even the holders of mortgage-related securities, should be liable for any “predatory” loans they handle or hold. If potential liability were uncapped, there is a danger that few, if any, subprime loans would be originated or securitized.

*Emerging markets need to ensure that policies support continued resilience should global market conditions remain volatile.*

Policies should take into account that emerging markets with current account deficits financed with short-term capital flows could be particularly vulnerable to rapid shifts in global risk appetite. In addition, those countries that have either engaged in, or been a destination for, carry-trade-related activities may be impacted by adjustments in exchange rates resulting from an unwinding of global carry trades. This would include, for example, countries in emerging Europe where household mortgages have been denominated in Swiss francs. More generally, the repricing of credit will raise the cost of capital to emerging market corporates borrowing externally, creating a drag on growth.

*Emerging markets need to step up surveillance of risks of credit indiscipline and related vulnerabilities.*

The vulnerabilities that may be building as a result of the weakening of credit and market discipline represent an area for attention. In some cases, private sector borrowers in emerging markets are adopting relatively risky strategies to raise financing, often taking exchange rate risk, and thus increasing their exposure to volatility. Capital market financing has supported rapid credit growth, but investors may not be willing in the event of continued turbulence to lend to weaker banks. As well, emerging markets are facing other challenges related to surging capital inflows. Thus, even as the funding liquidity disruptions in mature markets work themselves out, deleveraging and a pullback from risky assets is likely to continue. While these developments may be offset to some degree by high GDP growth and improved macroeconomic policies, authorities in some emerging markets could intensify monitoring and strengthen policies to ensure that risks remain manageable.

*Greater external borrowing by emerging market corporations and exposure to foreign currency risk require increased surveillance, as does the exposure of domestic financial institutions to synthetic and structured products.*

Many emerging market central banks collect information on foreign borrowing by local corporations. However, the growth of cross-currency swap markets and the availability of various means of transforming currency exposure mean that monitoring systems need to be strengthened. Regulators should be proactive in gathering market intelligence that can reveal the underlying scale and motivations for capital flows. In addition, financial engineering that takes credit exposures offshore through various entities may not be fully captured by official data. Financial institutions in countries where local markets are underdeveloped or have low yields have found structured and synthetic instruments alluring. While these instruments have their rightful place under sound asset and liability management practices, users of them need to be aware of risks

should volatility disrupt pricing and returns. Regulators could try to ensure that exposures to interest rate and currency derivatives that embed features that enhance yield are well understood by local investors and borrowers, and that exposures are seen as manageable.

*With numerous two-way channels open to international markets, and the growth of derivative-related transactions, capital controls may be offering less insulation.*

Expectations of exchange rate appreciation can increase short-term debt-related flows into emerging markets. These can complicate policymaking, leading to imbalances in domestic markets and increasing external financing risks. This makes it more difficult for policymakers to set independent paths for interest rates and/or exchange rates. Official restrictions on offshore-onshore trading offer some protection against speculative flows. However, persistent imbalances between onshore and offshore rates tend to encourage circumvention, as has been the case in a number of Asian and Latin American markets. Efforts to strictly enforce barriers have had mixed results (see Chapter 3).

*Addressing structural weaknesses and fragilities in local markets and strengthening the framework for monetary operations are a critical focus.*

Capital inflows can pose significant challenges for policymakers, at times overwhelming foreign exchange and money markets. Market volatility in the short term—some of which is attributable to rapid inflows—can hamper banks' efforts to manage their assets and liabilities, as hedging becomes more difficult. Policymakers need to develop flexible monetary operation frameworks and remove remaining rigidities in money markets to avoid inadvertently inviting speculative inflows.

In sum, recent events have suggested a number of areas requiring the attention of both the public and private sectors. Some initial lessons and possible policy responses are provided above, but there is still much to learn, since events are still unfolding. It will be important for policymakers to weigh the benefits of rapid responses against the longer-term costs (perhaps unintended) that they may entail.



## Annex 1.1. The Global Financial Stability Map

This annex outlines the indicators selected for each of the broad risks and conditions in the global financial stability map. 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 level of each indicator relative to its history to guide our assessment of current conditions, relative both to the April 2007 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. The stability map remains a work in progress and will be developed further in future GFSRs. As the concepts underlying the risks and conditions are refined, alternative indicators that represent them more effectively could replace some of those discussed below.<sup>49</sup>

Table 1.6 shows how each indicator has changed since the April 2007 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 1.26).* To capture movements in general monetary conditions in mature markets, we begin by examining the cost of central bank 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

<sup>49</sup>Bell and Dattels (forthcoming) provides a fuller discussion of the concepts and construction of the global financial stability map.

