

International Financial Stability

Roger W. Ferguson, Jr., Philipp Hartmann,
Fabio Panetta and Richard Portes

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Geneva Reports on the World Economy 9

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ICMB INTERNATIONAL CENTER
FOR MONETARY
AND BANKING STUDIES

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Any views expressed are those of the authors and should not be regarded as those of the institutions with which they are affiliated.

Foreword

The ninth *Geneva Report on the World Economy* examines the main threats to financial stability in the major industrial economies and the emerging economies, focusing on the implications of the major changes that have occurred in the global financial system in the past two decades.

At the time when the conference met in May 2007, it was customary to marvel at the long period of quiescence in world financial markets. Low risk premia and continuing high returns were increasingly seen as the inherent characteristics of the new international financial system. Many observers were confident that this happy situation would go on forever, fueled by unprecedented global risk diversification and supported by amazingly sophisticated financial instruments.

This was not the view of the report's authors and, indeed, much of the conference focused on the flaws that were hidden but, few doubted, were there and would be revealed soon enough. As it turns out, we did not have to wait very long to witness a major crisis that affected the largest world interbank markets and severely dented the profits of many of the most prominent financial institutions. A first reason to read the report is to find how the careful observers who gathered in Geneva were concerned about many of the fault lines that emerged a few weeks later.

Naturally, the authors of the ninth report have amended their text in the wake of the crisis, but they did not have to make drastic changes. They first examine financial stability from a macro perspective, considering macroeconomic imbalances, the decline (and spike) in financial market volatility and its causes, and international financial integration. They then adopt a micro perspective, considering the implications for stability of the growth of household risk bearing, financial sector consolidation, the emergence of new financial instruments and the growth of hedge funds. They conclude by assessing the policy implications of these developments, and their practical proposals ought to be considered with great attention.

ICMB and CEPR are delighted to provide a forum for the authors to put forward this careful analysis of international financial stability. We are confident that it will be widely read and discussed. It should give policy-makers, academics and the informed public a more sophisticated understanding of these issues.

Charles Wyplosz
Stephen Yeo

16 October 2007

Executive Summary

The issues

This report offers a comprehensive and detailed view of international financial stability in the light of the major structural changes in the international financial system over the past two decades. It is not a chronicle of recent events. Rather, it analyses secular phenomena in a perspective informed by frontier academic research and the research and policy-oriented work of central banks, supervisory authorities and international organisations.

As we go to press in September 2007, the global financial system shows signs of stress. This is financial turmoil, but not a systemic financial crisis: there have been only a few relatively isolated bank failures (and no failure of a large and complex financial institution) and no widespread substantial declines in asset prices. Risk is being repriced, the creditworthiness of certain asset classes is under question, funding vehicles (conduits for asset-backed securities) are being unwound, a number of major banks made sizable losses in their credit trading business, and liquidity is unavailable in certain markets. Beyond these immediate concerns, the topic of financial stability is important because, as the complexity and scale of the international financial system have increased in recent years, so too have the potential effects of financial instability on the real economy.

Over the decade until mid-2007, financial crises had become less frequent, and international financial markets seemed quiescent. Previous financial crises in emerging markets had prompted these countries to accumulate foreign exchange reserves.

In some respects, financial markets are better regulated and more stable today than twenty years ago. Markets are more complete, and market information is more generally available. But new institutions and market phenomena may also pose risks to financial stability, in particular in the transition. This report identifies and analyses these new developments:

- extreme global liquidity and international imbalances;
- possible bubbles in asset markets, notably housing;
- a significant decline in volatility since 2003;
- growing cross-border financial integration, with some potentially dangerous aspects such as the carry trade;
- new credit facilities for households and the rise in household indebtedness;

- financial consolidation that has created large complex financial institutions (LCFIs) of systemic importance;
- a proliferation of new, often opaque, financial instruments, whose risks may not be well understood by certain financial institutions buying them and some of which may be subject to significant mispricing;
- the rise of hedge funds and their prominent role in capital markets; and
- the shift from 'buy and hold' to 'originate to distribute' (and trading) as the focus of banks' credit business.

Analytical framework

The report begins with an analytical framework that lays out the basic theory and terminology used. Grounded in the distinction between exogenous shocks, endogenously emerging financial imbalances and the transmission mechanisms that propagate crises, the framework may provide a useful basis for central banks' financial stability reports. In particular, the framework defines key concepts such as:

- financial stability and its international dimensions;
- systemic risk;
- contagion;
- different notions of liquidity and the relations among them, as well as the inverse relation between market liquidity and volatility;
- tail risk, correlation risk and other forms of risk; and
- leverage.

Finally, the chapter sketches the current risks to international financial stability in the light of the framework developed.

Macroeconomic imbalances

Our discussion of macroeconomic imbalances centres around the 'global imbalances' related to the US current account deficit, as well as possible housing market bubbles in particular countries. The current global macroeconomic environment appears benign, despite the recent credit market turmoil. No major sovereign debtor has been in difficulties since Argentina defaulted six years ago (with no contagion effects). The US and several other countries have large current account deficits, yet the capital markets are financing them without apparent strains.

We believe, however, that the present configuration of current accounts and exchange rates is not sustainable. An abrupt 'correction' could cause financial instability. If expectations change sharply and elasticities of substitution between domestic and foreign assets are high, there could be a sudden and large dollar depreciation with major asset price changes and real effects.

Volatility

From 2004 until very recently, we observed extreme 'financial quiescence': volatility was exceptionally low across all asset classes and markets, and risk premia (yield spreads, premia on credit defaults swaps) were also very low. The recent turmoil raised volatility, but no more than in other recent volatility spikes. In fact, the Report identifies several structural factors underlying an apparently secular downward shift in volatility.

Still, some of the factors that reduce volatility may at times undermine financial stability. Market liquidity may be higher on average but more vulnerable to sudden shifts. Low volatility and low interest rates have led to a search for yield that may have encouraged excessive risk-taking. If market prices and portfolio choices rest on expectations of low volatility, investors may be vulnerable to volatility spikes. Nevertheless, the spikes of May 2006, February/March 2007, and summer 2007 were not especially large, and they do not appear to have been a source of financial instability.

Financial integration

Cross-border financial integration has accelerated dramatically over the past fifteen years; more so among industrial countries than among developing and emerging market countries. Theory suggests an ambiguous relation between financial integration and financial stability, and recent empirical cross-country studies find no or a negative connection between liberalisation of the financial account and the frequency or severity of banking and currency crises. Our own simple analysis tends to corroborate these results for de facto measures of financial openness. Nevertheless, individual countries' circumstances differ, and for many developing and emerging market countries, premature opening of the financial account could be too risky.

Looking at whether specific emerging market countries might be sources of systemic risk, we find that a domestic financial crisis in either China or India is unlikely to induce strong financial contagion in other major countries. It could, however, trigger a significant slowdown of the world economy which in itself would have financial stability implications.

The carry trade is another potential source of instability related to cross-border capital flows. The Report shows that its profitability is very sensitive to changes in the level and volatility of exchange rates. It could unwind abruptly, especially in a large volatility spike. Still, it is not clear that this would pose a systemic risk.

Household finance

In the past decade the household sector in most countries has become increasingly exposed to financial risk. This reflects a steady increase in debt levels; a rise in real and financial wealth; a larger weight of risky assets in financial portfolios; and a gradual shift from Defined Benefit to Defined Contribution pension plans. Households' direct and indirect exposure to longevity risk has also increased.

The growing exposure of households to financial risk and growing household indebtedness raise policy challenges. The issues of transparency and consumer protection are foremost. Consumers find it difficult to understand and evaluate new financial products, many of which are complex and opaque. Policy should seek to improve financial education and protect uneducated consumers.

Financial consolidation

The growing role of LCFIs may have made them 'too big to fail' - or conversely, 'too big to rescue'. It also raises the issue of regulatory capture. When financial institutions become very large and local markets very concentrated, their lobbying power increases significantly. This suggests a potential weakening of market discipline, which calls for increased levels of disclosure. Cross-border financial consolidation also raises coordination problems for supervisors, regulators, and lenders of last resort. Moreover, liquidity pools are more likely now to be international: the evaporation of liquidity may quickly extend across borders, while LCFIs may access liquidity wherever it may be. This suggests that not only regulators, but also the major central banks must cooperate more closely in dealing with liquidity shocks.

New financial instruments

Given all the benefits from innovative financial instruments, the appropriate question is how to make these instruments safer. First, market-driven, but regulatory- and supervisory-authority-guided, approaches are necessary for successful financial risk management. As new instruments are designed, regulation must keep pace. Second, financial risk management solutions must be global.

The Counterparty Risk Management Policy Group (CRMPG) offers an example of these principles. In the wake of the Long Term Capital Management failure, this group of 12 global financial firms examined how to improve risk management procedures. Because of its recommendations, firms can now better measure their aggregate counterparty risk exposures, documentation standards have improved, the use of collateral to mitigate risk has increased, and stress testing procedures are commonplace. Also, much progress has been made on documenting the backlog of unconfirmed credit derivative trades, increasing the use of electronic trade documentation, and improving the settlement protocol.

From 1993–5, there were several major derivatives disasters. But the derivatives market appears safer today than it was in the 1990s, even as it has expanded from an already remarkable \$12 trillion by a factor of 30 over the past 15 years. This spectacular growth suggests that derivatives are meeting the market test of fulfilling a genuine purpose. Meanwhile, the lower frequency of major disasters despite this rapid growth suggests that market participants are using derivatives more responsibly.

Hedge funds

Many regulators in the US and other major markets believe that the best way to monitor hedge fund activity is indirectly, through their sources of funds. Banks must regularly assess the creditworthiness of their hedge fund borrowers and counterparties. Brokers must actively monitor the positions of hedge funds and manage their exposure to them. These financial institutions should share information about their counterparty exposures to hedge funds.

Market participants would also benefit from greater emphasis on tail risk, which is of particular systemic relevance. And a 'Capital Markets Safety Board' that investigates, reports and archives information on hedge fund (and other financial sector) debacles may likewise offer valuable benefits in combating systemic risk.

Regulators have reached no international consensus on the need for further oversight. We see no clear benefit from additional regulation. Hedge funds do not seem to have played a significant role in setting off the current financial turmoil. Some have suffered from it and others have profited, but their problems have had little systemic impact.

The new global financial system

The business model of banks is evolving from the traditional buy-and-hold model (BH), in which banks are funded with short-term deposits and invest in loans held until maturity, to the originate-to-distribute (OTD) model, in which banks originate loans and then repack and sell them to other investors, distributing risks throughout the economy. Most of these risks are passed to other banks, insurance companies and leveraged investors, who are the main buyers of structured finance and credit derivative products.

The wider distribution of risks within the global financial system offers many potential benefits. It makes many assets more liquid, frees additional resources for investment and reduces the volatility of asset prices. Because it distributes risk across a diverse universe of investors, it should in principle reduce the likelihood of systemic events.

Recent developments in the US subprime market and their ramifications suggest that the OTD model also has weaknesses that might entail new forms of risk or magnify existing ones. Banks have less incentive to monitor borrowers *ex post*, although in principle they have more incentive to screen them *ex ante*. They have switched from relying on 'soft information' and relationships to model-based pricing. Many of the new instruments are illiquid, and the role of ratings firms in evaluating them is highly controversial. There has been a transfer of activity from regulated to unregulated investors. To sum up, this model may be more efficient, but more complex, with more tail risk, operational risk, and legal risk. We argue that the shift from BH to OTD should not (and probably cannot) be reversed. But policy-makers and industry bodies can try to make it work better, to push it towards a more balanced, market-based model.

Further policy conclusions

In conclusion, we stress several key policy implications of the report:

- Regulators and market participants should pay particular attention to tail risk.
- Liquidity pools are now global, and this requires ongoing cooperation among the major central banks and regulators.
- New regulations could require originators to retain equity pieces of their structured finance products.
- Regulators need aggregate information on structured finance (SF) instrument holdings and on the concentration of risk to assist in the regulatory process.
- Industry bodies should promote product standardization and accurate pricing in the SF market.
- Credit market transactions that do not definitively transfer risk should not be treated by regulators or risk managers as if they do.
- Regulators should insist that prime brokers and investors know better the positions and strategies of the hedge funds with which they transact.
- Ratings firms should provide a range for the risk of each instrument rather than a point estimate or should develop a distinct rating scale for structured finance products.

1 Introduction

The theme of this ninth edition of *Geneva Reports on the World Economy* is international financial stability. The Report examines the main threats to financial stability in the major industrial economies and the emerging economies to which they are most exposed. It focuses on the implications of the major structural changes that have occurred in the global financial system in the past two decades.

Why do we care about this topic today? Most immediately, as this report goes to press in October 2007, the global financial system shows signs of stress. Risk is being repriced, the creditworthiness of certain asset classes is under question, funding vehicles (conduits for asset-backed securities) are being unwound, and liquidity is unavailable in certain markets. Many are concerned that global growth might slow as a result of these financial market developments. Beyond these immediate concerns, the topic of financial stability is important because, as the complexity and scale of the international financial system have increased in recent years, so too have the potential effects of financial instability on the real economy. Major bank failures or financial asset price declines can cause more disruption to investment and household consumption today than when the financial sector was smaller.

By one measure, the value of assets traded on the capital markets of the major industrial countries has grown from 1.6 times as large as GDP to 2.5 times as large over the past 15 years (Figure 1.1). The financial sector's share of economy-wide value added has risen by about one-third, from 5% to around 6.7% (Figure 1.2).¹

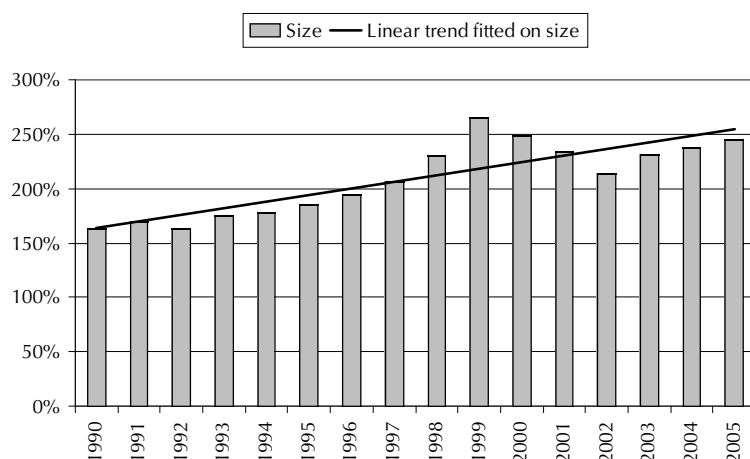
These data suggest that the potential impact of financial instability on the real economy has grown. If there were major banking crises or substantial asset price declines, the consequences for investment and household consumption may well be greater today than when the financial sector was smaller. And recent research confirms that in the past two decades systemic risk in banking has increased in both the US and the euro area.²

Until mid-2007, financial crises had become less frequent and international financial markets seemed quiescent. These trends may have been misleading, since the consequences of any emerging instability may be more severe now than in the past. Moreover, as the US subprime lending problem unfolds, the repricing of risks in major credit markets reminds us that low volatility and the absence of crises is not synonymous with the absence of risk. The troubles at Bear Stearns and the bail-out of IKB Deutsche Industriebank at the time of this writing are cases in point.

The governance structure supporting the international financial system has

2 International Financial Stability

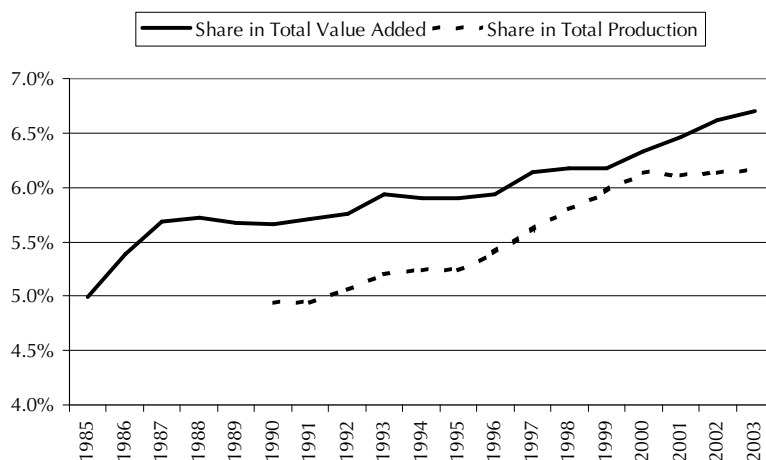
Figure 1.1 Capital markets as percentage of GDP



Data sources: BIS, IMF, World Federation of Exchanges, ECB, Datastream and own calculations.

Notes: Sum of (i) stock market capitalisation, (ii) bank credit to the private sector and (iii) domestic debt securities issued by the private sector, divided by GDP. For Denmark and Sweden stock market capitalisation is an estimate of the share of each country in the stock market capitalisation of the OMX market. For the US stock market capitalisation is the sum of NYSE and NASDAQ. The following countries are included: Australia, Austria, Belgium, Denmark, Finland, France, Germany, Italy, Japan, Netherlands, Norway, Portugal, Spain, Sweden, UK and United States.

Figure 1.2 Share of the financial sector in total value added and in total production



Data source: OECD STAN database.

Notes: Classification based on ISIC rev. 3, No. 65-67, 'Financial Intermediation' which includes: i) financial intermediation except insurance and pension funding, ii) insurance and pension funding, except compulsory social security, iii) activities related to financial intermediation. The following countries are included: for value added, Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, UK and United States; for production, all these except Ireland and Spain.

changed significantly in recent years. A series of financial crises in emerging markets has prompted these countries to accumulate foreign exchange reserves to avoid similar problems in the future. These events and the growth of international capital markets have reduced the lending and crisis-management roles of the International Monetary Fund. They have also changed the Fund's focus, with the creation of a capital markets department (now the Monetary and Capital Markets Department) and new IMF responsibilities for monitoring capital market activities. The Basle Committee on Banking Supervision has put forward internationally agreed standards for banks for two decades. The Financial Stability Forum was established in 1999 to promote financial stability through international information exchange and co-operation in financial supervision and surveillance.

In some respects, financial markets are better regulated and more stable today than 20 years ago. Markets are more complete, and market information more generally available. But the greater importance of financial markets raises the stakes. And there are also new institutions and market phenomena that may pose a threat to financial stability. This report identifies and analyses these new developments:

- extreme global liquidity and international imbalances
- possible bubbles in asset markets, notably housing
- a striking decline in volatility
- growing cross-border financial integration, with some potentially dangerous aspects such as the carry trade
- credit facilities for households and the rise in household indebtedness
- financial consolidation that has created large complex financial institutions (LCFIs) of systemic importance
- a proliferation of financial instruments, which may be subject to significant mispricing
- the rise of hedge funds and their prominent role in capital markets

This report consists of two parts. Part 1 examines financial stability from a macroprudential perspective. In particular, it considers macroeconomic imbalances, the decline in financial market volatility from 2004–2007 (recently disturbed by the summer 2007 volatility spike) and its causes, and international financial integration. Part 2 takes a micro perspective. It considers the implications for financial market stability of the growth of household risk bearing, financial sector consolidation, the emergence of new financial instruments and the growth of hedge funds. The final chapter assesses the policy implications of these developments and draws conclusions.