**Table 1.6. Changes in Risks and Conditions Since the April 2007 *Global Financial Stability Report***

Conditions and Risks	Change since April 2007 GFSR
<b>Monetary and Financial Conditions</b>	↓
• G-7 average real short rate	↓
• G-3 excess liquidity	↑
• Financial conditions index	↓
• Growth in official reserves	↑
<b>Risk Appetite</b>	↓↓
• Investor survey of risk appetite	↓
• State Street investor confidence	↑
• Flows into emerging market bond and equity funds	↓
• Risk aversion index	↓
<b>Macroeconomic Risks</b>	↑
• <i>World Economic Outlook</i> global growth risks	↑
• G-3 confidence indices	↔
• Economic surprise index	↓
<b>Emerging Market Risks</b>	↔
• Fundamental EMBIG spread	↔
• Sovereign ratings upgrades/downgrades	↔
• Private sector credit growth	↑
• Inflation volatility	↔
<b>Credit Risks</b>	↑↑↑
• Global high-yield index spread	↑
• Credit quality composition of high-yield index	↑
• Speculative default rate forecast	↑
• LCFI portfolio default probability	↑
<b>Market and Liquidity Risks</b>	↑↑
• Hedge fund estimated leverage	↓
• Speculative positions in futures markets	↑
• Common component of asset returns	↑
• World implied equity risk premia	↔
• Composite volatility measure	↑
• Financial market liquidity index	↑

Note: Changes are defined for each risk/condition such that ↑ signifies more risk or easier conditions and ↓ signifies the converse. ↔ indicates no appreciable change. EMBIG = Emerging Markets Bond Index Global; LCFI = large complex financial institutions.

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 exchange rates, interest rates, credit spreads, and asset market returns.

Rapid increases in official reserves held by the central bank create central bank liquidity in the domestic currency and in global markets. In recent years, the investment of a large share of these reserves into U.S. treasuries and agencies has contributed to the low yields in global fixed-income markets. To measure this, we look at the growth of official international reserves held at the Federal Reserve.

### 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 1.27).* We aim to measure the extent to which investors are actively taking on more risk. A direct approach to this exploits survey data that explicitly seek to determine the risk-taking behavior of major institutional investors. The Merrill Lynch Investor Survey asks more than 300 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, on the basis that an increase in such positions signals an increased willingness of institutional investors, relative to individual domestic investors, to take on risk. The State Street Investor Confidence Index uses changes in investor holdings of equities relative to safer assets to measure risk appetite, covering portfolios with around 15 percent of the world's tradable assets. In addition, we take account of flows into emerging market equity and bond 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. By comparing returns between treasury bills and equities, the model allows the level of risk aversion to move over time. Taken together, these

measures cover various aspects of risk-taking and 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 1.28).* Our principal assessment of the macroeconomic risks is based on the analysis contained in the *World Economic Outlook* and is consistent with the overall conclusion reached in that report on the outlook for, and risks associated with, global growth. We complement that analysis by examining measures that focus on movements in confidence about the overall economic outlook. First, we look at the GDP-weighted sum of confidence indices across the major mature markets to determine whether business and consumers are optimistic or pessimistic about the economic outlook. Second, we examine an index of economic activity surprises. This index shows whether data releases are consistently surprising financial markets on the upside or downside to capture the extent to which informed participants are likely to have to revise their outlook for economic growth in light of realized outcomes.

### Emerging Market Risks

*Underlying fundamentals in emerging markets and vulnerabilities to external risks (Figure 1.29).* These risks are conceptually separate, though closely linked to macroeconomic risks, as they focus on emerging markets only as opposed to the global environment. Using the model of emerging market sovereign spreads presented in previous GFSRs, we can identify the movement in Emerging Markets Bond Index Global (EMBIG) spreads accounted for by changes in the fundamentals of emerging market countries as opposed to the spread changes resulting from external factors. These fundamental factors account for changes in economic, political, and financial risks within the country. This is then complemented by examining the trend in sovereign rating actions of Standard & Poor's and

Moody's. Such a measure attempts to capture improvements in both the macroeconomic environment facing such economies and progress in reducing vulnerabilities arising from external financing needs. We also want to measure fundamental conditions in emerging market countries that are separate from those related to sovereign debt, particularly given the reduced need for such financing across many emerging market countries. Consequently, we examine the growth in private sector credit across emerging market countries. Rapid rates of credit growth have the potential to lead to financial sector and household vulnerabilities and upward inflationary pressures. Finally, we examine the volatility of inflation rates across emerging markets to capture the extent to which domestic monetary policies are successfully controlling inflation.

### Credit Risks

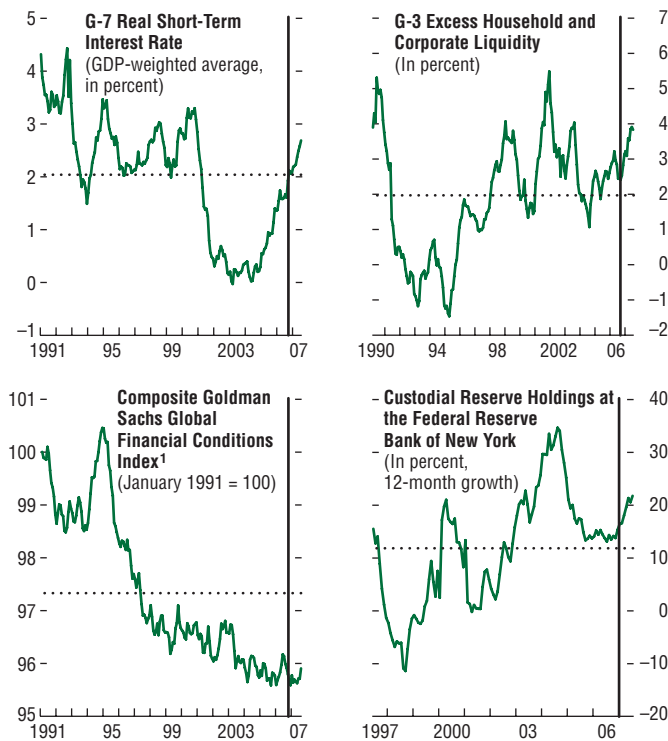
*Changes in and perceptions of credit quality that have the potential to create losses resulting in stress in systemically important financial institutions (Figure 1.30).* Spreads on a global high-yield index provide a market price-based measure of investors' assessments of corporate credit risk. We recognize, however, that such an assessment forms only part of the pricing of such assets, and that prices can deviate from fundamental valuation over extended periods of time. Consequently, we also focus on more direct measures of credit quality. To do this, we examine the credit quality composition of the high-yield index to identify whether it is increasingly made up of higher or lower quality issues. To be precise, we report the percentage of the index comprised of CCC or lower rated issues. This captures two distinct effects: first, a change in the ratings of corporate issues already in the index, and second, differences in the quality of new issues that are entering the index compared with the current constituents. Both are important in measuring the overall level of credit quality. We also examine forecasts of the global speculative default rate produced by Moody's. While forecast default rates depend

on the robustness of the underlying econometric model, they at least conceptually present a forward-looking measure of defaults as opposed to the traditional trailing-realized default rates. Finally, we use the credit risk indicator for LCFIs to highlight market perceptions of systemic default risk in the financial sector, given our remit of focusing on financial stability.

### Market and Liquidity Risks

*The potential for instability in pricing risks that could result in broader spillovers and/or mark-to-market losses (Figure 1.31).* An indicator attempting to capture the extent of market sensitivity of hedge fund returns provides a market risk indicator for this important trading group. We also produce a speculative positions index, constructed from the noncommercial average absolute net positions relative to open interest across a range of futures contracts covering most asset classes as reported to the Commodity Futures Trading Commission. This measure will rise when speculators are taking large positional bets on futures markets relative to commercial traders. Next, we estimate the proportion of return variance across a range of asset classes that can be explained by a common factor. Higher correlations across asset classes tend to increase the risks of a more disorderly correction of market prices in the face of a shock. We also look at 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 returns and so increase potential market risks. We also look at a measure of implied volatility across a range of assets to assess the extent of market concern over risk, though it may also indicate the extent to which markets are too complacent about those risks. Finally, we attempt to capture funding, secondary market trading, and perceptions of counterparty risks in core markets. To measure this aspect, we examine the spread between major mature market government securities yields and interbank rates, bid-ask spreads on major mature market currencies, and daily return-to-volume ratios of equity markets.

**Figure 1.26. Global Financial Stability Map: Monetary and Financial Conditions**

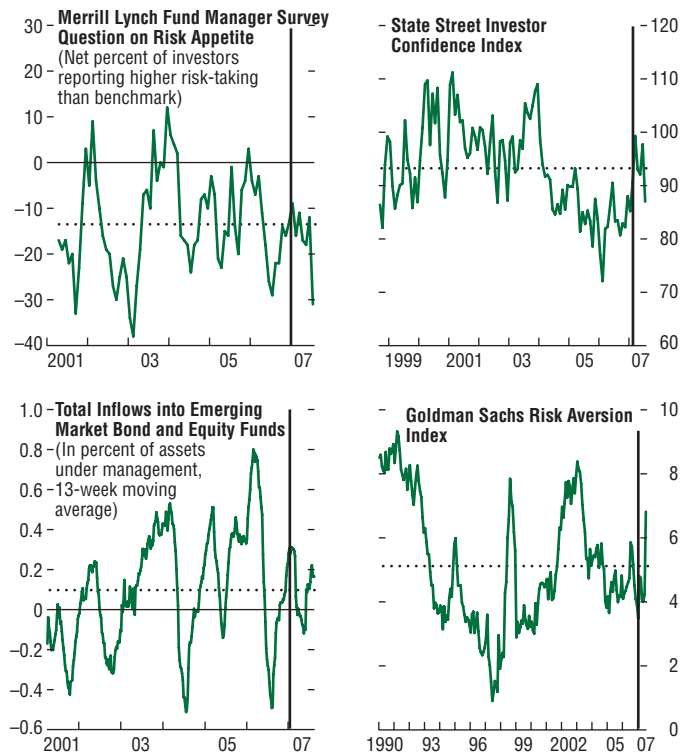


Sources: Bloomberg L.P.; Goldman Sachs; OECD; and IMF staff estimates.

Note: Dashed lines are period averages. Vertical lines represent data as of the April 2007 GFSR.

<sup>1</sup>A GDP-weighted average of China, the euro area, Japan, and United States. Each country index represents a weighted average of 3-month LIBOR (35% weight), the 10-year swap rate plus the 10-year credit default swap or CDX (55%), the Goldman Sachs nominal trade-weighted dollar index (5%), and the S&P 500 stock price index (5%). Prior to October 2003, the Moody's A-rated corporate bond index is used for corporate bond yields.

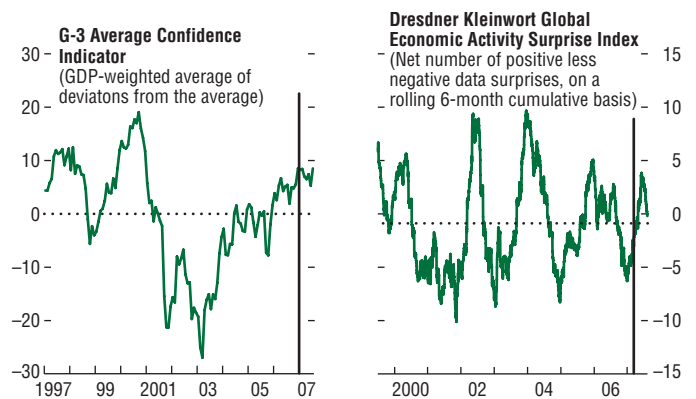
**Figure 1.27. Global Financial Stability Map: Risk Appetite**



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 2007 GFSR.