Although we are writing (summer 2007) at a time of financial market turbulence caused by a re-pricing of risk and the withdrawal of liquidity, this report has a longer-term focus. It will therefore refer to the current market dislocation as an example of major propositions and provide an analysis of its sources, without limiting its discussion of financial instability to this one case.

2 Assessing International Financial Stability: An Analytical Framework

2.1 Financial stability, systemic risk and policy

2.1.1 Financial stability, instability and systemic risk

The financial system comprises financial intermediaries, markets and market infrastructures. Financial instability can impair intermediation and destroy wealth by disrupting investment, consumption and economic growth. A financial system is stable if it can withstand external shocks and the unravelling of financial imbalances without impairing investment and macroeconomic activity (ECB, 2006).³

Financial instability can be viewed as an unstable equilibrium, in which a small disturbance leads to drastic changes.⁴ A related characterization of an unstable financial system focuses on whether it is close to the emergence of a discontinuity, where a shock would lead to a 'jump' to a crisis state. An unstable equilibrium or a discontinuity can arise from a financial imbalance (e.g., a housing price bubble or the over-exposure of the banking system to a specific sector or region) or from investors' misassessment of risks. Even if the financial system is far from crisis, a large enough shock might cause a discontinuity in the functioning of the financial system.

The central question is whether instability spreads from specific financial institutions or market segments, and creates aggregate risk. Systemic risk is a threat to the stability of the entire financial system serious enough to endanger the real economy.⁵

There are two distinct forms of systemic risk, which may require very different policy responses.⁶ Contagion is the propagation of failures or crashes across financial institutions or markets. In an unstable financial system, an initially idiosyncratic problem can spread through contagion. Examples include the Chicago banking panic during the Great Depression, the failure of Continental Illinois in 1984 and the 1987 stock market crash. The rapid repricing of risk and de-leveraging of the financial system during July and August of 2007, which originally emerged due to concerns about the health of the subprime mortgage sector in the United States, may prove to be another example.

The second form of systemic risk refers to potential financial system destabilisations due to severe aggregate shocks (for example, recessions or the popping of asset price bubbles). Here widespread financial instability emerges from a shock that affects many financial institutions and markets simultaneously. Examples are the extended Japanese banking crisis of the late 1980s and 1990s and the Nordic

banking crises of the early 1990s.⁷

Contagion can emerge from several sources. First, exposures of financial institutions and traders to each other can cause bank failures or financial market crashes to propagate.⁸ Second, asymmetric information about the health of financial institutions and market exposures can have similar effects, as rational agents may regard one failure as foreshadowing others.⁹ Third, when there are self-enforcing mechanisms, the system may generate contagion phenomena autonomously.¹⁰

Financial institutions and markets may be vulnerable to aggregate shocks because they are severe and unanticipated; because many bank balance sheets are inherently fragile; or because investors and financial institutions have incentives to take on excessive exposures to similar risks.¹¹

Contagion and aggregate shocks can be mutually reinforcing. For example, banks will be weaker after an adverse aggregate shock and hence more easily brought down by contagion effects (Chen, 1999). Liquidity can also play a role, as we discuss below.

This report does not attempt to model or measure financial stability or systemic risk.¹² Rather, it asks how structural changes in major financial systems have affected financial stability.

2.1.2 Financial crises, their anatomy and macroeconomic implications

Systemic risk may lead to a systemic financial crisis. Bordo et al. (2001, p. 55) characterize financial crises as 'episodes of financial-market volatility marked by significant problems of illiquidity and insolvency among financial-market participants'. The chapters that follow consider whether the low levels of market volatility and ample liquidity that have prevailed until recently mean that the financial system has become more stable.

Crises may take many forms, but the *internal dynamics* are similar. Kindleberger (1978) argues that the immediate cause of a financial crisis

...may be trivial, a bankruptcy, a suicide, a flight, a revelation, a refusal of credit to some borrower, some change of view which leads a significant actor to unload. Prices fall. Expectations are reversed. The movement picks up speed. To the extent that speculators are leveraged with borrowed money, the decline in prices leads to further calls on them for margin or cash, and to further liquidation. As prices fall further, bank loans turn sour, and one or more mercantile houses, banks, discount houses or brokerages fail. The credit system itself appears shaky and the race for liquidity is on. (pp. 107–8)¹³

A crisis takes on its full dimensions through a generalized fall in asset prices that hits both markets and institutions (Eichengreen and Portes, 1987). Causality is not always easy to establish, since a severe aggregate shock may destabilize the financial system. But we normally find that systemic financial crises have strong negative effects on the real economy.¹⁴ As asset prices fall, firms and households face increased financing costs. As banks default and the overall amount of bank capital becomes limited, the credit creation process may grind to a halt. Consumption, investment and overall growth decline. The severity of a financial crisis should ultimately be gauged by its real effects.¹⁵

This report focuses on how to maintain financial stability (the *ex ante* view) rather than on how to manage a crisis (the *ex post* view).

2.1.3 Sources of financial instability: shocks, imbalances and transmission channels

Financial stability, by definition, resides in financial institutions and markets – the financial system. But non-financial firms, households and the macroeconomy are also relevant. The failure of firms or households to repay debt, for example, or even the fear that such a failure might occur, can cause financial instability and crisis.

Thus instability can arise from *shocks* from inside or outside the financial system. An example of the former is the failure of a large and complex financial institution, such as a major clearing bank or hedge fund, due to firm-specific events. Examples of the latter are a severe recession or an excessive increase in household debt followed by a wave of insolvencies.

Most shocks that cause financial instability from inside the financial system, such as bank failures, will arise at the microeconomic level. Macroeconomic developments from outside the financial system may cause either individual failures or systemic crises, depending on their severity. Overall, the distinction between microeconomic and macroeconomic factors can blur. We must therefore go deeper in identifying the origins of financial instability.

By *imbalances*, we mean endogenous accumulations of factors that increase the risk of instability and crises. The endogeneity can be related to market imperfections or imperfections in economic policies. Imbalances can originate from within the financial system. For example, banks' willingness to extend property loans during a real estate price bubble can lead to a systemic banking crisis as soon as the property market cools. Similarly, systemically important banks may become over-exposed to emerging market sovereigns, which are themselves overextended and then experience a currency crisis and default on their loans (the debt crisis of 1982).

Indeed, if the imbalance is large enough, there need not be much of a shock to cause a crisis. Allen and Gale (2004) show that crises can emerge endogenously through self-enforcing, self-amplifying changes in asset prices without any external shock. Such a crisis is sometimes called a 'Minsky moment', referring to Hyman Minsky's characterization of capitalist financial systems as inherently prone to generating intrinsic cycles and recurring crises (see also Kindleberger, 1978).¹⁶

Imbalances can also build up outside the financial system, causing shocks to the financial system when they unravel. Thus the reversal of a real investment boom could lead to firm failures that undermine the stability of banks. Sometimes real and financial imbalances are intertwined. If macroeconomic forces generate exchange-rate misalignments while bank balance sheets are accumulating significant currency mismatch, abrupt exchange-rate changes can bring down the banks (the Asian crisis of 1997-98).

The third element in understanding the origins of financial instability and crises is the *transmission mechanism* through which they emerge and propagate. Transmission within the financial system can exhibit contagion. The failure of some banks can endanger others through interbank exposures, asymmetric information about interbank or asset-side exposures, or multiple equilibria. Problems can spread from one type of financial institution or market to another.

An important example is the stock market crash of 1987, which created problems for securities settlement and financial institutions dependent on it. The sharp decline in prices on the New York Stock Exchange caused similar price reactions in stock index futures traded on the Chicago Mercantile Exchange (CME). These, in turn, triggered margin calls by the CME clearinghouse on brokers, who passed them on to their customers, many of whom had to cover them through bank loans. But the brokers and banks did not receive all the balancing payments through the clearing and settlement systems. So banks became increasingly reluctant to extend bridge loans. If the Fed had not urged key money centre banks to resume lending to brokers, failures could have had severe consequences for the financial system (see Brimmer, 1989, or Bernanke, 1990). This report will consider whether recent financial developments have made certain financial markets or institutions more important, enhancing their potential role in the transmission of financial instability.

Financial instability can be transmitted to the real economy through real investment, consumption or savings. For example, a major decline in stock or housing prices can reduce consumption through wealth effects. A major increase in credit spreads or a tightening of banks' lending standards in the presence of instability can limit firms' access to finance and reduce real investment. As financial development changes the patterns of risk sharing in the economy, the relative importance of these transmission channels can change.

2.1.4 Financial instability and policy responses

Thus our analysis of financial stability must consider shocks, imbalances and transmission mechanisms. Can the most dangerous and likely future shocks be identified? When is a shock or an imbalance severe enough to endanger stability significantly? Which channels are most likely to propagate or amplify instability?

Answers to these questions affect the design of policies to limit systemic risk and financial crises. Preventing systemic financial crises, even at some *ex ante* cost, is usually preferable to responding to them *ex post*.¹⁷ This means designing regulations and other features influencing market behaviour so as to limit the likelihood of severe instability. We therefore consider which shocks might occur, how they can be avoided, and how the financial system can be made more robust to them; what structural weaknesses in the financial system could become a source of instability and how they can be remedied; and whether transmission channels can be influenced so as to limit amplification effects.

A key feature of this report will therefore be the analysis of structural developments in financial markets such as the growth of new financial intermediaries (in particular, hedge funds) and instruments (e.g., credit risk transfer instruments). We shall assess their effects on market behaviour, volatility, financial stability and the likelihood of a crisis.

2.1.5 The international dimension

This report is about international financial stability. As Eichengreen and Portes (1987) note, 'In an international financial crisis, disturbances spill over national borders, disrupting the market's capacity to allocate capital internationally.'

The international dimension widens the set of relevant shocks, imbalances and transmission mechanisms. But we cannot cover all economies. This report focuses primarily on the main industrial countries and a few ‘systemically important’ emerging market countries (notably China and India; see Chapter 6). It highlights phenomena that have a bearing on the stability of the financial systems of the major industrial countries. An instability with a cross-border dimension concerns us if it has the potential to affect materially one or more major industrial countries. We therefore do not discuss most of the emerging market countries. But we must keep in mind that systemically important shocks can arise from seemingly unlikely sources. For example, the Russian exchange-rate crisis and debt default in August 1998 is thought to have contributed to the crisis of Long Term Capital Management (LTCM) and even to Brazil's January 1999 exchange-rate crisis. Similarly, some commentators saw the tremors originating in Iceland in early 2006 as the origin of the instability that raised volatility and affected Turkey in May 2006.

2.2 Key concepts

We briefly review several concepts related to financial stability and systemic risk that are used extensively below: liquidity, connectivity, leverage, types of risk and tail risk.

2.2.1 Liquidity

All agree on the central importance of liquidity for the stability of financial markets and institutions. But the concept of liquidity has different meanings in different contexts.¹⁸ Three main notions of liquidity, each relevant to financial stability, are used in this report.

The first is financial market liquidity. A market is liquid if it allows agents to exchange assets easily, at low transaction costs (including bid-ask spreads) and with limited price impact. Liquid markets are typically characterized by many traders.

The second notion, funding liquidity, refers to the ease with which firms can finance their activities. Liquidity conditions for funding tend to be ample when interest rates are low, financial markets are large and developed, and banks are in a position to extend credit.

Macroeconomic liquidity refers to the growth of money, credit and aggregate savings. It is ample when monetary policy is accommodative, official interest rates are low, and money and credit expand rapidly. It can also be ample when there is a high propensity to save, whether nationally or globally.

These three notions of liquidity are related. When macroeconomic liquidity is ample, funding liquidity will usually be so as well. In situations of high funding liquidity, it is easier to finance trading activity, which fosters market liquidity. Actions taken by the US Federal Reserve and the European Central Bank during the summer of 2007 amply demonstrate the relationship among these types of liquidity. The official sector, concerned about the withdrawal of private-sector liquidity, introduced liquidity into financial systems by discount window-type lend-

ing in order to overcome disruptions to market and funding liquidity in the asset-backed securities market.

The relationship between traders' funding liquidity and asset market liquidity may be a source of financial instability (Brunnermeier and Pedersen, 2007). Traders provide market liquidity, and their ability to do so depends on their availability of funding. But that depends on the market liquidity of the assets. Hence there can be 'liquidity spirals', in which market liquidity suddenly dries up.

The three liquidity concepts also relate to financial stability. Lack of market liquidity can increase the likelihood and the consequences of financial market crashes. As prices decline sharply and are expected to fall further, the demand side dries up and supply surges, accelerating price declines. The imbalance between buyers and sellers goes hand in hand with limited market liquidity, until prices are perceived to have reached bottom. More generally, market liquidity and market volatility tend to be inversely related. In sum, limited market liquidity is often a risk to stability, whereas ample market liquidity tends to be stabilizing.

There are markets that are highly liquid in normal times but lose their liquidity in stress periods. Some market participants rely on the high liquidity to continue, thereby exacerbating instability when liquidity suddenly dries up under stress.

The relevance of funding liquidity for financial stability is more subtle. Excessive funding liquidity can fuel asset price bubbles and investment booms. This can set the stage for instabilities when the bubble or boom is over. Limited funding liquidity can constrain market liquidity. *Ex post*, it can reinforce instabilities among financial institutions and extend the effects of a financial crisis to non-financial firms and the real economy.

The relevance of macroeconomic liquidity is also not straightforward. To the extent that macroeconomic liquidity is positively related to funding liquidity, it can generate the same effects. In particular, it can promote the underpricing of risks and encourage a 'search for yield'.¹⁹ Moreover, excessive macroeconomic liquidity can raise inflation risks, which can distort asset prices and lead to future aggregate shocks. The accumulation of international reserves can contribute to rising macroeconomic liquidity.

2.2.2 Connectivity

The tendency of financial instability to spread is affected by the degree to which different financial assets, financial institutions and financial systems are 'connected'. The rising integration of markets, institutions and systems has increased the degree of 'connectivity' in the financial systems of the major industrial and emerging market economies. This could enhance efficiency, as it simplifies arbitrage, diversification and risk sharing, while creating scale economies. Moreover, larger financial markets and institutions are likely to be more resilient to a shock of a given size than a more fragmented financial system. For large shocks, however, the propagation of instability may be more widespread and could therefore have more severe consequences. In what follows we distinguish between different aspects of greater connectivity in financial systems and focus mainly on their implications for financial stability.

One dimension of connectivity is interdependence across different asset class-

es. The more closely the prices of different asset classes are related, the more widely across markets severe price declines may propagate. We discuss cross-asset correlations in our chapter on volatility. The structure of interdependence across assets may change from tranquil periods to periods of stress – 'correlation breakdown'.²⁰ Portfolio diversification may then provide less protection against instability. The interplay between liquidity risk and the risk of changing correlations can magnify both (Acharya and Schaefer, 2006). Hence even if univariate tail risk (see below) has not risen, the consequences of an extreme event may be greater than the markets perceive.

Another dimension of connectivity is international financial integration, in particular the interdependence of asset markets across borders. The more closely the valuations of assets of different countries are related, the more likely it is for a problem to spread internationally. Chapter 6 of this report is dedicated to international financial integration. A similar point relates to different financial institutions. The more banks, insurers and other intermediaries integrate or interact, the more likely a financial disturbance is to propagate across the system. The more banks consolidate and expand their operations abroad, the larger the impact of a single failure on the domestic and international financial system. Chapter 8 of this report discusses financial consolidation in depth. Last, firms and households may be more or less related to financial markets and intermediaries (see Chapter 7). The more they are connected, the more pronounced could be the real effects of financial instabilities.

2.2.3 Leverage

Leverage refers to the possibility of amplifying returns by investing with borrowed funds. Leveraged investments have gained prominence in recent times through the growth of hedge funds and private equity firms. Not all hedge funds use leverage, but some use it extensively.

An advantage of leverage is that it makes it possible to finance a larger number of profitable investments. In principle, this should make financial markets more efficient and promote economic growth.

These investments are subject to greater risks than non-leveraged positions. Not only are profits magnified, but losses as well. Moreover, leveraging increases the size of positions. Thus financial institutions taking leveraged positions have an interest in unwinding losing positions before they become too large. In situations of stress, this unwinding can occur quickly, further accelerating price declines. In particular, if different financial institutions have taken similar positions, then selling activity and further price declines multiply. In times of stress, leveraged positions may therefore increase the likelihood of discontinuities, such as fast, 'jump-like', price adjustments.

In the corporate sector the increased leverage observed in relation to the growth of private equity business may also create fragility, despite the positive effects on efficiency and growth. Firms with higher leverage (debt-to-equity) ratios will typically be more vulnerable to rising interest rates. While this report does cover hedge funds, it does not address private equity. The activities of private equity firms generally have a less direct bearing on financial stability and are at present unlikely to pose significant systemic risk.

2.2.4 Types of risk

The report refers regularly to the main risks that investors and financial institutions must manage: market, credit and operational risk. Liquidity risk is also considered, although strategic and reputational risk are not.

Market risk refers to the possibility that changes in asset prices can lead to gains or losses. This concerns equity, bond, foreign exchange and related derivatives positions. *Credit risk* refers to the possibility that counterparty defaults or changes in the probability of default (as reflected for example in ratings changes) lead to capital gains or losses. Bank loans and marketable debt instruments such as bonds have significant credit risk components. *Operational risk* refers to the risk of loss resulting from inadequate or failed internal processes, people and systems, or from external events (Basel Committee on Banking Supervision, 2004). Activities that cause this risk include fraud, inappropriate business practices, IT system failures and business process failures (such as data entry errors).²¹ *Liquidity risk*, as discussed above, refers to the circumstance in which an institution (or market) cannot transact in financial instruments without incurring disproportionately large transaction costs. The concept might also refer to a case in which a creditworthy institution holding high quality assets cannot fund its daily operations and its balance sheet through short- and intermediate-term borrowings from private sector counterparties.

The management of market risk is the most advanced in financial markets, although recently the management of credit risk has also developed substantially. The strong growth in recent years of securitization and credit risk transfer instruments (in particular credit derivatives, collateralized debt obligations and credit-linked notes) also implies that the dividing lines between market and credit risk have become increasingly blurred. For example, banking book positions can now be hedged with trading book instruments. Credit default swap indices, such as CDX or iTraxx, provide highly liquid markets for insuring against the default of major North American and European firms. These developments are discussed in greater depth in the chapter on new financial instruments.