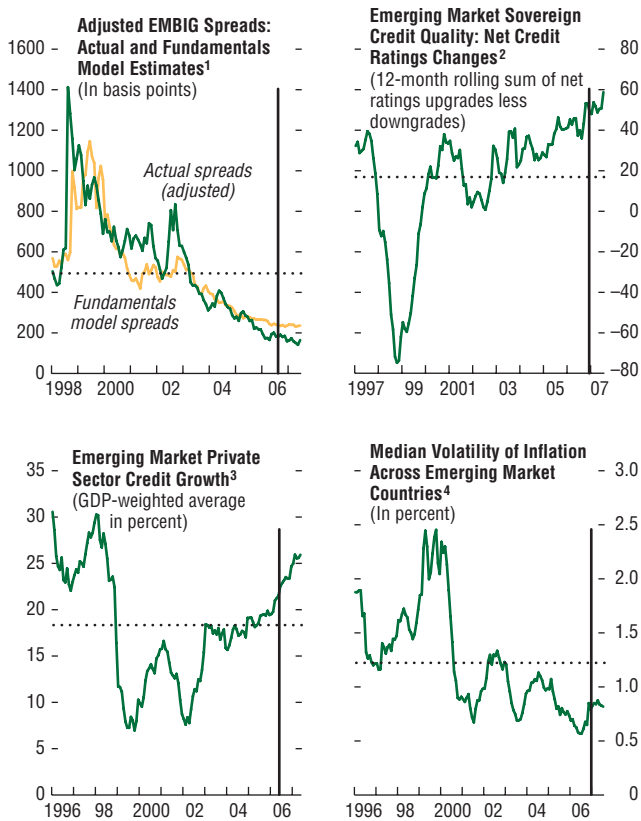
**Figure 1.28. Global Financial Stability Map: Macroeconomic Risks**



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

Note: Dashed lines are period averages. Vertical lines represent data as of the April 2007 GFSR.

**Figure 1.29. Global Financial Stability Map: Emerging Market Risks**



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

Note: Dashed lines are period averages. Vertical lines represent data as of the April 2007 GFSR.

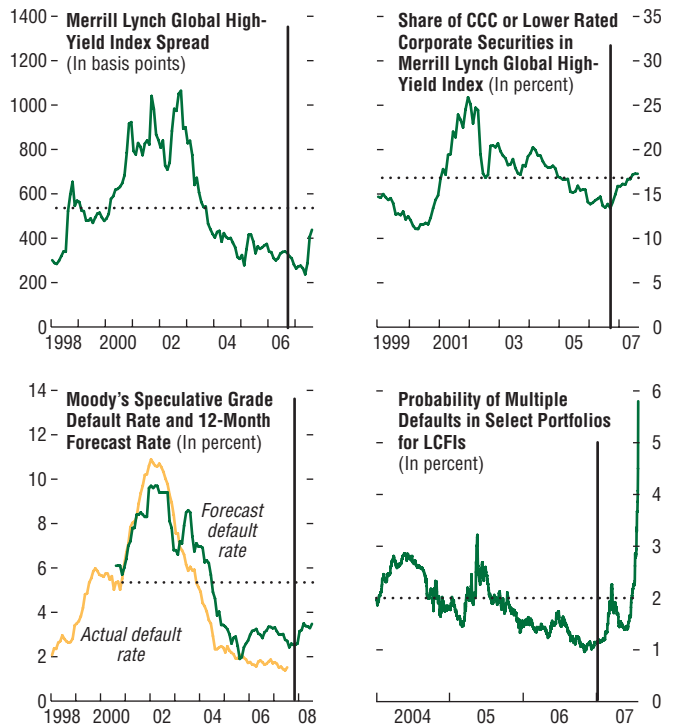
<sup>1</sup>EMBIG = Emerging Markets Bond Index Global. The model and its output exclude Argentina because of breaks in the data series related to debt restructuring. Owing to short data series, the model also excludes Indonesia and several smaller countries. The analysis thus includes 32 countries.

<sup>2</sup>Net actions of upgrades (+1 for each notch), downgrades (-1 for each notch), changes in outlooks (+/- 0.25), reviews and creditwatches (+/- 0.5).

<sup>3</sup>Using data of 44 countries.