The most widely used measure of risk, particularly market risk, is *volatility*. Volatility reflects many aspects of market behaviour and sentiment. It is measured historically, as realized volatility, or in a more forward-looking fashion as implied volatility (as priced in options). The most common measure of volatility is the standard deviation, which measures the amplitude of fluctuations in asset returns.²²

2.2.5 Tail risk

A systemic financial crisis is a rare extreme event, whose likelihoods is difficult to assess. Empirically, however, financial asset returns exhibit 'fat tails', in the sense that the probability of extreme events is higher than standard statistical tools predict.²³ Rubinstein (2000) notes that if stock index returns are lognormally distributed with a 20% annualized volatility (the historical average since 1928), the probability that the S&P index futures would fall 29% in a single day, as they did on 19 October 1987, is practically zero (more precisely, 10^{-160}). In August 2007, the head of quantitative equity strategies at Lehman Brothers told the *Wall Street Journal* that 'events that models only predicted would happen once in 10,000

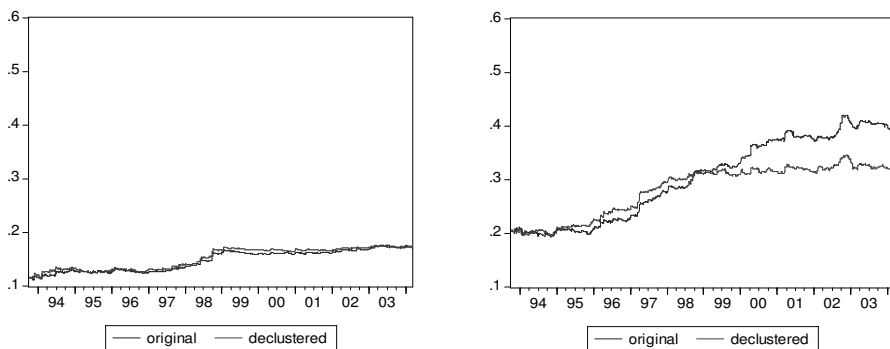
years happened every day for three days.'

Some argue that tail risk is underpriced because markets are uninterested in distant catastrophic events, partly because of institutions (e.g., marking to market), partly because of incentives. Rajan (2005) argues that as modern financial systems have moved towards more market-based, arms-length transactions, the incentive for individual financial institutions to take on tail risk has risen. For example, investment managers whose compensation structures imply proportional participation in investors' profits but no sharing of losses have strong incentives to increase risk. Investment bankers and fund managers investing in market-based instruments may therefore take on more risk than traditional commercial bankers, whose remuneration depends less on performance.

For tail risk to be systemic, however, one cannot stop at the level of individual financial institutions or traders. The risk must be widespread, affecting many financial agents at the same time. Rajan conjectures that the incentives for taking on more tail risk in a more market-oriented system, interacted with herd behaviour, imply an increase in systemic risk: '...if herd behaviour moves asset prices away from fundamentals, the likelihood of large realignments – precisely the kind that trigger tail losses – increases.' (p.339)

In fact, Hartmann et al. (2005) estimate that, since the late 1980s, two different measures of systemic tail risk have increased in both the US and the euro area banking system. Extreme systematic risk in banking, i.e. the vulnerability of banking systems against large aggregate shocks, has increased in a similar fashion on both sides of the Atlantic. Extreme spillover risk among banks, i.e. vulnerability against contagion, has increased much more in the US than in the euro area (see Figure 2.1).

Figure 2.1 Evolution of multivariate extreme spillover risk among the 25 major euro area (left panel) and US banks (right panel)



Notes: Points on the lines represent recursive estimates of a 25-dimensional tail dependence parameter that measures the degree with which the stock market valuations of these large and complex banking organizations co-move in case one or several of them experience very extreme downturns. 'Decclustered' (light line) denotes estimates corrected for GARCH effects. 'Original' (dark line) estimates are not corrected in this way.

Source: Hartmann et al. (2005)

2.3 Current risks to international financial stability

History makes clear that a serious systemic crisis can have either a macroeconomic or a microeconomic origin. The Great Depression had macroeconomic causes and was propagated internationally through both financial markets and trade. The debt crisis of the 1980s, primarily a macroeconomic phenomenon for individual countries, was also rooted in structural characteristics of the credit markets (excessively low lending rates and spreads in the 1970s, partly based on the ahistorical belief that 'sovereigns do not go bankrupt'), and of the money centre banks (over-exposure to Latin America relative to their capital base). The Mexican crisis of 1994–5, a macroeconomic phenomenon arising from current account and exchange rate misalignment, was propagated internationally through contagion (the 'tequila effect'). The Asian crisis arose from a combination of macroeconomic factors (exchange-rate policies) and microeconomic, structural problems (balance sheet mismatches). This report considers both microeconomic and macroeconomic threats to international financial stability.

2.3.1 Existing and potential imbalances

A major potential imbalance in the international financial system is excess macroeconomic liquidity, creating also funding liquidity. There are several sources of what some have called a 'liquidity glut'. First, the extended period of relatively low interest rates in industrial countries and the associated strong growth of monetary and credit aggregates, even if appropriate from the perspective of price stability, may have allowed investors to fund projects that do not have a positive net present value over the medium term. Moreover, they may have fuelled a 'search for yield', with risks potentially underestimated. Financial markets that traditionally tend to overreact may show signs of distress when monetary policy shifts or the cycle turns (see Chapter 5).

Second, savings in excess of domestic investment opportunities where local financial markets are undeveloped might channel funds into the international system (Bernanke, 2005). Third, foreign exchange market intervention to avoid the appreciation of local currencies (against the dollar) results in reserve accumulation and domestic inflationary pressures.²⁴

A sharp fall in global liquidity need not have systemic implications if it is foreseen. But even if markets expect monetary tightening, they may not fully anticipate how this will affect balance sheets and the pricing of new financial instruments that have not been market-tested. On the other hand, historically low levels of volatility, spreads and long-term interest rates need not cause concern if they are justified by appropriate regulation, new underlying structures and robust market conditions, and if markets are not in fact myopic. Subsequent chapters deal with these questions in depth.

Many observers point to the risks posed by so-called '*global imbalances*'.²⁵ These are the large US current account deficit and the corresponding surpluses of a few Asian and oil exporting countries, as well as apparent misalignments of their exchange rates. Abrupt unravelling of the imbalances could cause large and disorderly capital flows and asset price changes, including abrupt exchange-rate adjustments. On the other hand, both theory and historical experience suggest that the

reversal of capital flows and the correction of exchange-rate misalignments need not be abrupt, nor have systemic consequences. If adjustment is gradual and is foreseen, then there should be no systemic crisis, unless even gradual adjustment reveals mispricing and threatens balance sheets. The key question, addressed in Chapter 3, is whether or not market expectations are satisfied.

We consider the shocks that could lead to the unravelling of imbalances and the transmission channels that could lead to financial instability and adverse effects on growth. But we emphasize that the unwinding of global imbalances need not be caused by a large shock. It can be triggered endogenously, as part of the process by which the imbalances emerged, or also by apparently small and *a priori* unimportant events.

Large volumes of *carry trades* may reflect policy-induced distortions²⁶ and may signal imbalances. The carry trade may be just a manifestation of excess macroeconomic liquidity, and if the liquidity bubble pops, there need be no concern just because some traders will lose money. But a large-scale reversal could have systemic implications. Chapter 6, which discusses cross-border financial integration, considers why and when such a reversal could occur. Financing in low interest rate currencies and investing in high interest rate currencies would not appear profitable if markets moved towards uncovered interest rate parity (alignment of international interest rate differentials with exchange rate movements). Of course, international financial stability does not require that uncovered interest parity be satisfied, and empirical studies suggest that it usually is not. But there are times when the markets do behave efficiently. And as in all markets, big bets on potentially unstable expectations are risky and potential sources of systemic instability. A change in exchange-rate expectations or the return of exchange-rate volatility could reverse the carry trades, threaten some heavily exposed institutions, and result in large capital flows and exchange-rate adjustments.²⁷

Not all macroeconomic imbalances are 'global'. Some are national or regional but may still have consequences for international financial stability. Attracting heightened attention at present is the over-extension of credit to subprime mortgage borrowers in the United States and its ramifications for securities backed by these mortgages. Similarly, some regions in the United States and some countries in Europe may have experienced housing price bubbles. Central and Eastern European countries are also experiencing particularly strong credit growth, which may reflect either healthy financial development and catching up or an over-extension of credit.

2.3.2 Potential shocks

The period of low volatility that prevailed from 2004 to 2007 may be coming to an end. In 2006 and early 2007, there were brief 'spikes' of volatility in international financial markets that quickly subsided without bringing volatility back to the level of the 1980s or 1990s. In July and August 2007 another spike occurred. Although the current episode is not over, it is clear that some major financial institutions were unprepared for it. The broader issue is whether major institutions are prepared for a more permanent return of volatility beyond these spikes. As we have seen, a volatility shock – large, unexpected and sustained – could provoke sharp portfolio adjustments and a disorderly unwinding of positions. Hedge funds

in effect sell volatility, options that assume volatility will stay low. If that assumption were to prove false, it could lead to substantial losses. Chapter 4 extensively discusses volatility developments and risk pricing.

Shocks to the international financial system could come from a sudden re-pricing of risk, through which historically low risk premia and spreads would rise to more normal levels. In the summer of 2007, as this report goes to press, an episode of this kind has occurred, where yields on certain fixed-income securities have notched up. The issue we shall consider is whether the major financial institutions are prepared for such a shock on a larger scale.

Chapter 9 details the tremendous expansion of new financial instruments in recent years. The markets are now huge: for derivatives, mortgage-backed and asset-backed securities, and credit risk transfer instruments (credit derivatives such as collateralized debt obligations and credit default swaps). The volumes are so high that the discovery of any significant mispricing in these markets could have major effects on balance sheets. Many of these assets are priced on the basis of complex models and are held rather than traded, except when liquidation is forced. Even when there appear to be market prices, the markets may be illiquid, and any forced sale could have a large price impact. The question is whether any systemically important institutions are unduly exposed to the risk of repricing or the need to dispose of such assets suddenly.

Yet another type of systemic risk could emerge from a significant reduction in *market liquidity* in international financial markets, itself perhaps provoked by the repricing of complex financial instruments. Such a repricing of complex instruments, asset-backed securities and asset-backed commercial paper, is underway as this Report is being completed. The summer of 2007 liquidity shock (see Box 11.1) followed a series of events in the US subprime mortgage market, described below, that severely disrupted confidence. A shock to market liquidity might also follow the failure of a large and complex financial institution. The recent financial failures or distress of two Bear Stearns hedge funds, a Goldman Sachs fund and Basis Capital, an Australian hedge fund, seem to have propagated the disturbances evident in financial markets, even though none of these was a large complex financial institution.

As we write, the new credit markets are being seriously tested. The liquidity of these markets largely depends on the activity of hedge funds and other major investors. Theoretical 'stress-testing' exercises are useful but not sufficient. As we have seen most recently, a large shock may result in orderly repricing or a small shock may send big waves. Much depends on the accuracy of market expectations as well as the structure of balance sheets.

Given the boom of its stock market and remaining uncertainties about bank balance sheets, there is some reason to fear a *domestic financial crisis in China*. Chapter 6 considers whether such an event could threaten international financial stability.

2.3.3 Transmission channels

There are many ways that financial instability can propagate within the financial system and to the real economy. We can only briefly discuss potential transmission channels for the disturbances mentioned above, focusing particularly on

newly important ones.

The substantial advance of *international financial integration* since the late 1970s affects how global imbalances accumulate and unwind, and the relevance of domestic financial crises for international financial stability. In theory, the impact of financial integration on financial stability is ambiguous. Integration could increase stability by improving risk sharing and enhancing the liquidity of markets. But it may also increase cross-border contagion risks. Which of the two effects dominates is an important question, but an empirical one. This is why we dedicate Chapter 6 to the relationship between cross-border financial integration and international financial stability. The chapter also addresses the systemic importance of China and India and the role of carry trades.

A disorderly unwinding of global imbalances can, and often has, propagated widely. The key question is how the resulting macroeconomic instability would translate into financial instability and its propagation throughout major industrial countries and systemically important emerging market economies. Chapter 3 addresses this.

Financial development also has significant implications for the transmission of financial instability. It leads to a wider spreading of risks in the economy. For example, it gives households access to better but also more risky financial instruments, so that they now share a greater proportion of their risks. The new credit markets allow banks to transfer credit risks to other financial intermediaries (foreign banks, hedge funds, funds of funds, etc.). Some of these intermediaries will pass risks on to institutional and individual investors, including households. The household sector may therefore play a larger role in the transmission of financial instability than before, both as a source of instability and as a channel for its real effects. We therefore dedicate Chapter 7 to household risks.

Since the LTCM episode, particular attention has been paid to the potential role of hedge funds in the transmission of financial instability. Hedge funds face few constraints on their investment strategies and are therefore very diverse. They play a useful role in providing liquidity to capital markets. The flip-side of this positive role is that, in times of stress, hedge funds might help transmit instability by ceasing to provide liquidity. Chapter 10 discusses them extensively.

Many of the new credit markets are particularly dependent on the liquidity provided by hedge funds. Moreover, they play a pivotal role in spreading credit risk among different financial intermediaries. Chapter 9 discusses the role of the new financial instruments.

2.4 International financial stability and the financial markets

Imbalances may induce or reflect asset mispricing. Shocks may provoke sharp changes in asset prices. Transmission mechanisms generalize the repricing and thereby endanger market liquidity, funding liquidity, and macroeconomic liquidity.²⁸ That could generate financial instability with potential systemic implications – and, in an extreme case, financial crisis.

Of course, there may be no significant mispricing, and the markets and major financial institutions may be properly anticipating repricing. Many market participants and analysts feel otherwise, however, and some officials have explicitly

warned the markets to prepare better for repricing. The report assesses the risks to international financial stability in this context.

3 Macroeconomic Imbalances

3.1 The analytical background

A macroeconomic imbalance is an endogenous accumulation of factors that increase the risk of instability. The greater the imbalance, the less the shock required to make it unravel – indeed, an imbalance could endogenously rise to an unsustainable level and unravel without any exogenous shock. This chapter discusses macroeconomic imbalances, the shocks that might make them a source of financial instability, and the ways in which that instability might be transmitted globally.

Financial innovation (discussed in Chapters 9 and 10) should increase resilience to small shocks by diffusing risk. But the associated financial deepening and the incentives it creates for different types of investors²⁹ might increase vulnerability to large systemic shocks such as major changes in asset prices or in aggregate liquidity.³⁰ Macroeconomic imbalances can create such threats to financial stability, especially because linkages across markets have grown more pronounced.

A disturbance arising from macroeconomic imbalances can lead to a sudden fall in liquidity. In particular, the unravelling of macroeconomic imbalances can cause large asset price declines. These in turn can increase default risk, reducing capital market liquidity and creating a downward spiral.

3.2 Causes for concern

Need we worry in the current benign macroeconomic environment? There has been no significant default on sovereign debt since Argentina, over five years ago, and that had no contagion effects. No substantial debtor is currently in major difficulties, and several have even prepaid. Only a few years ago, the IMF seemed seriously overexposed to the combination of Turkey, Brazil, Russia and Argentina. Now its problem is insufficient revenues because of its low level of outstanding loans. A few countries – such as the United States, Hungary, Turkey, Australia, Spain – are running current account deficits at levels that were once deemed dangerously high. But the international capital markets³¹ are financing them, and some policy-makers in these countries suggest their capital account surpluses are actually signs of success. Meanwhile, long-term interest rates have been unusually low for an extended period and spreads on emerging market debt are also at historically low levels. Even the upset in the subprime and certain funding markets

has, to date, left little discernible mark on emerging market economies or the functioning of their financial markets.

Nevertheless, policy-makers are clearly concerned with potential macroeconomic shocks to financial stability, and some fear that the tranquil market conditions may reflect misjudgements. ECB president Trichet has expressed concern that financial markets are not adequately pricing risks such as the possibility of a disorderly unwinding of imbalances in countries' current accounts (*Financial Times* 19 May 2007).

The consensus view among international macroeconomists is that there are serious global macroeconomic imbalances: the US current account deficit and associated exchange-rate misalignments. This perception has led to a focus on these issues in the multilateral surveillance and coordination efforts of the International Monetary Fund and repeated calls for 'action'.³² Other macroeconomic causes for concern about financial stability include: 'excess liquidity' at a global level; the apparently growing carry trade; bubbles in housing markets around the world; and the vulnerabilities of some emerging market economies.

3.3 Are the 'global imbalances' actually an equilibrium?

How can the apparent contradiction between market behaviour, which has been benign, and macroeconomic data, which show large imbalances, be reconciled? Several recent analyses argue that we are observing a configuration that naturally leads to long-term global flows and asset price behaviour that are not 'imbalances'. Rather, they appear as the natural consequence of underlying structural factors in the major countries and the global economy and financial system.

A long historical perspective has led some observers to conclude that 'capital is flowing out of countries with low investment and growth and into the United States and other fast-growing countries' and that this configuration is sustainable over the long term, and not a potential source of macroeconomic instability.³³

To explain the stability, Mendoza et al. (2007) propose a model in which imbalances can be the outcome of financial integration among countries that differ in financial market deepness. Countries with more advanced financial markets accumulate foreign liabilities in a gradual, long-lasting process. This induces a negative correlation between indicators of financial development and current account balances.

Similarly, Caballero (2006) argues that financial underdevelopment in regions that are increasingly important sources of world savings creates local asset shortages, which are generalised by financial globalisation. Global liquidity is abundant and is chasing a limited supply of tradeable assets.³⁴

A key feature of the story is that the United States has a comparative advantage in transforming fixed assets into securities, i.e., in issuing tradeable claims. Hence the capital flow to the United States, its low level of long-run interest rates, and its ease in financing current account deficits. The global shortage of tradeable assets causes asset price bubbles, low inflation (which increases the real volume of financial assets), and speculative valuations. Caballero suggests this is a sustainable equilibrium. Moreover, policies that would force a reduction in asset values (in particular, tighter monetary policy) would simply raise the excess demand for

assets, whose general equilibrium counterpart would be an excess supply of goods – a recession.

A rather different rationale for the current pattern of capital flows and exchange rates is the 'Bretton Woods II' story of Dooley et al. (2004, 2007). They contend that, by maintaining undervalued exchange rates, China and other Asian countries implement an export-led growth strategy while deliberately accumulating dollar foreign exchange reserves as collateral for foreign direct investment. This pattern, they say, will continue for a decade or more.

3.4 Dynamics: structural changes and exogenous shocks

Even if the current macroeconomic 'imbalances' were in fact an equilibrium, that equilibrium might be unstable. Exogenous shocks or structural changes can trigger sharp market corrections, raise volatility, impair liquidity, and thereby threaten highly leveraged large complex financial institutions (LCFIs) or important segments of their portfolios. Consider four types of shock:

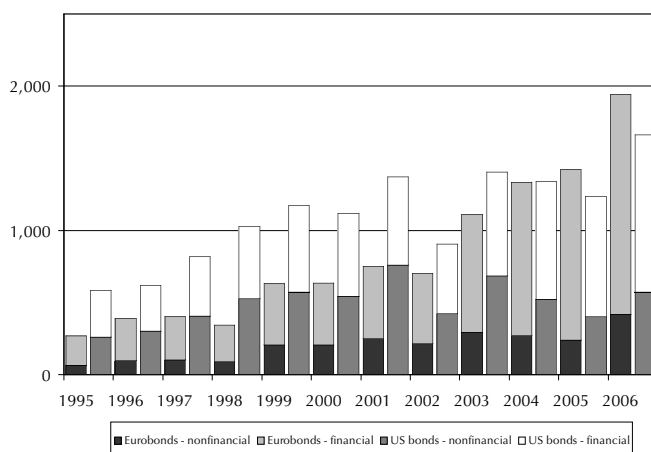
- abrupt exchange-rate changes, possibly due to changes in expectations;
- a shock causing a sudden reversal in the pattern of capital flows;
- a rise in global inflation; and
- a fall in global liquidity.

3.4.1 Abrupt exchange-rate changes

A key issue for global stability is the likely speed of exchange-rate adjustment and the danger of overshooting. The dollar depreciation that began in February 1985 was large – about 27% in real effective terms – but spread out over almost three years. It was a steady decline, with no sudden plunge that shook markets, although the current account did not return to equilibrium until 1991. There is no obvious link between this process and the stock market crash of October 1987.

Obstfeld and Rogoff (2004, 2005) argue that the US current account is unsustainable, and that a substantial, possibly abrupt, exchange-rate depreciation will occur as a result. But they do not give any dynamics. Blanchard et al. (2005) and Gourinchas and Rey (2006) set out gradual paths towards US current account sustainability. Neither gives a scenario for an abrupt shift, but Blanchard et al. point to the elasticity of substitution between domestic and foreign assets as the key parameter determining the speed of adjustment. If that elasticity is high – or rises significantly – exchange rates will change more rapidly (and, inferentially, a shock is more likely to provoke a sharp adjustment).

The elasticity of substitution between euro-denominated and dollar-denominated assets is likely rising (Papaioannou and Portes, 2007). Since 1999, the euro-area markets have gained substantial liquidity, and Europe now offers assets and asset markets that are highly competitive with the United States. Both the euro area and the UK have large, deep and liquid asset markets. Increased regulation in the United States (e.g. the Sarbanes-Oxley) might have further improved the relative competitiveness of European financial markets.

Figure 3.1 Corporate issuance in the US bond market and the Eurobond market (US\$ billion)

Source: Thomson Financial Securities Data Corporation.

Note: Figures exclude asset-backed issues.

Figure 3.2 The trade-weighted dollar (Jan 1997 = 100)

Source: Board of Governors of the Federal Reserve System

Notes: A weighted average of the foreign exchange value of the US dollar against the currencies of a broad group of major US trading partners. Broad currency index includes the euro area, Canada, Japan, Mexico, China, United Kingdom, Taiwan, Korea, Singapore, Hong Kong, Malaysia, Brazil, Switzerland, Thailand, Philippines, Australia, Indonesia, India, Israel, Saudi Arabia, Russia, Sweden, Argentina, Venezuela, Chile and Colombia. For more information about trade-weighted indexes see http://www.federalreserve.gov/pubs/bulletin/2005/winter05_index.pdf.

The euro-area government debt market is larger than that of the US. Although the US corporate bond market is much larger than the euro corporate market, corporate new issuance in euros exceeded that in dollars in 2005–6 (Figure 3.1). Euro-area securities markets offer lower transactions costs and in some cases (e.g. for corporate bonds) tighter bid-ask spreads than those in the United States (Biais et al., 2006). A change in market and central bank perceptions of the euro asset markets could induce a sudden portfolio shift and a sharp exchange-rate adjustment.

In the benign scenarios with gradual adjustment, the path is expectations-consistent, and that is fundamental to such a story. Such a path might have begun in May 2004 – but if so, why did the dollar depreciation reverse in 2005, only to resume in 2006? (See Figure 3.2.) These reversals might be explained by unex-

pected shifts in monetary policy, but then how can market participants believe they are on the smooth path postulated by theory? And if the process does last for a decade or more, the US net debt will rise continuously, and the income balance in the current account will deteriorate, adding to the trade deficit. As Eichengreen (2006) points out, 'The indefinite maintenance of a current account deficit of 7.5% of GDP by a country whose rate of nominal GDP growth is 5% (3% real growth plus 2% inflation) implies an eventual ratio of net external debt to GDP of 150%.' It is unlikely that this would be consistent with financial stability.

A gradual path must be expectations-consistent (a 'rational expectations path') and must compensate holders of dollar-denominated assets for the currency depreciation with higher real returns. But this is not so – the long-term real interest rate differential between dollar and euro is under 1% and has been so for some time. One interpretation is that investors are myopic and are not taking account of the long-run requirement of dollar depreciation. But that then opens the door for a bad scenario, which Krugman (2007) calls a 'Wile E. Coyote moment'. At some point, market participants will realise that the dollar must fall further and faster than they expected – and it will. Then US interest rates will rise sharply – short rates because policy-makers will want to limit the fall, long rates because inflation expectations will rise and investors will move out of dollar assets. In this 'sudden stop', the exchange rate might overshoot. Central bank behaviour (e.g., a move to diversify out of dollars or a surprise change in policy rates) could create a shock that provokes such a change in expectations.

One can extend this scenario. The rise in interest rates would exacerbate the problems in the US mortgage and housing markets. Equity prices would likely fall and credit spreads would rise. US firms would face a higher cost of capital, but the exchange rate depreciation would alleviate the strains. So the main risks to financial stability would come from capital markets (e.g., a stock market crash, bond market turmoil similar to 1994, or subprime lending problems that spread to other sectors). For Europe, the risk would perhaps relate less to capital markets and more to credit and banking. Some of the capital flows would go to Europe, and the euro would appreciate. The real effects would be less severe if the unravelling came during the current upturn. The financial effects might be more limited, since the credit risk transfer markets still play a limited role in Europe.

Abrupt exchange-rate changes could reverse the carry trade, and the consequent capital flows could accentuate exchange-rate movements. That might, however, be endogenous. Plantin and Shin (2006) show that under reasonable assumptions, carry trades can generate large, persistent deviations of price from fundamentals (and in particular, the failure of uncovered interest parity). And they find that the exchange-rate dynamics for the high-yield currency exhibit a pattern of slow appreciation punctuated by sharp depreciation, known in the markets as 'going up by the stairs, coming down in the elevator'. But the long side of the carry trade is now spread over several currencies; it is not just yen into dollar, as in 1998. And note that in October 1998, although the yen appreciated 13% against the dollar in three days, and liquidity dried up in some key markets, there were minimal real effects, partly because policy intervention was swift and effective. Chapter 6 discusses the carry trade further.

It is important to recognize that a gradual correction carries its own risks. A slow depreciation of the dollar might leave the United States with a dangerously high

level of external debt. Any prolongation of the adjustment process also raises the threat of a protectionist American response to continuing trade deficits. And a serious slide into protectionism, which might be formalized in legislation, could be highly disruptive to trade and to financial markets. There is a more direct threat to financial markets from 'asset protectionism'. Countries accumulating large holdings of foreign exchange reserves are increasingly looking to move out of low-yielding bonds into real assets (FDI, equity investments), using 'sovereign wealth funds' as their investment vehicles. But the United States and some European countries, concerned about the opaque nature of these funds and their political control, may seek to restrict the ability of such creditors to operate in their markets.³⁵

3.4.2 Potential shocks and structural changes

A formal model can identify specific parameters that determine the direction of flows and associated exchange-rate and interest rate behaviour. The analysis of Caballero et al. (2007) exhibits interactions between two regions in the global economy, the United States and emerging market countries (with a focus on Asia and oil exporters). The framework can be extended by adding a third region, Europe. As suggested above, the US on net supplies financial assets and the emerging market countries demand them. Fast growth in the latter, coupled with their inability to generate sufficient local financial instruments, increases their demand for saving instruments from the United States. The 1997–8 Asian crisis and gradual global integration of the emerging market economies generate capital flows towards the US, contributing to the US current account deficit, reducing global real interest rates, and boosting the share of US assets in global portfolios. These are equilibrium phenomena. The US exchange rate initially appreciates and then depreciates, very gradually.

The key parameters are the levels of financial development (proxied by equity market indices), aggregate savings ratios, and output growth rates. The authors conclude that 'a substantial growth speed up in Europe and Japan, or a sudden shift in [the emerging market region's] appetite for its own financial assets (as could happen with the emergence of local bubbles), would lead to a sharp reversal in capital flows, interest rates and exchange rates. One could also go outside the model and add a credit-risk concern with US [growing] liabilities to generate a more harmful reversal...'

Other shocks could also generate an abrupt reversal of capital flows, with potential financial stability implications (to the extent that market participants are not fully hedged).

Accelerated financial market development in the emerging markets, which increases their supply of financial assets, would raise their interest rates, causing declines in US asset values and consumption and an improvement in the US current account position. There would be a sudden appreciation of emerging market real exchange rates relative to the dollar, followed by a gradual depreciation. A fall in savings in the emerging market region would have similar effects.

If the growth rate in Europe were to rise relative to the United States, then the emerging market capital outflows would be diverted towards Europe. If emerging market growth rates were to fall, then their capital outflows would fall as well.

Similarly, if financial development in Europe were to surpass the United States, again the capital flows to the United States might fall sharply. A sharp rise in emerging market country stock markets (Shanghai, Sensex, ...) relative to Wall Street is equivalent to accelerated emerging market financial development.

A rise in US savings (say because of a housing market crash leading to a cut in consumption) could also reverse capital flows. It would increase the demand for financial assets, leading to a decline in equilibrium interest rates, and possibly a reversal of capital flows.

Barring highly unusual circumstances, none of these parameters changes sharply and abruptly (except in a domestically generated financial crisis, say arising from a true housing crash in the United States). A more likely possibility is a sharp change in market expectations. This could be provoked by a sudden realization that financial development (corporate governance, property rights protection, etc) is improving rapidly in the emerging markets or Europe; that an investment boom is picking up in the emerging markets or that their savings are finally falling (or, say, a fall in the oil price); that growth rates are falling in the United States relative to Europe; or that asset prices (e.g. housing) are falling in the United States. Shifts such as these are the macro shocks that could lead to a sudden, possibly disorderly, unwinding of the current 'global imbalances', with possible consequences for financial markets and financial stability.

3.4.3 A rise in global inflation, a fall in macroeconomic liquidity

A noticeable increase in inflationary pressures would raise volatility and provoke central bank responses. The sources might be oil and gas markets; or emerging market exchange-rate policies and the inability to sterilize foreign exchange market intervention fully. Central banks' concern might further lead to a policy-induced contraction in global macroeconomic liquidity, as rises in policy rates cause reductions in central bank liquidity supply.

A fall in macroeconomic liquidity (as measured by money and credit relative to GDP or excess *ex ante* savings) will reduce funding liquidity and hence trading activity and market liquidity. A fall in funding liquidity could prick asset price bubbles, and a fall in macroeconomic liquidity could contribute to the repricing of risk.

Are housing markets especially vulnerable? Chapter 7 discusses this. Some countries seem to have high housing price levels relative to fundamentals, partly because of easy mortgage finance. In those countries, a rise in nominal interest rates would threaten household finances and housing markets. Still, in several of the countries concerned, the phenomenon has been geographically localised (London, Boston, New York, Miami, San Francisco); and some countries have not had the boom at all (e.g., Germany, Japan, Switzerland). Both observations suggest that the house price boom is not simply a consequence of excess global liquidity, so that a global liquidity shock need not have a widespread impact on housing markets.

3.5 Emerging market vulnerabilities

This report considers at length only two emerging market countries, which we regard as 'systemically important', China and India. Because significant financial market disturbances have occasionally arisen from countries that were not 'systemically important' – e.g., Russia in 1998 – it is worth briefly noting emerging market vulnerabilities.

The fundamental emerging markets problem currently is the 'classical' capital inflows problem, compounded in some countries by high current account surpluses. It is an example of the inconsistent triad of fixed exchange rates, open capital markets, and monetary policy autonomy. If the authorities allow exchange-rate appreciation, there will be a slowdown in exports and growth. But pegging the currency leads to inflationary pressures. It is hard to implement capital inflow controls (Thailand). Sterilisation is only partly effective and has costs. Many countries are now back to effectively pegging against the dollar. In consequence, some, especially in East Asia (but also perhaps India, Argentina, some other Latin American countries and some GCC countries), are accumulating domestic imbalances – in particular, inflationary pressures and asset price bubbles – along with their rising international reserves. And some emerging market countries (e.g. in Central and Eastern Europe – Estonia, Latvia, Bulgaria, Romania, Hungary) have high current account deficits covered by even higher capital inflows.

Nevertheless, the fundamentals – fiscal positions, debt (domestic and foreign), current accounts (most emerging market countries) and reserves – are generally good: there has been substantial financial market development – e.g. foreign entry into domestic currency bond markets.

The current exceptionally low spreads on emerging market debt could rise sharply if risk appetite falls or if US long rates rise. Still, those spreads are so low relative to even recent historical levels that there is substantial room for increases without causing significant problems for the major emerging market countries. And it can be argued that the current low level of spreads is justified by the fundamentals: not just low US rates, but also substantial improvements in emerging market country current accounts, fiscal balances, and foreign exchange reserves. Nevertheless, several countries (such as Hungary and Turkey) with substantial current account deficits, apparently-overvalued real exchange rates, high fiscal deficits and housing bubbles do look vulnerable. And contagion effects – the proclivity of investors to stampede en masse out of sound emerging markets when less stable markets encounter difficulties – remain possible.

A volatility shock would widen emerging market spreads and reverse current flows into their bond markets, clearly a problem for countries with large current account deficits. There was a shock to those countries in spring 2006, and Turkey suffered a 20% exchange rate depreciation over a few weeks. This was coupled with a sharp spike in various measures of volatility globally. This subsided very quickly, as did the 'Shanghai shock' and volatility spike of February 2007, which is reassuring.

3.6 Propagation of shocks and responses to them

This report discusses financial integration in detail below. Although it is difficult to see how cross-border flows could be a source of disturbances, they may be a mode of transmission.

The good news is that financial innovation in the globally integrated markets has brought a wider range of assets and risk diversification. Markets are much larger, more liquid, and therefore more resilient. Increased liquidity, greater availability of information and more competition should lead to better pricing, although there is room for substantial doubt regarding the pricing of complex new instruments.

The bad news is that financial integration naturally brings more spillovers (e.g., the global activities of hedge funds). The rise in foreign assets and liabilities and closer connection of asset prices entail more contagion risk. Domestic banks may be induced to take more risks to compete with foreign banks. And there are the dangers of excessive capital inflows and lending, followed by a sudden stop, especially worrisome if there is a lot of short-run, foreign-denominated debt.

Financial integration and development have increased the substitutability between domestic and foreign assets. Capital flows are therefore more sensitive to changes in interest rates and shocks to expectations (conversely, the interest rate premium needed to sustain flows is lower). A shift in capital flows not originating from an interest rate shock could have significant effects on rates. For example, Warnock and Warnock (2006) and Frey and Moec (2005) estimate that foreign inflows into the US Treasury market reduce long yields by as much as 115–150 bp.

3.7 Conclusions

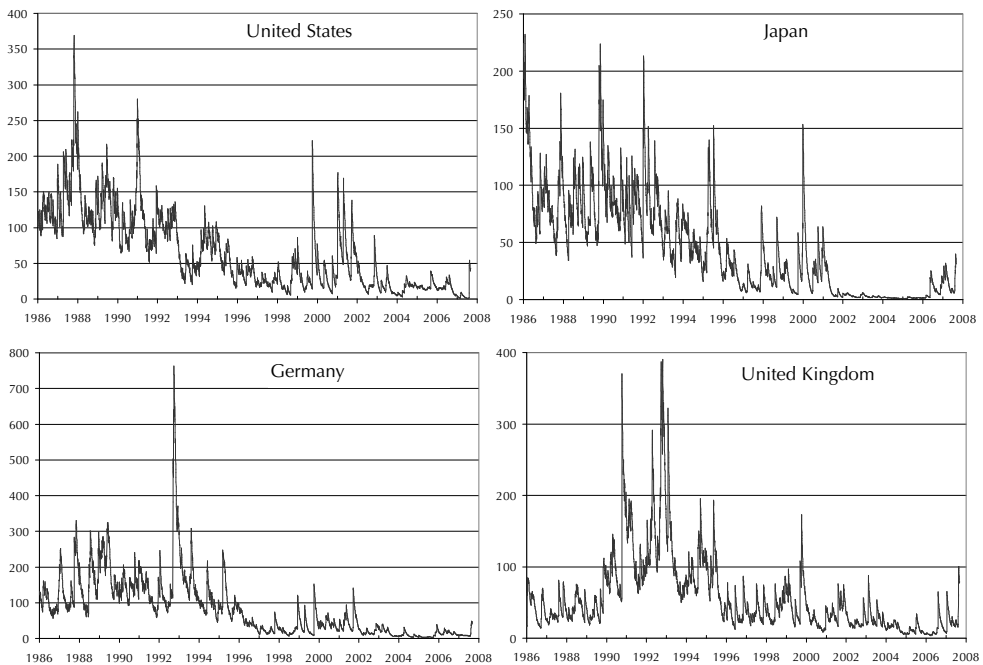
Macroeconomic imbalances such as the present configuration of current accounts and exchange rates can endanger financial stability. The systemic risks posed by a fall in macroeconomic liquidity, a reversal of the carry trade, deflation of housing market bubbles, and emerging market vulnerabilities, though less of a concern, cannot be ignored.

The existing pattern of current accounts and exchange rates may persist for a while longer. But we believe it is not sustainable indefinitely. The inevitable dollar depreciation and changes in capital flows may be gradual. Sharp changes in market expectations or perceptions could, however, cause abrupt changes in exchange rates and interest rates and a 'sudden stop' of capital flows to the United States. These in turn could be associated with abrupt and broad-based asset price declines. The variables to watch are financial development in the emerging markets and in Europe, the savings-investment balance in emerging markets, and relative growth rates in the United States, Europe and Japan. Even if these variables move gradually, market views on them can shift suddenly, which could create international financial instability.