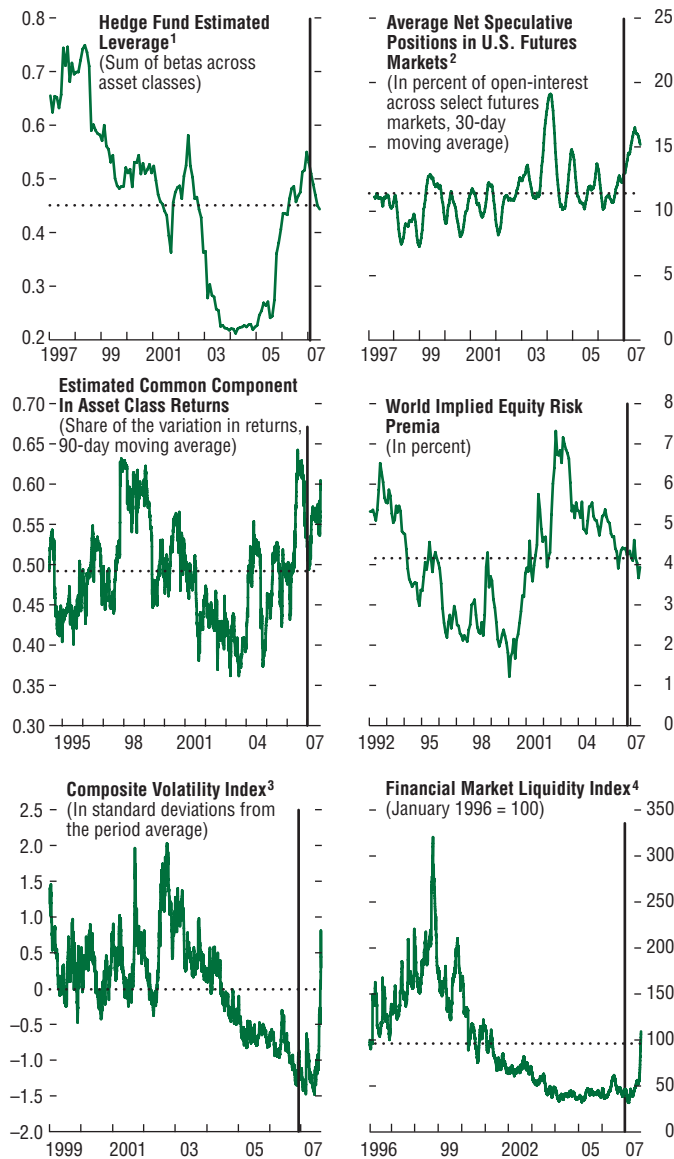
<sup>4</sup>Average of 12-month rolling standard deviations of consumer price changes in 25 emerging markets.

**Figure 1.30. Global Financial Stability Map: Credit Risks**



Sources: Bloomberg L.P.; Merrill Lynch; Moody's; and IMF staff estimates.  
Note: Dashed lines are period averages. Vertical lines represent data as of the April 2007 GFSR. LCFIs = large complex financial institutions.

**Figure 1.31. Global Financial Stability Map: Market and Liquidity Risks**



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

Note: Dashed lines are period averages. Vertical lines represent data as of the April 2007 GFSR.

<sup>1</sup>36-month rolling regressions of hedge fund performance versus real asset returns.

<sup>2</sup>Data represent the absolute value of the net positions taken by noncommercial traders in 17 select U.S. futures markets. High values are indicative of heavy speculative positioning across markets, either net-long or net-short.

<sup>3</sup>Data represent 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.

<sup>4</sup>The index is calculated combining the spread between government securities yields and interbank rates, currency bid-ask spreads, and daily return-to-volume ratios of equity markets. A higher value indicates tighter market liquidity conditions.



## Annex 1.2. Sovereign Wealth Funds

*Note: This annex was prepared by a Monetary and Capital Markets Department staff team led by Udaibir S. Das, with inputs from the Fiscal Affairs and Statistics Departments.*

Tentative estimates of foreign assets held by sovereigns include \$5.6 trillion of international reserves and between \$1.9 trillion and \$2.9 trillion in types of sovereign wealth fund (SWF) arrangements. These amount to about 10 times less than the assets under management of mature market institutional investors (\$53 trillion) and modestly higher than those managed by hedge funds (\$1 trillion to \$1.5 trillion) (Financial Stability Forum, 2007). Current IMF projections are that sovereigns (predominantly emerging markets) will continue to accumulate international assets at the rate of \$800 billion to \$900 billion per year, which could bring the aggregate foreign assets under sovereign management to about \$12 trillion by 2012. Against the backdrop of this expected growth, this annex provides a taxonomy of SWFs, discusses their asset allocation frameworks, and highlights some operational issues.

### Overview

The growth of SWF-type institutional arrangements can be seen as a policy response to the strong accumulation of foreign assets by the official sector. However, SWFs are not new, especially in countries rich in natural resources (e.g., oil). SWFs have recently gained prominence in several (non-oil) emerging markets and commodity-based developing countries, reflecting large balance of payments surpluses.

Large current account surpluses and capital inflows have prompted an ongoing debate on sovereigns' underlying policies and possible adjustments, such as the appropriate level of exchange rate flexibility, the "optimal" level of reserves, and the potential allocation of foreign assets to SWFs.

The growth in sovereign assets is turning the official sector into an active investor group.<sup>50</sup> Sovereigns' cross-border asset allocation choices are assuming importance in the context of prudent management of public financial assets. The recent literature on SWFs has focused on (1) issues of transparency in the external and government accounts; (2) different objectives of the funds, and approaches toward risk and longer-term investment horizons; and (3) the emphasis on "return" rather than "liquidity" for balance of payment needs. In particular, questions remain as to the potential impact of countries' asset allocations and strategic investments on international capital movements and asset prices.

### Sovereign Wealth Funds: One Type or Several?

The reporting of sovereign financial assets has focused thus far on the appropriate methodological treatment of reserve assets (Box 1.5). Although there is no universally agreed-upon definition, SWFs can generally be defined as special investment funds created or owned by governments to hold foreign assets for long-term purposes. SWFs can be classified according to at least two criteria: (1) the sources of sovereign wealth, and (2) their policy objectives (Table 1.7).