4 The Decline of Financial Volatility

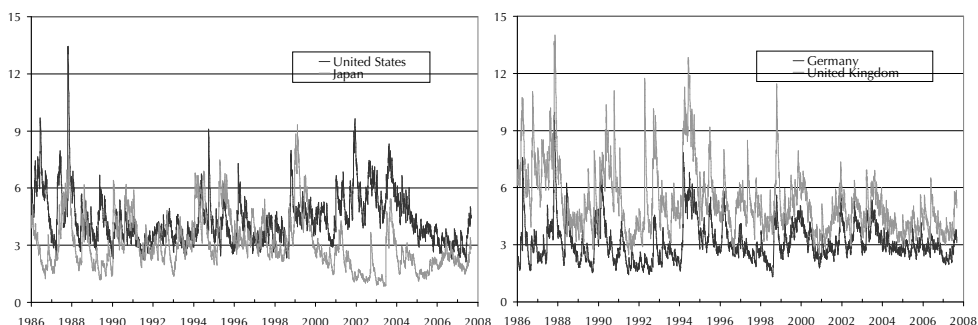
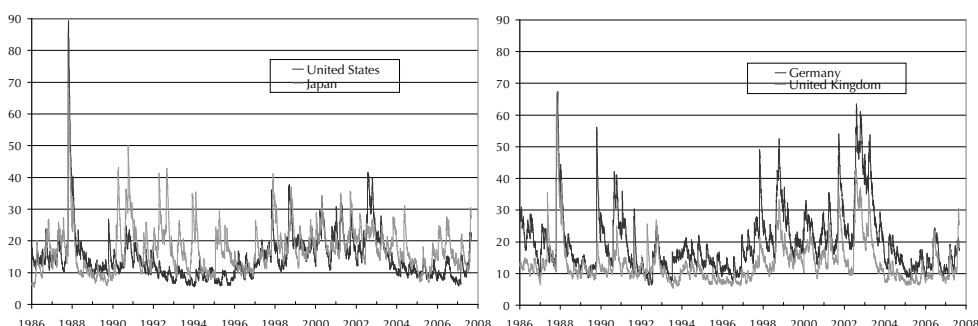
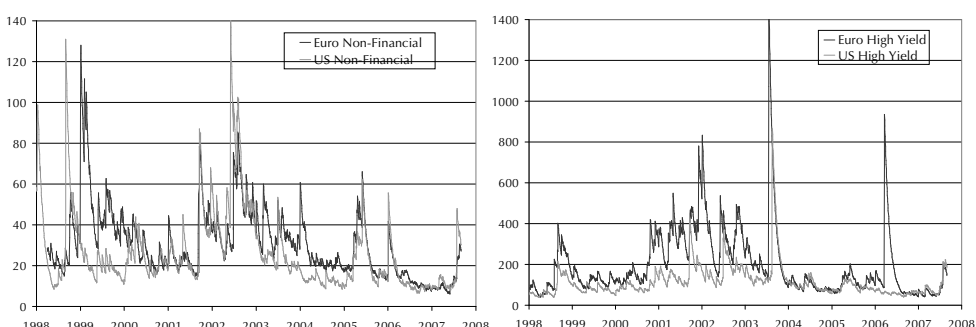
The two most common measures of financial volatility are *historical volatility*, computed based on past price movements, and *implied volatility*, a forward-looking measure computed based on current option prices.³⁶ These measures, although computed in distinct ways, tend to move in tandem because a jump in the value of a given asset often conveys important information about its future volatility that is captured in option prices. Due to data availability, this chapter refers mainly to historical volatility. As shown below, its main conclusions hold for implied volatility as well.

Figure 4.1 Volatility of short-term rates



Source: Based on Bloomberg data.

Notes: Annualized daily volatility of yield changes (in basis points), estimated as an exponentially-weighted moving average according to RiskMetrics™ methodology.

Figure 4.2 Volatility of long-term bonds, equities and corporate spreads**a) Long-term government bonds****b) Equities****c) Corporate spreads**

Sources: Based on FTSE, JPMorgan Chase, Merrill Lynch, Standard & Poor's and national stock exchange data.

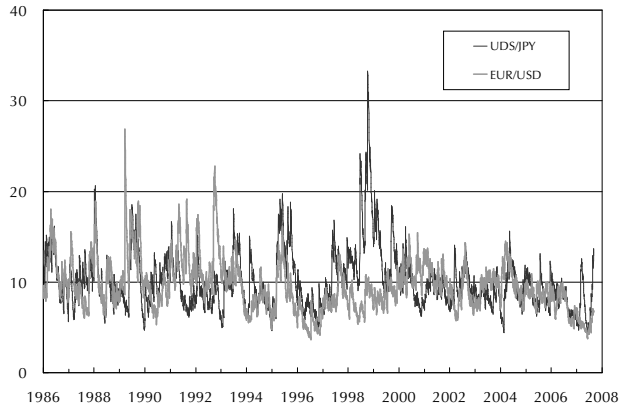
Notes: Annualized daily volatility of bond and stock returns (in percentage points); and annualized daily volatility of changes in corporate yield spreads (in basis points). Estimated as an exponentially-weighted moving average according to RiskMetrics™ methodology.

4.1 The recent decline of financial volatility³⁷

In the past three years, the volatility of short-term interest rates, long-term bonds, stocks, exchange rates and corporate spreads has been below the historical norms of the previous two decades. The volatility of short-term interest rates reached 20-year lows in all the main currency areas (see Figure 4.1), while the drop in the volatility of bond and stock markets has been less pronounced (see Figure 4.2). In

the foreign exchange market the reduction in volatility has clearly emerged only since the summer of 2006 (see Figure 4.3). The decline in equity volatility has been sustained in some countries (e.g., the United States and Germany), but more transitory in others (e.g., the emerging market economies, as shown in Figure 4.4).

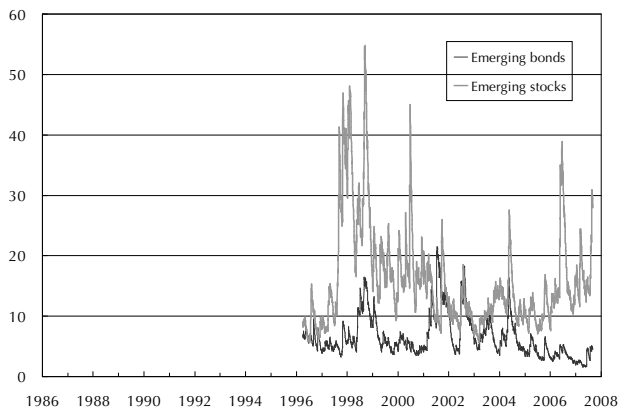
Figure 4.3 Volatility of exchange rates



Sources: BIS, Bloomberg, Citigroup and MSCI data. Annualized daily volatility of exchange rates (in percentage points).

Note: Daily volatility is estimated as an exponentially-weighted moving average according to RiskMetrics™ methodology.

Figure 4.4 Volatility of emerging market securities



Sources: BIS, Bloomberg, Citigroup and MSCI data. Annualized daily volatility of securities returns (in percentage points).

Note: Daily volatility is estimated as an exponentially-weighted moving average according to RiskMetrics™ methodology.

Table 4.1 The decline of financial market volatility in the main currency areas and asset classes ⁽¹⁾

(daily data; percentage points, percentages and p values)									
Average volatility ⁽²⁾			Percentage decline in volatility	Has the distribution of volatility changed?		Volatility lower than current percentile ⁽⁵⁾	Average volatility in recent periods of market turbulence ⁽²⁾		
Previous volatility (Jan. 1986 – June 2004)(A)	Current volatility (July 2004 – August 2007)(B)		(1-B/A)*100	Are distributions equal? ⁽³⁾	Is current volatility lower than previous volatility? ⁽⁴⁾		May 9 – June 13 2006	February 27 – March 14 2007	July 10 – September 4 2007
3-month interest rates									
USA	72.9	15.4	78.9	no [0.00]	yes [0.00]	9.7	16.9	6.2	20.3
Japan	51.2	6.6	87.0	no [0.00]	yes [0.00]	18.1	18.7	26.8	17.3
Germany	94.9	10.5	88.9	no [0.00]	yes [0.00]	4.9	16.7	9.3	22.5
Equity markets									
USA	15.4	10.4	32.8	no [0.00]	yes [0.00]	22.0	11.0	13.9	17.7
Japan	18.1	14.9	17.7	no [0.00]	yes [0.00]	34.9	18.2	17.6	17.6
Germany	20.8	13.7	34.1	no [0.00]	yes [0.00]	24.1	19.5	14.5	18.7
Long-term bond prices									
USA	4.5	3.5	21.3	no [0.00]	yes [0.00]	26.1	3.2	3.5	4.4
Japan	3.2	2.1	35.6	no [0.00]	yes [0.00]	20.1	2.8	1.8	2.7
Germany	3.2	2.8	12.2	no [0.00]	no ⁽⁶⁾	42.9	3.2	2.4	3.4

Sources: Based on BIS, Bloomberg, FTSE, JPMorgan Chase, Standard & Poor's and national stock exchange data.

Notes: (1) Annualized daily volatility, estimated as an exponentially weighted moving average, according to RiskMetrics™ methodology. (2) For money markets, volatility of changes in interest rates (in basis points). For bond and stock markets, return volatility (in percentage points). (3) Wilcoxon test. In square brackets there is the probability of being wrong in rejecting the hypothesis that previous volatility (pre July 2004) and current volatility (post July 2004) are drawn from the same distribution. (4) Kolmogorov-Smirnov test. In square brackets there is the probability of being wrong in accepting the hypothesis that current volatility is lower than past volatility. (5) Percentage of observations between January 1986 and June 2004 in which volatility was lower than its current average level. (6) Within the sample period it can be rejected neither the hypothesis that current volatility is lower than past volatility nor the hypothesis that current volatility is higher than past volatility.

Table 4.1 compares the level of volatility from July 2004 to September 2007 ('current volatility') with volatility in the period January 1986-June 2004 ('previous volatility'). Daily volatility of short term interest rates, in basis points, dropped from 95 to 11 in Germany, from 51 to 7 in Japan and from 73 to 15 in the United States. In the 1986–2004 period, money market volatility was lower than current volatility only 5% of the time in Germany, 10% of the time in the US and 18% of the time in Japan. Formal statistical tests confirm that a decline in money market volatility occurred.

The decline in the volatility of equities ranges from 18 percent in Japan to about 33 percent in the United States and Germany. Even controlling for the level of returns, this decline has been pronounced in Germany (25%). Current volatility lies around the first quartile of the distribution of volatility in the previous twenty years in the United States and Germany while in Japan it is around the 35th percentile.

For long term bonds the decline in volatility has been less pronounced (12% in Germany, 21 percent in the United States and 36% in Japan). As a percentile of its historical distribution, current volatility is low in Japan and the United States (around the first quartile in both cases), while it is only slightly below previous levels in Germany.³⁸

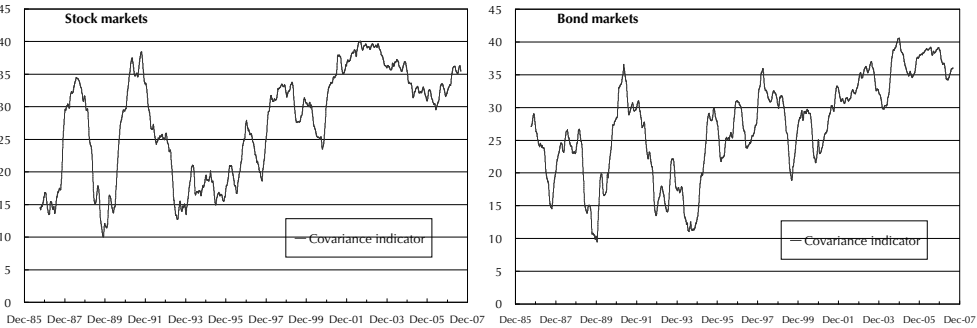
In the three years to September 2007, international financial markets have registered three periods of turbulence: in May–June 2006, when the turmoil was triggered by concerns about inflationary pressures and ensuing uncertainty about the amount of monetary tightening; in February–March 2007, after a sharp decline in the Chinese stock market and concerns about potential spillovers from the US subprime mortgage market to other sectors of the financial system; and commencing in July 2007, again driven initially by concerns about the US subprime mortgage market. In the first two episodes, volatility rose, but the increase was short lived and the levels reached were generally well below those of the previous two decades.³⁹ The third period of turbulence continues as we write this report and it is too early to know whether the increase in volatility will be short-lived.

Overall, the data suggest that the new level of financial volatility is generally low but not exceptionally low in any specific market or asset class (money markets being an exception). The distinguishing feature of the past three years – which may be considered a period of 'financial quiescence' – is that financial volatility has been low simultaneously across different asset classes and markets. While the pattern of volatility differs somewhat across countries, a similar behaviour has emerged in both industrial and emerging market economies.

Is the volatility of global portfolios also lower? The answer is not as obvious as it might seem. The impact of the fall in volatility observed at the individual country/asset level on the variation of returns experienced by investors holding global portfolios may have been offset by the increased tendency of domestic bond and stock markets to co-vary (see Figure 4.5).⁴⁰ The volatility of an equally-weighted bond-equity international portfolio, an indicator often used by practitioners, suggests that global volatility is low, but at a level broadly comparable to that observed in the mid-1990s (see Figure 4.6). Hence, in order to isolate the behaviour of global volatility it is necessary to examine indicators that are not affected by covariances.

Figure 4.7 reports indicators of the volatility of global portfolios that are, by

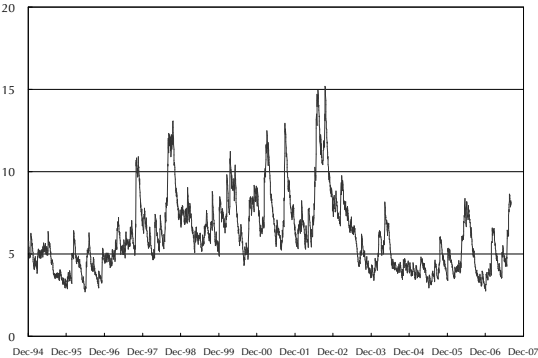
Figure 4.5 Co-movements in global stock and bond markets (in %)



Sources: Based on FTSE, JPMorgan Chase, Standard & Poor's and national stock exchange data.

Notes: Each graph shows the proportion of the global bond or equity portfolio variance which is due to covariances between the domestic markets included in the portfolio. Global portfolios are equally weighted portfolios of benchmark indices for the United States, Germany and Japan.

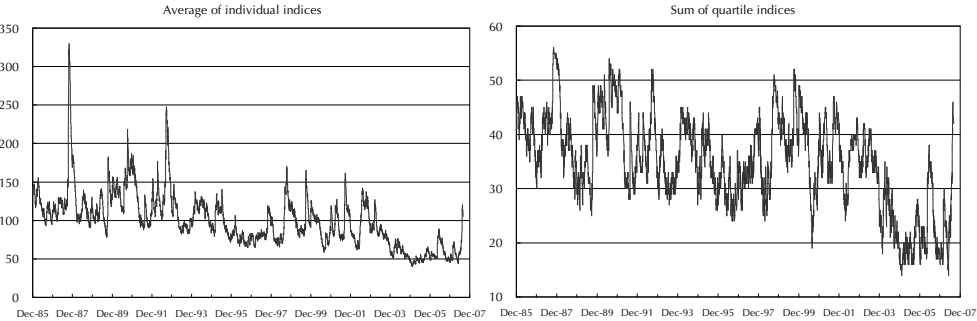
Figure 4.6 Volatility of global portfolios⁽¹⁾



Sources: EFFAS, FTSE.

Notes: (1) Annualized daily volatility of an equally weighted bond-equity international portfolio including the FTSE global stock index and the EFFAS global bond index, in percent.

Figure 4.7 Global volatility indices⁽¹⁾



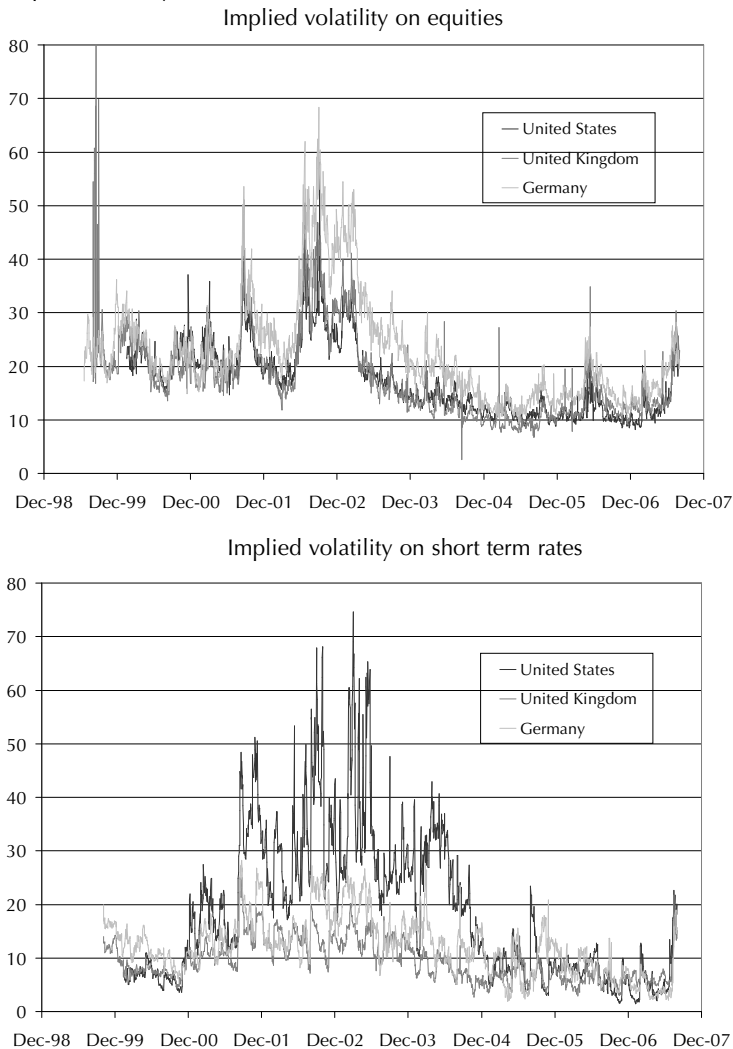
Sources: Based on BIS, Bloomberg, FTSE, JPMorgan Chase, Standard & Poor's and national stock exchange data.

Notes: (1) On the left hand side, simple average of the daily volatility indices of 14 financial markets (for each index, sample period = 100). The 14 markets are the bond, money and stock markets of five countries (Germany, Japan, Switzerland, UK and US), where the Swiss bond market is excluded due to poor data availability. Daily volatility is estimated as an exponentially weighted moving average according to RiskMetrics™ methodology. On the right hand side, sum of quartile indices of the daily volatility of the above mentioned 14 markets. On any given day, each quartile index takes a value from 1 to 4 depending on the quartile of the sample distribution daily volatility belongs to. By construction, the global quartile volatility index ranges between 14 and 56.

construction, unaffected by the changing pattern of covariance among individual markets.⁴¹ These indicators confirm that the volatility of global portfolios has been subdued in recent years, in spite of closer co-movements of domestic markets. In other words, although higher correlations among world markets have tended to increase the volatility of internationally diversified portfolios over the past two decades, in the most recent period, this increase has been dominated by the pronounced decline in the volatility of individual markets.