#### *Sources of Sovereign Wealth Funds*

The funding of SWFs comes from different sources, which can be combined. Some funds are byproducts of fiscal budget surpluses accumulated due to a combination of revenues from exports and spending restraint. Fiscal surpluses and public savings generated domestically, such as privatization receipts, can also be sources for SWFs, as can large balance of payment surpluses, with or without a corresponding budget surplus.<sup>51</sup>

<sup>50</sup>See Chapter 2 of the April 2007 GFSR (IMF, 2007a).

<sup>51</sup>SWFs from public savings and privatization are more akin to nonrenewable resource funds, as they represent an increase in net financial wealth.

### Box 1.5. Sovereign Wealth Funds: A Statistical Perspective

*Statistical and data issues raised by the use of sovereign wealth funds (SWFs) are currently being studied by the International Monetary Fund. This box provides some information about these issues.*

The draft sixth edition of the *Balance of Payments and International Investment Position Manual (BPM6)* includes a methodology for determining whether foreign assets held in SWFs should be included in reserve assets. To be included in reserves, the foreign assets of the SWF need to be readily available to the monetary authorities and be a liquid claim in foreign currency on nonresidents.

A specific issue for SWFs is whether there is some legal or administrative guidance that results in the assets being encumbered in a way that precludes their ready availability to the monetary authorities. If the SWF's external assets are on

the books of the central bank or an agency of the central government that exercises control over the disposition of funds, then the presumption is that the assets are international reserves, provided all other criteria for being a reserve asset are met, particularly liquidity (*BPM6*). If, however, the funds are held in a long-term fund separately incorporated, the presumption is that they should not be included in reserves. But any final determination of whether an asset can be classified as a reserve asset depends upon close examination of the circumstances.

Assets held in a resident SWF that are claims on nonresidents but do not meet the criteria to be classified as reserve assets are classified in the financial accounts (transactions) and international investment position under the appropriate instrument and functional category.

### A Taxonomy Based on Policy Objectives

The following types of funds can be distinguished, based on their dominant objectives:

- *Stabilization funds* are set up by countries rich in natural resources to insulate the budget and economy from volatile commodity prices (usually oil). The funds build up assets during the years of ample fiscal revenues to prepare for leaner years.
- *Savings funds* are intended to share wealth across generations. For countries rich in natural resources, savings funds transfer non-renewable assets into a diversified portfolio of international financial assets to provide for future generations, or other long-term objectives (IMF, 2007c).<sup>52</sup>
- *Reserve investment corporations* are funds established as a separate entity either to reduce the negative cost-of-carry of holding reserves or to pursue investment policies with higher

returns. Often, the assets in such arrangements are still counted as reserves.

- *Development funds* allocate resources for funding priority socioeconomic projects, such as infrastructure.
- *Pension reserve funds* have identified pension and/or contingent-type liabilities on the government's balance sheet.<sup>53</sup>

Additional objectives include enhancing transparency in the management of revenues from (commodity) exports and fiscal policy. In practice, SWFs typically have multiple or gradually changing objectives. For example, some countries set up funds for both stabilization and savings objectives. As circumstances change, the objectives of the funds may also change. This is especially true for countries that export natural resources. Initially, a stabilization fund is established to smooth fiscal revenue or sterilize foreign currency inflows. As the assets

<sup>52</sup>See IMF (2007c). While newer oil funds predominantly focus on stabilization objectives, the recent increase in oil prices has added emphasis to savings objectives, and in some cases, enhanced asset management.

<sup>53</sup>To some extent, development funds and even pension reserve funds can be considered as subsets of SWFs that are (explicitly or implicitly) linked to long-term fiscal commitments.

in the fund continue to grow beyond the level needed for the purpose of stabilization, country authorities may revisit the objectives and redesign the structure of the fund to broaden the objective. This often leads to assets being split into several tranches for different objectives, or to the creation of separate funds with different objectives.<sup>54</sup>

### Sovereign Wealth Funds and Strategic Asset Management

Two major considerations usually guide the allocation and distribution of SWF assets. The first is the accumulation and withdrawal rules regarding the fund's future cash flows where applicable. The second is the fund's objectives. Together, these considerations drive the strategic asset allocation (SAA), which reflects the return objective, risk tolerance, and identified constraints (such as liquidity and financing needs, investment horizon, and legal and regulatory requirements).

SWFs may hold assets with negative correlation to the country's major exports (e.g., oil) or offset the price risk of future imports (depending on the country's risk profile) via its SAA decisions. Funds without identified liabilities allow for a more exclusive focus on a return objective and acceptable level of risk. However, for some SWFs, sterilization instruments used to mop up excess liquidity may need to be considered as liabilities, especially from an integrated asset and liability management perspective.<sup>55</sup> The objectives of SWFs could be undermined

<sup>54</sup>The institutional arrangements for managing these different types of arrangements are broadly of three categories. The first two pertain to those managed by the central bank and/or an independent agency. A third category of SWFs consist of those funds already established that acquire the modality of "tiers of accounts," that is, separate funds for different purposes. In some instances, the central bank transfers funds to the SWF, while in other cases funds are transferred to the central bank for management purposes.

<sup>55</sup>Returns on the SWFs are therefore net of interest payments to the holders of the sterilization instruments. At the same time, the currency mismatch, often resulting from issuing domestic currency liabilities, would need

by the accumulation of liabilities elsewhere in the public sector.<sup>56</sup> Some funds, such as pension reserve funds, may have identified liabilities to be matched within the SAA framework to allow for a clear operational framework and transparent objectives.

SWFs' allocations of sovereign reserve assets to domestic investments have macroeconomic implications, especially for developing and emerging market economies. To invest domestically, SWFs would typically need to convert part of their accumulated assets back into domestic currency, possibly reversing the economic policies that led to reserve accumulation. Investing domestically could stimulate domestic demand with inflationary consequences. Issues of fiscal accounting, transparency, and risk could also emerge if those investments are actually government spending operations that should take place within the budget. Therefore, domestic investments are generally seen to be ruled out in SWFs.

Different types of SWFs could have markedly different SAAs reflective of their different objectives and constraints. Stabilization funds, for instance, are generally conservative in their SAA, using shorter investment horizons and low risk-return profiles, or other instruments (perhaps longer-term) that vary inversely with the risk the fund is meant to cover. Typically, such funds are designed to insulate the budget from terms-of-trade shocks and to meet contingent financing requirements. In this regard, they are akin to reserves, which are managed for safety and liquidity, and it is only after such considerations are satisfied that higher risk/return objectives are set.

SWFs with long-term objectives, such as savings funds, may be better able to accommodate short-term volatility in asset returns. Nonetheless, savings funds and pension reserve

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to be taken into consideration when setting the SWF's investment strategy.

<sup>56</sup>Accumulating assets in an SWF may not affect the net wealth of the public sector if, for instance, the fund is being financed by issuance of public debt.

**Table 1.7. Size and Structure of Major Sovereign Wealth Funds**

Country	Fund Name	Assets	Source of Funds	Ownership and Investment Management	Investment Strategy and Strategic Asset Allocation (SAA)
United Arab Emirates	Abu Dhabi Investment Authority (ADIA)/ Abu Dhabi Investment Council (ADIC)	\$250 billion to \$875 billion <sup>1</sup>	Oil	Owned by the emirate of Abu Dhabi, ADIA has been the primary conduit for investing oil surpluses in overseas assets since 1976. Recently a separate legal entity, the ADIC, was established to encourage competition with the ADIA. Abu Dhabi's surpluses will now be allocated to both the ADIA and ADIC.	Major global investor. Investment strategy and asset allocation is unknown.
Norway	Government Pension Fund—Global	\$308 billion (as of March 31, 2007)	Oil	Owned by the government and managed by Norges Bank Investment Management.	Global asset allocation with 40 percent in equities and 60 percent in global fixed income.
Saudi Arabia	No designated name	\$250+ billion <sup>2</sup>	Oil	Saudi Arabia Monetary Agency manages the foreign assets: \$225 billion is held on its own balance sheet, a portion of which is designated as reserves, and \$51 billion is managed on behalf of various government agencies.	Major global investor. Although the size of assets is known, the investment strategy and SAA is not known beyond broad indications.
Kuwait	Kuwait Investment Authority (KIA)  General Reserve Fund (GRF) and Future Generations Fund (FGF)	\$160 billion to \$250 billion <sup>1</sup>	Oil	The KIA is an autonomous government body responsible for the management of the GRF and FGF, as well as any other funds entrusted to it on behalf of the government of Kuwait.	The GRF is invested in the local, Arab, and international financial markets. The FGF has a global asset allocation based on investment guidelines approved by the FGF board.
Singapore	Government Investment Corporation (GIC)  Temasek Holdings	\$100+ billion  \$100+ billion	Other  Other	Separate investment corporation established in 1981, fully owned by the government.  Temasek Holdings is a private company, set up in 1974 to hold and manage investment previously held by the principal shareholder, the Ministry of Finance.	Global asset allocation (not made public). Invests in all major asset classes.  SAA weights unknown. Geographical distribution as of March 2006 was 38 percent Singapore assets, 40 percent in rest of Asia, 20 percent in the Organization for Economic Cooperation and Development, and 2 percent in "other" countries.
China	State Foreign Exchange Investment Corporation <sup>3</sup>	\$200 billion	Other	To be determined.	To be determined.
Russia	Oil Stabilization Fund <sup>4</sup>	\$127 billion (as of August 1, 2007)	Oil	Owned by the government and managed by the Russian Central Bank.	Invests largely in fixed-income assets, with 44 percent in U.S. dollars, 46 percent in euros, and 10 percent in pound sterling.