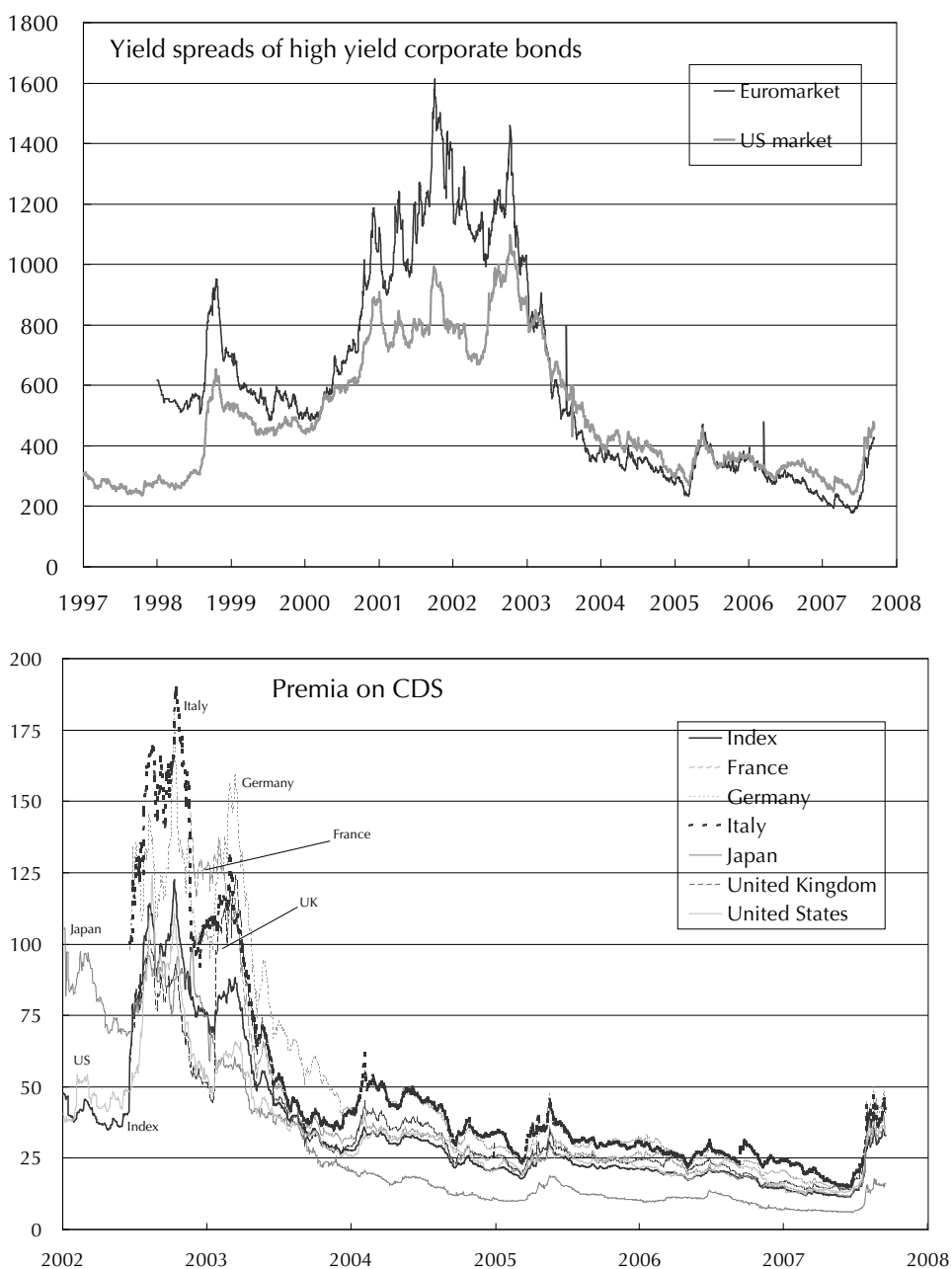
The previous figures used measures of historical volatility because longer time series are available for these data. However, the drop in financial volatility in recent years is also detectable from forward-looking measures such as implied volatility. This is shown for equities and short-term rates in Figure 4.8. Similar results hold for other asset classes such as bonds and currencies.

Figure 4.8 Implied volatility⁽¹⁾



Source: Bloomberg, CME, Dax, FTSE, Liffe and Standard & Poor's.

Note: (1) Percentage points

Figure 4.9 Credit risk premia (1)

Sources: Based on Merrill Lynch, Bloomberg and Thomson Financial data.

Notes: (1) Daily data. Basis points. As for the CDS premia indices at the country level, simple average of the premia on 5 year CDS written on the senior debt issued by large financial and non financial companies; premia are denominated in dollars for the United States, in yen for Japan and in euro for the other countries. The CDS premia index is the simple average of the country indices.

4.2 Risk premia have also fallen

Another feature of the recent period of financial quiescence is the low level of risk premia. Term premia are near their lowest values since the 1960s in most markets (see Figure 5.8). Credit risk premia are also very low: Figure 4.9 shows that the reduction has been particularly pronounced for high yield bonds and for the CDS market. Even during the turbulence of the summer of 2007 credit risk premia have remained well below the levels reached in 2001–2. The next chapter explores why markets have become less volatile.

5 Why Has Financial Volatility Declined?

5.1 Introduction

Firm empirical evidence is still lacking on what caused volatility to decline in the past three years and whether the decline is permanent. This section analyses potential real, financial and monetary policy explanations for the drop in volatility. It then considers why the low-volatility regime may be temporary and discusses the potential financial stability implications of renewed financial volatility.

5.1.1 The ‘good luck’ hypothesis

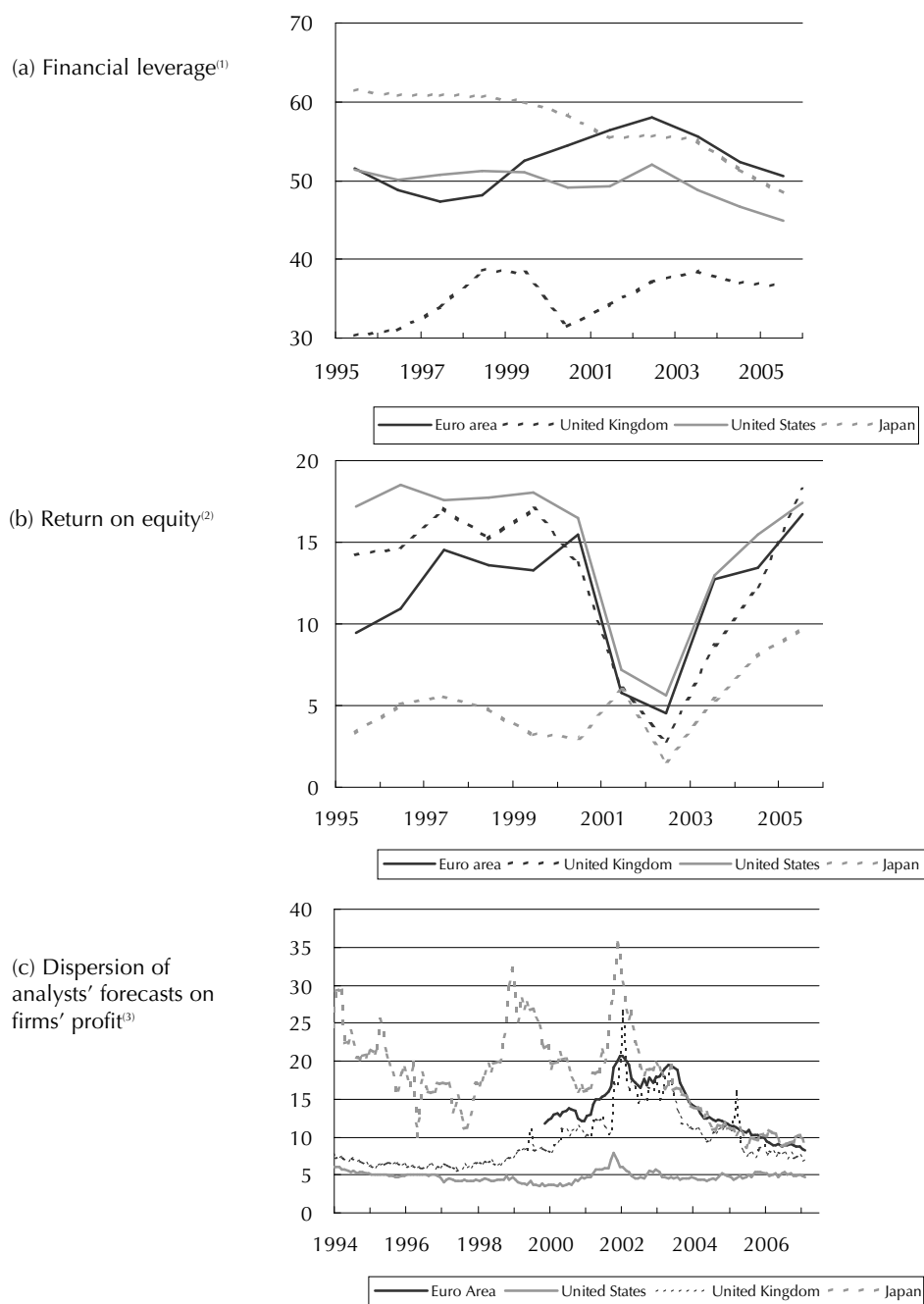
One possible explanation for the drop in asset price volatility observed since 2004 is that the intensity and frequency of economic, geopolitical and natural shocks have declined. According to this view, financial market stability reflects good luck rather than a change in financial fundamentals.

This assertion is not easy to prove or disprove. However, casual observation of the events of the past few years does not seem to support the ‘good luck’ hypothesis. Since the summer of 2004 (the start of low volatility in most markets), the global economy has been hit by a number of adverse shocks: natural disasters such as US hurricanes and East Asian earthquakes and tsunami; terrorist attacks; war; and large and persistent energy price increases. The financial sector has also sustained significant shocks such as the bankruptcies of Delphi Corporation and Refco (the third-largest in US history), rating downgrades in the US auto industry and the recent failure of Amaranth, whose \$6 billion in losses set a new record for hedge funds. Volatility spiked briefly after several of these events, but then reverted to its previous low level. Hence, the notion that the recent drop in volatility reflects the absence of significant macroeconomic and financial shocks in recent years seems dubious.

5.2 Real factors

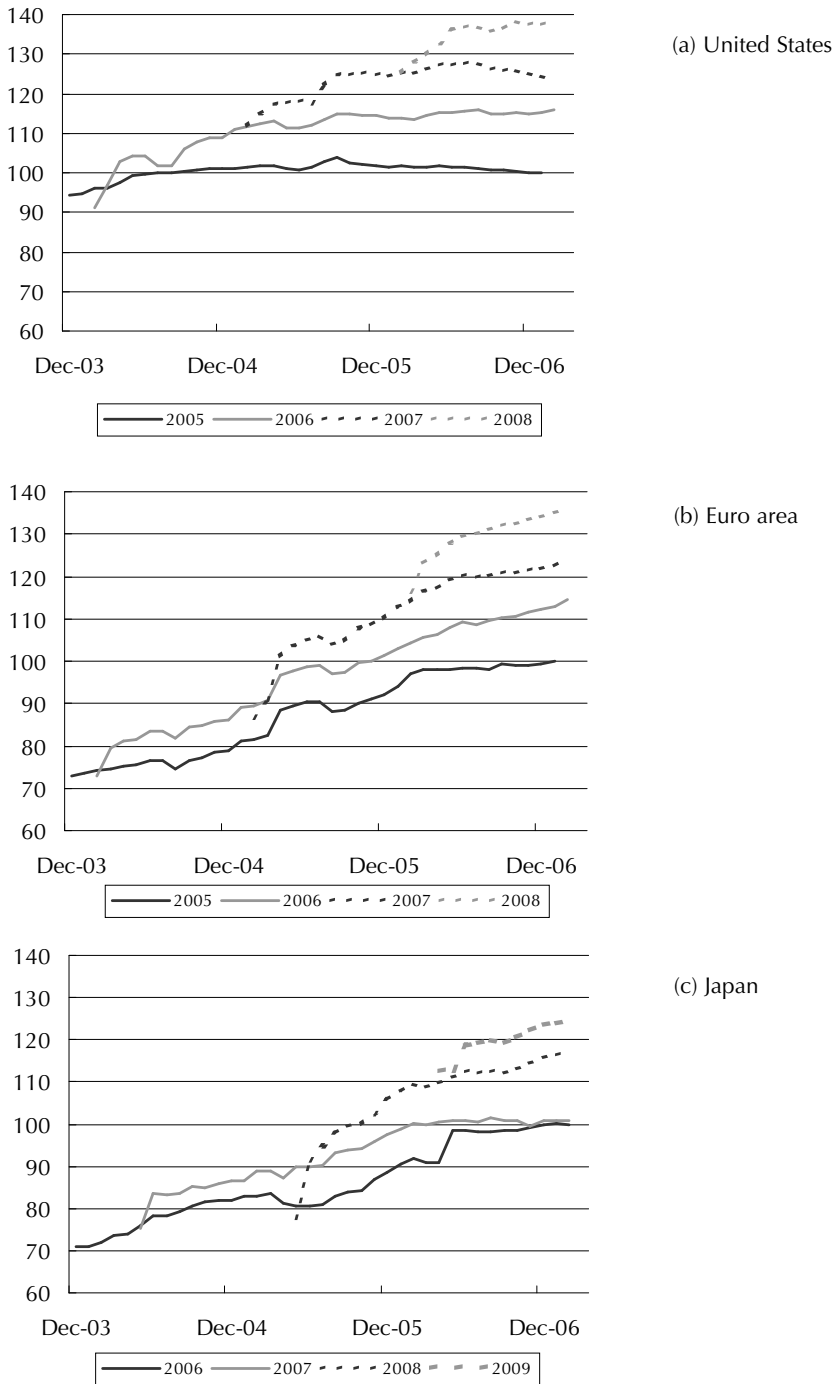
5.2.1 Cyclical macro factors

There is sound evidence that financial volatility is typically countercyclical.⁴² This is due above all to cyclical variation in the volatility of fundamentals that affect the variability of expected returns (the risk-free rate and the risk premium; see

Figure 5.1 Profitability and leverage of non-financial firms in the major countries

Notes: (1) Ratio of financial debt and equity, calculated at book value; sample of non-financial companies that represent approximately 90% of the market capitalization of their respective markets. Observations with negative equity value are excluded. (2) Return on equity is the ratio of net profits to end-of-year equity, calculated at book value. Observations with negative equity are excluded. (3) Cross sectional standard deviation of financial analysts' forecasts as a proportion of the mean forecasts for one-year-ahead earnings. Data refer to the S&P500 for the US and to the respective MSCI indices for the other countries.

Figure 5.2 Expected growth of earnings of listed companies⁽¹⁾



Source: Based on I/B/E/S data.

Notes: (1) Indexes, 2005=100 (for Japan, 2006=100). The graph shows actual and expected total earnings for each year. Data refer to companies included in the S&P 500 for the United States and in the respective MSCI indices for the other countries.

Schwert, 1989). However, the variability of fundamentals is not sufficient to explain the cyclical pattern of volatility (Bekaert et al., 2005). Other common explanations of the countercyclical behaviour of financial volatility relate to the cyclical variation of risk aversion, which affects risk premia⁴³ and the tendency for investor uncertainty about fundamentals to increase when the economy is weak (Veronesi, 1999). Whatever the mechanism, the world economy's prolonged expansion and low inflation have clearly contributed to the recent fall in financial volatility.

5.2.2 Strong balance sheets and improved profitability

Firm-specific characteristics also help explain stock price volatility.⁴⁴ Studies have found that volatility is lower for firms with lower leverage, higher profitability and less uncertainty about future profits.⁴⁵ Consistent with these findings, since 2003, as non-financial companies have de-leveraged and grown more profitable (see Figure 5.1, panels a and b and Figure 5.2) and their profits have become more predictable (see Figure 5.1, panel c), stock returns have become less volatile.

5.2.3 Secular increase in economic stability: the 'great moderation'

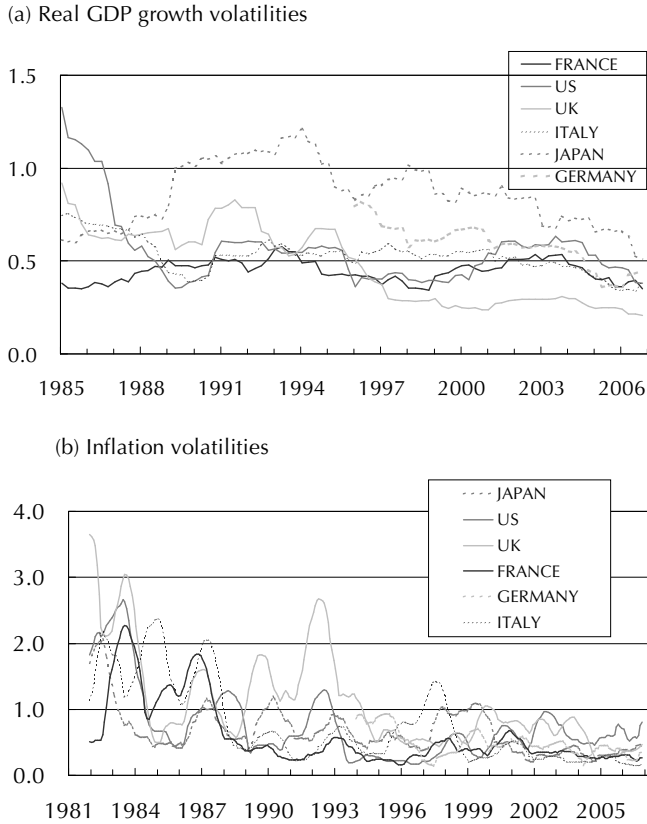
For more than two decades, the world economy has been characterized by a stark divergence between real and financial volatility. A significant reduction in the volatility in GDP and many of its components, known as the 'great moderation', has not induced a decline in the volatility of asset prices. From 1985–2004, for example, the standard deviation of US GDP growth was 1.1%, about half of the volatility recorded from 1962–1984 (2.1%). The volatility of equity returns, meanwhile, was largely unchanged (Ferguson, 2005), a phenomenon that Rogoff (2007) terms a 'conundrum'. This section reviews the main stylized facts concerning the great moderation and its possible causes. The next section explores why financial volatility failed to decline until years after the start of the great moderation.

5.2.3.1 Greater macroeconomic stability

Over the past three decades, measures of economic activity (including employment, GDP and its main components) have become dramatically less volatile in most G7 economies (see Figure 5.3, panel a).⁴⁶ There is clear statistical evidence of reduced output volatility in (at least) Germany, Italy, Japan, the UK, and the United States, although the magnitude and timing differ substantially across countries (Stock and Watson, 2002). US evidence suggests that the reduction in volatility is widespread across sectors.⁴⁷ Moreover, GDP growth has become easier to forecast and more persistent since 1984.

5.2.3.2 Lower and less volatile inflation

In the industrial economies, inflation has been lower and less volatile since the early 1990s (Figure 5.3, panel b; see also IMF, 2006b and Rogoff, 2003). This reflects, above all, central banks' success at stabilizing inflation since the early 1980s (see also Section 5.4.2). After declining in the industrial countries, the level and volatility of inflation have fallen in the major emerging market economies as well (see IMF, 2006b).

Figure 5.3 Realised volatility of real GDP growth and inflation⁽¹⁾

Source: IMF.

Notes: (1) Percent. For real GDP growth rates (monthly inflation), volatility is calculated as the 20 quarter (24 month) rolling standard deviation.

5.2.3.3 International business cycles have not grown more synchronized

Although it is conceivable that an increase in the synchronization of national business cycles could offset some of the benefits of declines in the volatility in individual economies, this has not occurred. Despite the closer commercial and financial links among the major economies over the past four decades and their common downward movement in GDP and inflation volatility, their business cycles do not appear to have become more synchronized.⁴⁸ The average correlation among the four-quarter GDP growth rates of G7 economies was about the same before and after 1984, reflecting a fall in some of these correlations and an increase in others (see Stock and Watson, 2002).⁴⁹ As for inflation, Ciccarelli and Mojon (2005) find that strong comovements among the OECD countries are nothing new – they have existed for 45 years. On average, this co-movement accounts for two-thirds of the variability of country inflation.

5.2.3.4 Why has the ‘moderation’ emerged?

One explanation of the great moderation is better monetary policy.⁵⁰ Bernanke (2004a) argues that in the 1960s and 1970s central bank attempts to affect output

and unemployment led to rising inflation. This was periodically reversed by tightening policy, which reduced output. Central bankers would then react by again stimulating output, starting a new cycle. This process, which increased output volatility, was halted in the 1990s when it became clear that monetary policy cannot permanently affect the level of output. In the past two decades, central bankers' growing emphasis on price stability may have contributed to the stability of growth in output and employment.⁵¹

Other explanations refer to structural changes in the economy, such as:

- a lower aggregate weight of cyclically-sensitive sectors (e.g. durable manufacturing);⁵²
- improved inventory management techniques;⁵³
- increased international trade, reducing the impact of fluctuations in domestic demand;
- banking deregulation;⁵⁴ and
- financial innovation and improvements in risk sharing.⁵⁵

Empirical evidence supports the relevance of all of these factors except the first.⁵⁶

5.2.4 Why did the great moderation not initially result in lower financial volatility?

We have already noted that the great moderation emerged long before the start of the recent phase of low volatility. This suggests that the relationship between macro volatility and financial markets volatility is weak, or that offsetting factors were at work throughout the period.

Rogoff (2007) proposes some explanations for the disconnect between real and financial volatility. First, sustained financial volatility may be partly due to a heightened sensitivity of securities prices to changes in risk as the level of risk declines. Second, equity prices should reflect long-run growth and volatility, not just short-run business cycle volatility. Finally, the delayed reduction in financial markets volatility may have arisen because investors needed time to absorb the implications of sustained lower macroeconomic risk.

An alternative explanation relates to monetary policy. Inflation or output stabilization may at times require forceful policy actions. In a situation where, say, inflation threatens to rise beyond what policy-makers deem acceptable, central banks may decide to move short-term rates above neutral levels to stifle price pressures; rates could then be eased once the inflationary threat has disappeared. These actions could cause large movements in short term interest rates that would be transmitted along the yield curve. This effect might have attenuated in recent years, due to the increased policy credibility of central banks and their preference for gradualism (the tendency to change rates in small increments in the face of macroeconomic and financial uncertainty).

Another reason why lower economic volatility may not have translated immediately into lower financial volatility is that the volatility of the discount rate that investors apply to future cash flows – historically the main driver of equity volatility – has not declined at all.⁵⁷ This could be because investors' risk perceptions and risk aversion may be independent of macroeconomic volatility, or perhaps because investors fear that volatility could revert to a higher level in the future

(Ferguson, 2005). Finally, descriptive evidence suggests that the volatility of GDP growth and (to a lesser extent) inflation have continued to decline over the past 5–10 years (see Figure 5.3). This most recent decline may have contributed to the drop in financial volatility.

5.3 Financial factors: improved market liquidity

Although the process may be reversing, it is still generally true that in recent years several structural innovations have contributed to improve the liquidity of financial markets and, thus, to contain volatility (on this issue see also Ferguson, 2005 and CRMPG II, 2005).

5.3.1 Higher transaction volume

In recent years, the transaction volume of financial markets has increased substantially, reducing idiosyncratic asset price movements due to investors' portfolio trades. More liquid markets are also characterized by tighter bid–ask spreads, which enhance price stability.

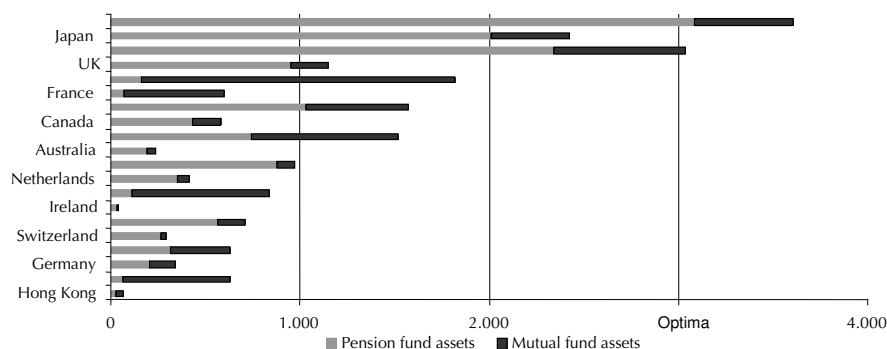
Transaction volumes in cash markets have grown sharply in recent years. The turnover ratio of global equities increased from 119% in 2004 to 141% in 2006.⁵⁸ Daily cash trading in foreign exchange markets increased by 44% from 2004 to 2006, to an estimated volume of US\$ 1.2 trillion.⁵⁹ The perturbation of markets that emerged in the summer of 2007 has yet to reverse this trend.

5.3.2 Financial innovation

Another development that has helped enhance market liquidity is the rapid growth of the market for risk transfer instruments, in terms of both transaction volumes and the range of available instruments (see Chapter 9). These instruments allow investors to price, unbundle and disperse risk throughout the financial system, and may indirectly enhance liquidity by allowing investors to assume or unwind exposures quickly, without having to trade in the cash market. The growth of derivatives markets has also been associated with a more heterogeneous investor base, which has helped to increase liquidity and reduce price volatility.⁶⁰ The close link between the new financial instruments and financial volatility was evident in the summer 2007 (see the discussion in the following chapters).

5.3.3 Institutionalization of investments

Another factor that has improved market liquidity is the growth of the assets held by well-informed institutional investors (e.g. pension funds and mutual funds; see Figure 5.4) managing diversified portfolios. Professional investors' widespread adoption of benchmarking, which reduces portfolio turnover, and their entry into several new asset classes, which enhances portfolio risk diversification (see Walker and Lefort, 2002 and CGFS, 2003), may reduce volatility.

Figure 5.4 Pension and mutual fund assets, 1996 vs 2006, US\$ billion

Sources: Watson Wyatt Worldwide 2007 Global Pension Assets Survey, Investment Company Institute website (www.ici.org).

Notes: This data includes some double-counting. United States (not shown) had US\$ 6.8 bn pension assets and US\$ 3.5 bn mutual fund assets in 1996; US\$ 14.0 bn and US\$ 9.7 bn in 2006. For 2006 mutual fund data is for Q3.

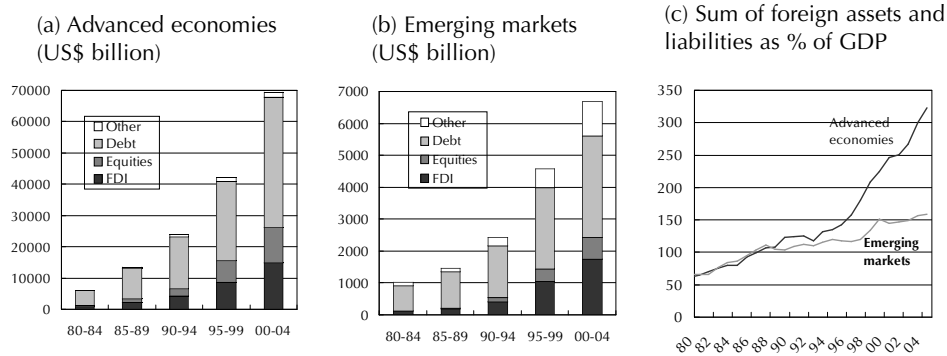
5.3.4 The growth of hedge funds

Hedge funds have recorded remarkable growth: at year-end 2006 the number of these intermediaries surpassed 9,000, managing \$1.4 trillion in assets, up from \$490 billion at year-end 2000.⁶¹ Moreover, hedge funds today account for a very large fraction of transactions in many important markets. According to market reports, about 30% of the trading volume on the NYSE and the London Stock Exchange is by hedge funds; moreover, hedge funds hold more than 75% of all actively traded convertible bonds. Hedge funds account for 45% of the transaction volume in emerging market bonds, 47% in distressed debt, and 25% of high-yield bonds. Hedge funds accounted for 55% of the credit derivatives trading volume. Their trading in interest rate derivatives rose 49% last year, while that in credit derivatives rose 50% (Dodd, 2006). The informed, active trading of hedge funds makes markets more liquid, while facilitating price discovery and hedging strategies by other intermediaries, all factors that reduce volatility (see Chapter 10).⁶²

5.3.5 Financial integration

The opening up and integration of previously-segmented financial markets improves liquidity. This in turn dampens volatility.⁶³ Moreover, cross-border financial integration improves global risk sharing, making investors holding global portfolios less exposed and less sensitive to country-specific shocks (see Chapter 6).

Financial integration is not a new phenomenon. The volume of international capital flows was already growing rapidly in the early 1990s, reflecting the effects of the deregulation of financial markets undertaken in most industrial countries in the previous decade. The extent of international financial integration has continued to grow in recent years, both in absolute terms and as a proportion of GDP (see Figure 5.5), due to technological and financial innovation.

Figure 5.5 Gross stocks of foreign assets and liabilities

Source: Lane and Milesi-Ferretti (2006).

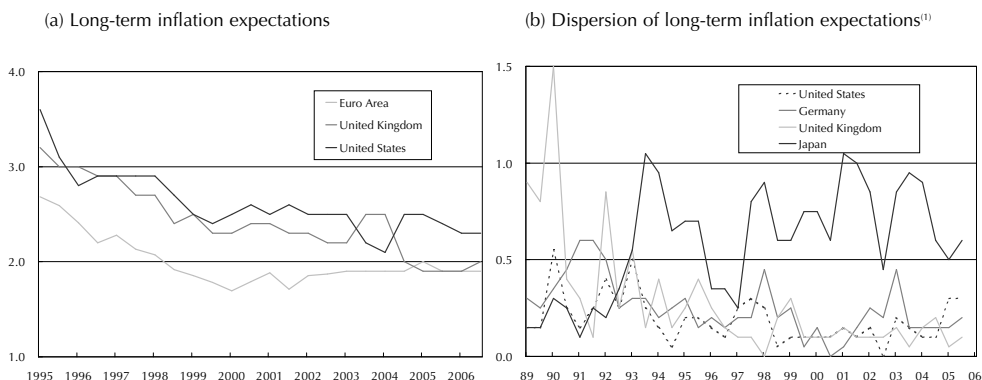
5.3.6 Developments in the US market for mortgage-backed securities

Developments in the US market for mortgage-backed securities (MBS) may have contributed, starting in 2004, to reducing the volatility related to the hedging strategies of MBS investors. MBS constitutes the largest component of the US fixed income market. To the extent that global markets are correlated – due, for example, to the benchmarking of money managers or cross-border arbitrage by hedge funds – lower volatility in the United States may have reduced volatility in other countries.⁶⁴

Until recently, the implementation of financial hedges had contributed to the volatility of interest rates in the US market for MBS. A large fraction of the US residential mortgages have a fixed-rate and a prepayment option; hence, mortgage portfolio investors are confronted with continuous and potentially rapid changes in the duration of their portfolios of residential mortgages and MBS paper.⁶⁵ Financial institutions tended to hedge the resulting risk through dynamic hedging strategies, which exacerbated the volatility of interest rates.⁶⁶ In recent years, several factors have helped to reduce hedging-related volatility. First, the end of the easing cycle in the United States in 2003 drastically reduced households' incentive to repay; the diminished refinancing activity, in turn, has drastically reduced mortgage originators' needs to hedge their positions (Goodman and Ho, 2004). Second, the rapid growth of adjustable rate mortgages, where the interest rate is reset periodically (Krainer, 2006), has substantially reduced the interest rate risk of MBS investors. This, in turn, has reduced the volume of volatility-inducing hedging trades. Finally, MBS investors seem to rely increasingly on static hedging strategies, which do not involve the continuous rebalancing of positions as interest rates change, and thus create less volatility.⁶⁷

5.4 Monetary policy

Monetary-policy-related factors may have dampened volatility in at least two ways. First, improvements in the *conduct* of monetary policy such as increased gradualism in policy action, greater transparency, and, in the recent past, improved communication, seem to have played a key role in reducing interest rate

Figure 5.6 Level and dispersion of inflation expectations

Source: Consensus Economics.

Note: (1) Interquartile range of forecasts formulated by professional forecasters.

volatility. Second, abundant global liquidity and exceptionally low interest rates may have encouraged a search for yield, increasing the supply of protection and dampening volatility. These two channels are reviewed below.

5.4.1 Improvements in the conduct of monetary policy

In the 1980s, once the ineffectiveness and the destabilizing nature of the activist monetary policies of the 1960s and 1970s became clear,⁶⁸ monetary authorities began to abandon the idea of achieving higher output growth by accepting higher price growth. They also recognized that monetary policy most effectively promotes stability when central banks act predictably.

Since the early 1980s, and coincident with the change in policy paradigms, inflation has declined substantially and has become less volatile in most industrialized countries; inflation expectations (as measured by surveys and the prices of inflation-indexed bonds) have likewise declined and stabilized. Professional forecasts of inflation have become less dispersed (see Figure 5.6).

If the recent decline in financial volatility largely reflects a decline in the volatility of short term interest rates – which may have propagated throughout the yield curve to longer maturities, equities and exchange rates – then monetary policy is likely to have played a direct role in reducing volatility. Indeed, in recent years monetary policymaking has changed in three relevant aspects: increased gradualism; greater transparency; and an improved operational framework.

Central banks have recently adopted a *gradualist approach* to monetary policy to reduce uncertainty and to promote financial stability (Bernanke, 2004b and 2004c). The recent tightening in the United States and in the euro area, where increases in official rates have been in 25-basis-point increments, illustrates this approach. More generally, policy moves in excess of 25 basis points have become increasingly rare in industrialized economies.

Recognizing the benefits of a more open policy process, central bankers have made significant efforts to improve *transparency*. Transparency is thought to help investors' understanding of monetary policy, to foster improvements in private sector forecasts of economic variables, to reduce the level and the volatility of

inflation, and to reduce the variability of output growth.⁶⁹ In addition to the *indirect* influence it can exert through greater macroeconomic stability, transparency can have a *direct* effect on financial volatility, by helping financial markets develop more accurate expectations of the future course of short-term rates (Bernanke, 2004b and 2004c). Since long-term rates and, less directly, equity prices depend on the future path of short-term rates, policies that stabilize investors' expectations about the rate outlook should also promote greater asset price stability.

Over the past decade central banks have improved their transparency. In the 1990s the introduction of inflation targeting (e.g. in Canada and the UK) was accompanied by greater openness about policy strategy and more effective communication of the motivations of interest rate decisions. More recently, other central banks have provided indications of the likely future path of policy. The Fed has oscillated between sending explicit signals (the announcement of the policy 'tilt' in 1999) and providing implicit indications (the 'balance of risks' in the 2000–3 period), turning again to direct signals in recent years (in 2003 comments about the likely future path of policy were introduced in the FOMC statements⁷⁰). In its tightening the ECB has clearly signaled its policy intentions before each move, guiding expectations through a variety of communication channels (including the introductory statements and the press conferences of the president). Between 2001 and July 2006, the Bank of Japan committed to keep policy rates at zero for as long as the economy experienced deflation. After its rate hikes in July 2006 and February 2007, it signalled its intent to increase rates further only in response to improvements in the economic outlook. The central banks of New Zealand and Norway have recently started publishing the expected path of future policy rates, a radical innovation in terms of transparency.⁷¹

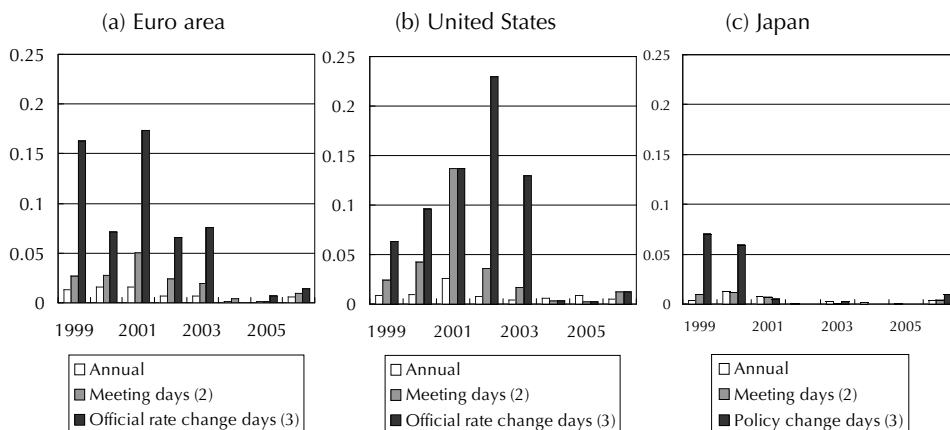
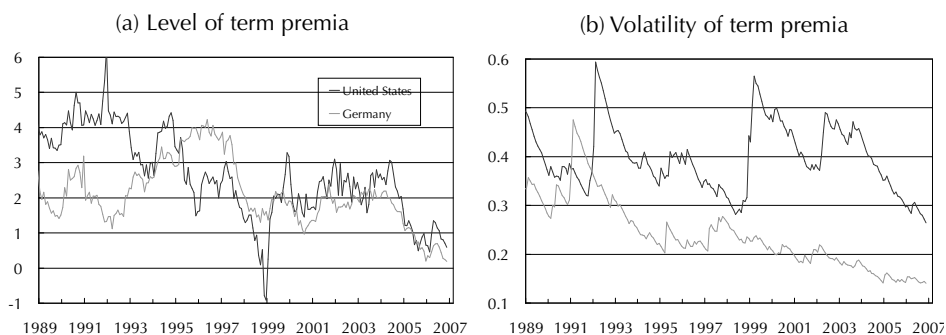
Finally, several central banks have recently improved their operational framework. For example, changes implemented by the Eurosystem in March 2004 were aimed at reducing uncertainty in the money market and at stabilizing market expectations about policy moves (see ECB (2005) for a description of these changes and an assessment of their impact).

The link between transparency and the high degree of predictability of monetary policymaking in recent years is well documented – see Lange et al. (2003), Ehrmann and Fratzscher (2005) and Poole (2005) for the United States and Bernoth and Von Hagen (2004) for the euro area. Indeed, the increased predictability of monetary policy worldwide in the past three years, shown in Figure 5.7 for three major central banks, has been striking.

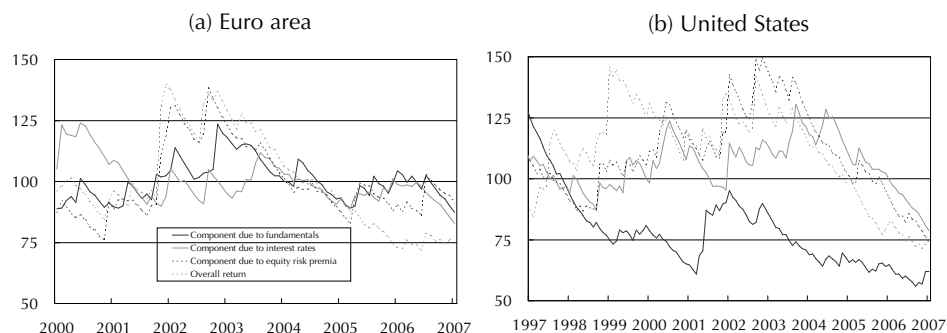
Since central banks directly control short-term rates, it is not surprising that money market volatility has reached historical lows in recent years, as discussed before. But how does lower short rate volatility propagate further out the yield curve and to other assets?