**Table 1.7 (concluded)**

Australia	Australian Future Fund	\$42 billion (as of May 1, 2007)	Other	Established in 2006. Owned by the government and managed by the Future Fund Management Agency. The aim is to underwrite the government's future superannuation liabilities.	Australia
United States (Alaska)	Alaska Permanent Reserve Fund	\$35 billion (as of June 30, 2007)	Oil and minerals	Owned by the state of Alaska, established in 1976, and managed by the state-owned Alaska Permanent Fund Corporation.	SAA consists of 53 percent equities, 29 percent fixed income, 10 percent real estate, and 8 percent alternative assets.
Brunei	Brunei Investment Authority General Reserve Fund <sup>1</sup>	\$30 billion	Oil	Owned by the government and managed by the Brunei Investment Agency.	Invests in a large global portfolio of financial and real assets. SAA not made public.
Korea	Korea Investment Corporation	\$20 billion	Other	Launched in 2005 to manage \$20 billion of entrusted foreign exchange reserves, of which \$17 billion is from Bank of Korea and \$3 billion from the government.	Plans to invest in a global asset allocation. SAA not yet available.
Canada	Alberta Heritage Savings Trust Fund	\$15 billion (as of March 31, 2007)	Oil	Owned by the government of the Province of Alberta, managed by Alberta Finance.	Invests in a global SAA with 30 percent fixed income, 45 percent equities, 10 percent real estate, and 15 percent alternative assets.
Chile	Economic and Social Stabilization Fund	\$9.83 billion (as of July 31, 2007)	Copper	Established in 2006. Owned by the government and managed by the Central Bank of Chile as a fiscal agent.	SAA consists of 72 percent government bonds and 28 percent money market instruments in U.S. dollars, euros, and yen.
	Pension Reserve Fund	\$1.37 billion (as of July 31, 2007)	Copper	Established in 2006. Owned by the government and managed by the Central Bank of Chile as a fiscal agent.	SAA consists of 79 percent government bonds and 21 percent money market instruments in U.S. dollars, euros, and yen.
Botswana	Pula Fund <sup>2</sup>	\$5+ billion	Diamonds	Owned jointly by the government and the Bank of Botswana. The government's share of the Pula Fund is accounted for on the balance sheet of the Bank of Botswana.	The fund invests in public equity and fixed-income instruments in industrialized economies. The fund does not invest in emerging markets, as they may be highly dependent on commodities.

Sources: Public information from websites; IMF; and Morgan Stanley Research.

Note: Other countries with known sovereign wealth funds include Azerbaijan, Kingdom of Bahrain, Chad, Ecuador, Equatorial Guinea, Gabon, Islamic Republic of Iran, Ireland, Kazakhstan, Kiribati, Libya, Malaysia, Mauritania, Mexico, Oman, Qatar, Sudan, Taiwan Province of China, Timor-Leste, Trinidad and Tobago, Uganda, and Venezuela.

<sup>1</sup>Estimates by Morgan Stanley Research and PIMCO.

<sup>2</sup>In some countries, such as Saudi Arabia and Botswana, there is no formal sovereign wealth fund but the monetary agency manages foreign assets on behalf of various government agencies.

<sup>3</sup>Announced on March 9, 2007, the fund may be established at the end of 2007.

<sup>4</sup>Starting in February 2008, the Oil Stabilization Fund will be divided into two separate funds with distinct policy objectives (Stabilization Fund versus National Welfare Fund).

funds also aim to preserve a minimum amount of capital, in real terms, so that the purchasing power of the funds is guaranteed. Pension reserve funds with explicit liabilities typically design SAA benchmarks that preserve their solvency.

### Some Issues for Consideration

The cross-border asset holdings of SWFs raise issues similar to those faced by other international market participants, including their role in global financial markets.

One view is that SWFs enhance market liquidity and financial resource allocation. This view recognizes that SWFs, especially the larger ones, typically use a mix of well-trained in-house expertise and well-regarded international external fund managers, and have longer investment horizons that can accommodate short-term volatility. Consequently, their investment operations may dampen asset price volatility and lower liquidity risk premia, compared with a situation in which these assets were to be managed with shorter duration.

Another view holds, however, that the limited publicly available information on some SWFs, their multiplicity of objectives, and a lack of clarity on their institutional structure and investment management, make it difficult to assess the SWFs' asset management activities and their impact on the capital markets. Without more public accountability, funds may alter their governance structures, perhaps as a result of losses, which, in turn, could lead to sharp changes in investment policies, possibly exacerbating market volatility in some asset classes. The public ownership of SWFs (and other state-owned entities) also raises questions about possible capital account restrictions initiated in recipient countries, especially to avoid certain types of foreign direct investment.

As their size, number, and use grows, and as domestic and international public attention directed toward them increases, SWFs may be faced with several institutional and operational challenges, including:

- *Defining objectives and setting and implementing sovereign asset allocation.* A well-defined SAA within a clearly articulated investment policy is a critical operational component for public investment funds, and as new developments arise, a reassessment of existing objectives and constraints might be needed and reflected in the overall risk tolerance.
- *Institutional arrangements,* including withdrawal and accumulation rules that reflect risk-sharing arrangements between the government and the SWF, or the central bank, and establishing responsibility for investment decisions and their outcomes.<sup>57</sup>
- *Accountability arrangements,* including fiduciary duty to citizens, the legal foundation, and the internal governance structure. In practice, the public disclosure of SWFs varies significantly in terms of the nature of information and its timeliness, providing for more or less public scrutiny of the sovereign assets.

There are a number of voluntary transparency initiatives that are relevant to SWFs.<sup>58</sup> These include the IMF's *Guidelines for Foreign Exchange Reserve Management, Balance of Payments and International Investment Position* data, as well as the Coordinated Portfolio Investment Survey, the *Code of Good Practices on Fiscal Transparency*, and the *Guide on Resource Revenue Transparency*. More targeted initiatives include the Joint Oil Data Initiative and the Extractive Industries Transparency Initiative.

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<sup>57</sup>For instance, in the case of some oil-related SWFs, it is often difficult to determine on which institutions' balance sheet the assets appear.

<sup>58</sup>Further advice on setting up SWFs or alternative uses of reserves is also being provided by the IMF as part of technical cooperation advice or by addressing specific requests from countries.



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