According to the 'market expectations hypothesis', long-term rates can be interpreted as averages of future expected short-term rates. This suggests that if short-term rates were thought to be more stable because of more transparent and predictable policies, long rates would also be more stable. This effect is likely to be contained, however, because the segment of the yield curve under direct control of central banks is limited and future policy revisions are possible.⁷²

Improvements in monetary policy-making could also affect the term premium (that is, the component of long rates representing the compensation investors

Figure 5.7 Mean absolute changes in one-month interest rates⁽¹⁾**Figure 5.8** Level and volatility of term premia

Notes: Term-premia are calculated as the difference between the 3-month forward interest rate 9 years ahead and the expected 3-month interest rate 9 years ahead. Expectations are obtained by projecting a no-arbitrage VAR including macroeconomic variables and the zero coupon curve, as in Pericoli and Taboga (2006). The volatility of term premia is calculated as the square root of an exponentially weighted moving average of squared absolute changes in term premia.

Figure 5.9 Contribution to the volatility of stock returns

Notes: Monthly stock returns are decomposed into three components (due to changes in fundamentals, interest rates and risk premia, respectively) following the dividend discount model in Panigirizoglou and Scammel (2002). Then, time series of volatility are calculated for each of the three components and for actual stock returns, using an exponentially weighted moving average. Finally, the four series thus obtained are rebased so as to make their sample average equal to 100.

require for the risk that their forecasts of future short rates could be incorrect). Empirically, the volatility of the term premium is the largest component of the volatility of long rates (see Kim and Wright, 2005 and Pericoli and Taboga, 2006). In recent years the level and the volatility of the term premium seem to have declined substantially both in the United States and the euro area (see Figure 5.8).

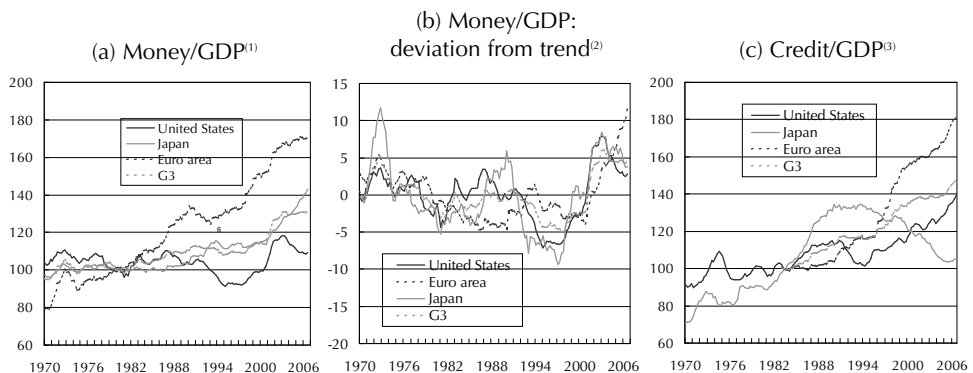
Finally, since (short and long) interest rates are used by investors to discount future dividends or earning streams from equities, less volatile interest rates should also translate into less volatile stock prices. A simple decomposition of equity volatility based on Gordon's formula shows that in the United States and the euro area the contribution of lower interest rates volatility to the reduction of equity volatility has been stronger in recent years (Figure 5.9). However, in both regions the drop in the volatility of equities reflects a reduction in the volatility of all components of equity prices: the interest rate, the value of fundamentals and the equity risk premium.⁷³

5.4.2 Global liquidity

In recent years, the benign global financial environment and the low level of long-term yields have been associated with the ample availability of liquidity.⁷⁴ Indeed, monetary and credit indicators suggest a significant expansion of liquidity in the G3 economies, with a further acceleration in the past 3–4 years (see Figure 5.10).

The conventional wisdom is that greater globalization and competition have enhanced the effectiveness of central bank anti-inflationary policies in the past ten years by helping to contain inflation and inflation expectations (Rogoff, 2007). Trade integration between advanced and emerging economies (EMEs) has curbed domestic inflation by depressing import prices and increasing the share of imports in demand.⁷⁵ EMEs have also dampened inflation by heightening competition in labour markets (see Freeman, 2006) and product markets (see Chen et al., 2006). This new environment has allowed central banks to follow a more accommodative stance and to keep short-term rates low, while excess savings in EMEs may have helped contain long-term rates.

Figure 5.10 Monetary and credit aggregates in the G3



Notes: (1) Index numbers, 1980=100. (2) Deviation from a linear trend. Euro area: M3. Japan: M2+ CDs. US: M2+ money market funds. (3) Index numbers, 1983=100.

According to some commentators, abundant global liquidity and low interest rates in the major economies may have encouraged a search for yield that induced investors to underestimate risks, compressing risk premia and volatility and inflating asset prices. Rajan (2005) argues that low interest rates increase the incentives of financial institutions to take risks. The availability of ample borrowing opportunities, coupled with well-developed derivative markets, facilitate strategies that can reduce risk premia to levels that are not sufficient to remunerate the risks undertaken. Indeed, according to market commentary, in recent years investors such as hedge funds, investment banks and pension funds have increased the supply of protection against financial risks, in order to get income from option premiums. This strategy has brought downward pressure on option prices, thus reducing implied volatility, with a possible feedback to realised volatility.

The liquidity/low interest rate hypothesis of low volatility is difficult to analyze empirically, and no sound evidence is available for or against it. Rajan (2005) mentions that, using a GARCH-ARMA equation, US short-term rates seem to be significantly correlated with the implied volatility on the CBOE S&P500 option contract. However, arguments in favour of the liquidity hypothesis generally rely on anecdotal evidence (see *The Economist*, July 2004; BIS, 2004; Bank of England, 2004b) or descriptive analyses.⁷⁶ The increase in daily open interest registered in the main exchanges since 2003⁷⁷ and the increase in market-based indicators of risk tolerance are perceived as consistent with the view that investors are willing to assume more risks. Although no causal relation can be inferred, graphical evidence suggests a close relationship between the build-up in liquidity on the one hand, and lower risk premia and greater risk tolerance on the other.

5.5 Implications for financial stability

Financial volatility can influence financial stability directly, such as by affecting investors' balance sheets. Or it can have indirect impacts, such as by influencing the willingness of businesses to invest and of banks to lend.

In recent years a combination of real, financial and policy-related factors (many of which are long-run rather than conjunctural) has led to a period of 'financial quiescence', in which volatility has been low simultaneously across different asset classes and markets. The current financial turmoil has raised volatility, but no more than in other recent volatility 'spikes'.

What are the financial stability implications of low volatility? The previous paragraphs emphasized that the multi-year reduction in volatility largely represents the consequence of improvements in the functioning and structure of global financial markets. Increased market liquidity, the greater role of professional, well-informed investors, better communication between central banks and financial markets, and stronger company balance sheets have all contributed to enhance investors' ability to avoid shocks or to deal with them, reducing volatility.

Against this background, some broad categories of risk can be identified.

First, some of the very factors that reduce volatility may, at times, undermine financial stability. For example, if the reduction in volatility is the consequence of increased risk-taking by financial institutions – the VaRs of major investment

banks signal an increase of overall portfolio risk – an abrupt return of financial volatility could cause losses to investors with large exposures. Moreover, the growing use of financial derivatives (which by their very nature rely on market liquidity) might, on occasion, increase asset price volatility by raising considerably the demand for liquidity (Tucker, 2005).⁷⁸ As we have learned on a number of other occasions, such as 1998 and mid-2007, instruments that facilitate risk sharing in normal times can lead to instability after a large shock, as large scale liquidations take place (see, for example, Box 11.1). In other words, market liquidity may be higher on average but more vulnerable to sudden shifts than in the past. As a consequence, volatility might be lower on average but subject to sudden swings.

The role of institutional investors is also ambiguous. Although they generally behave in ways that reduce asset price volatility (as was the case in the past few years), providing liquidity to markets and following portfolio strategies that stabilise prices, one cannot rule out less benign scenarios. Some of these investors, in particular hedge funds, could stop behaving as ‘contrarians’ and act instead like ‘momentum’ investors (for example, as a consequence of their recourse to program/algorithmic trading), selling into a falling market (for example) and thus contributing to an abrupt increase in volatility. Yet another example is the diffusion of adjustable rate mortgages: these instruments have reduced interest rate risk and volatility but at the same time they have raised default risk, which can on occasion lead to sudden spikes in volatility. Indeed, this mechanism seems to have triggered the recent crisis in the US subprime mortgage market.

A second risk stemming from the low-volatility environment of the past three years is the potential for a mispricing of risk: low volatility combined with exceptionally low market interest rates have led investors to a search for yield that may have encouraged excessive risk-taking.

The willingness of financial intermediaries to assume more risk reflects, at least in part, the strengthening of the macrofinancial environment: risk taking of financial institutions has typically fluctuated with economic and financial conditions and is integral to their business. Moreover, as financial institutions have improved their ability to manage risk, they might have felt more comfortable taking positions they would have been reluctant to hold even a few years ago (Summers, 2006). In this sense higher risk, if properly managed, does not necessarily represent a threat to the stability of the financial system. However, another often-mentioned possibility – with different implications for financial stability – is that higher risk tolerance is just another consequence of the ‘liquidity glut’ and the related low level of interest rates observed in recent years. According to Rajan (2005), persistently low interest rates may have induced ‘risk shifting’ strategies, leading investors to focus their attention more on the upside and less on downside risks.⁷⁹ Thus, in spite of the reduction in volatility, financial institutions may have increased their overall risk exposure. Such behaviour would be consistent with the classical mean-variance model of Markowitz (1952), which suggests that a drop in volatility can indeed induce investors to increase the weight of risky assets and the overall risk of the portfolio.

An example of a very popular investment strategy that takes advantage of the low volatility environment to generate higher yields at the cost of higher risk is the ‘carry trade’ (see Chapter 6).⁸⁰ Low exchange rate volatility encourages this kind of strategy. However, exchange rates are prone to sudden, large movements

that can cause substantial losses, especially if the carry trade is highly leveraged. Should volatility increase, currency fluctuations could cause losses to traders with large unhedged positions.

Another crucial and timely question is whether the fall in volatility is temporary or permanent. If temporary, did the summer of 2007 mark the start of a return to normal levels of volatility? In the previous sections we argued that important factors behind the drop in volatility seem to be structural, and may therefore have a permanent effect on volatility. These include the more liquid financial markets, the availability of new risk transfer instruments and improvements in monetary policy. Moreover, to the extent that the strengthening of the balance sheets of listed firms reflects efficiency gains that are independent of the economic cycle, its effect on volatility may also prove permanent. However, as we argue in Chapters 9 and 10, liquidity in some markets may prove fleeting, some instruments have not been tested under stress, and the degree of uncertainty surrounding structural changes in markets and instruments is material.

Additionally, conjunctural factors have also played a role, suggesting another reason that part of the volatility reduction might be reversed in the future. Foremost, if the volatility decline partly reflects increased risk-taking behaviour, possibly induced by low interest rates, it could reverse once investors find other, more attractive opportunities or come to recognize that interest rates may rise with potential negative consequences for certain asset classes and the institutions that hold them. Moreover, there is the potential effect of a slowdown of the world economy, which could affect financial volatility both directly – to the extent that cyclical factors play a role in containing volatility – and indirectly, by inducing an increase in investors' risk aversion (Campbell and Cochrane, 1999).

Finally, two monetary policy-related factors, that may have contained volatility in the recent past, may increase it in the future. First, in the light of the positive correlation between the level and the variability of nominal interest rates, future rate increases might be associated with a volatility increase, particularly for short rates. Second, uncertainty about future policy actions might increase as policy rates approach a turning point (a resumed 'two-way risk'), increasing uncertainty about short-term rates, with possible spillovers to longer rates and other asset classes.

More broadly, even if the drop in volatility from the highly volatile 1990s were permanent, it is worth asking whether investors are prepared to cope with persistent episodes of sudden volatility increases, which have occurred three times in 2006 and 2007 and can be expected to recur. The fact that market prices incorporate expectations of low volatility and investors select their portfolios accordingly might leave them vulnerable to a sudden revision of those expectations. During the turbulence that hit financial markets in May–June 2006 and again in February–March 2007, a sudden spike in asset price volatility was comfortably absorbed by most financial institutions, with the exception of specific classes of hedge funds. However, one might argue that the size and duration of these 'stress tests' were too limited to draw firm conclusions. Moreover, their effects could be much worse in less benign cyclical economic conditions. Most important, the volatility spike that commenced during July 2007 has yet to run its course as we publish this report. Some observers expect this spike to be more lasting than the previous two, as entire classes of funding vehicles, conduits for off-balance sheet

funding, are being withdrawn from the market.

In sum, one can conclude that the current environment is one of high uncertainty about financial market volatility: are we in a new low volatility regime? If so, what are the characteristics of this new regime? Is volatility likely to be permanently low and stable? Or is it going to be low on average, but subject to sudden, rare, large jumps such as the three that markets have experienced in 2006 and 2007? In this environment, market operators and policy makers alike are in a process of learning, which may make them prone to error.

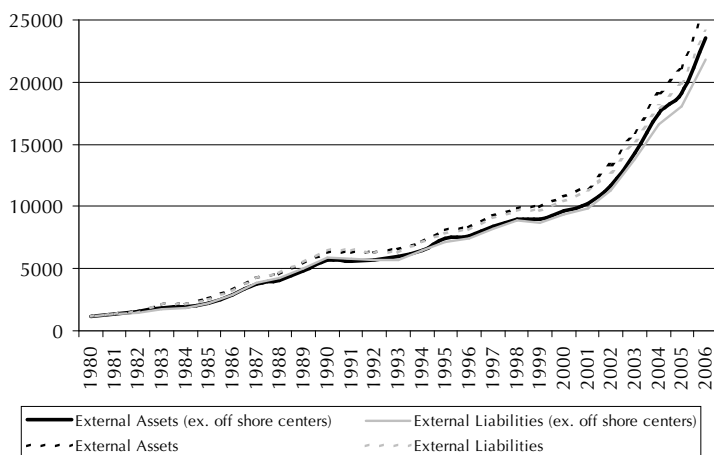
An increase in volatility does not necessarily signal a deterioration in financial conditions. Although financial instability is usually followed by heightened volatility, the reverse is not necessarily true. Increases in market volatility will affect financial stability mostly to the extent that financial institutions are unprepared. This is more likely when innovation is rapid, since it takes time to fully integrate new products and strategies into complex risk management systems. Supervisors and regulators should monitor the latest developments in financial markets to ensure that they are properly taken into account. In this respect, gathering and spreading information is of paramount importance: information on the magnitude and distribution of risk, on the characteristics of investors holding it, on the structure and liquidity of markets, on the workings of new products. A second point is to ensure that financial institutions understand the risks they are taking and are equipped to manage them efficiently. This involves checking the soundness of risk management practices and internal controls as well as operations, such as the back office.

6 Cross-Border Financial Integration

Another important structural change in the global financial system is the continuing progress in financial integration. International capital flows and financial liberalisation have been the subject of intensive debates for many years. But the rapid growth of cross-border flows of the past two decades adds a new dimension to the controversy about the relative benefits and costs of international capital mobility and its implications for financial stability.

Financial integration refers to the process by which different national markets grow together.⁸¹ Full integration means that financial activity occurs independently of political or geographical borders, so that it makes no difference to agents whether they transact with agents in the same or a foreign country. Full segmentation means that the financial markets of countries are fully separated, even for

Figure 6.1 External bank assets and liabilities, US\$ billion



Source: Bank of International Settlement (BIS).

Notes: External assets/liabilities 'ex. off shore centres' exclude financial centres (Bahamas, Bermuda, Cayman Islands, Isle of Man, Jersey and Netherlands Antilles). The data come from the 'locational' BIS banking statistics and cover banks' unconsolidated gross international on-balance sheet assets and liabilities. The data are based on the residence of the reporting institution and therefore measure the activities of all banking offices residing in each reporting country. Such offices report exclusively on their own unconsolidated business, which thus includes international transactions with any of their own affiliates. BIS reporting banks include banks residing in the G10 countries, Australia, Austria, the Bahamas, Bahrain, Bermuda, Brazil, the Cayman Islands, Chile, Denmark, Finland, Greece, Guernsey, Hong Kong SAR of the PRC, India, Ireland, Isle of Man, Jersey, Korea, Luxembourg, Macau SAR of the PRC, Mexico, the Netherlands Antilles, Norway, Panama, Portugal, Singapore, Spain, Taiwan (Republic of China) and Turkey. Detailed information on breaks in series in the locational banking statistics is available on the BIS website under <http://www.bis.org/publ/breakstables.pdf>.

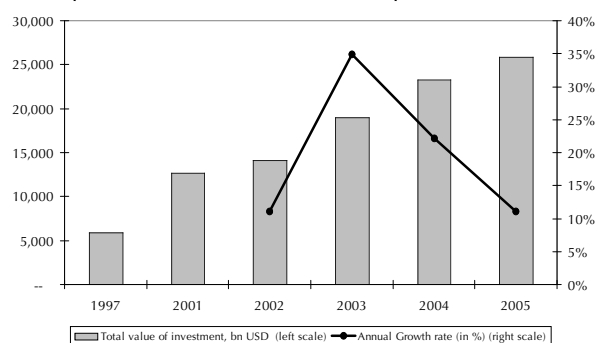
identical or similar assets. In terms of the analytical framework presented in Chapter 2, financial integration primarily affects the transmission mechanisms for financial instability. In particular, greater integration means that countries are more exposed to instabilities of other countries than would otherwise be the case. A shock originating in one country is more easily transmitted to another country if the two countries are highly integrated. Financial integration can also contribute to the build-up of international financial imbalances, insofar as more funds 'herd' into the same investments. Hence, financial integration is of major importance for international financial stability. As we will discuss extensively below, however, this does not mean that more integration implies more instability or that the costs of any resulting instability will offset the benefits of integration.

This chapter first considers data concerning progress in international financial integration. It then sketches the driving forces of integration and its effects on efficiency and growth. Third, it discusses whether financial integration tends to be associated with more or less financial stability and why. The fourth part of the chapter looks at some related issues: the stability implications of carry trades and of the integration of China and India in global capital markets. The chapter closes with a discussion of policy issues.

6.1 Evidence on international financial integration

The integration process is particularly pronounced at the regional level, as in the EU, but also tends to progress across continents. Figure 6.1 displays the exponential growth of banks' assets and liabilities held abroad since the early 1990s, from about US\$ 5 trillion to more than US\$ 20 trillion. Cross-border portfolio investment doubled from about US\$ 12 trillion in 2001 to around US\$ 25 trillion in 2005 (see Figure 6.2).

Figure 6.2 Cross-border portfolio investment assets: total portfolio investment, all economies

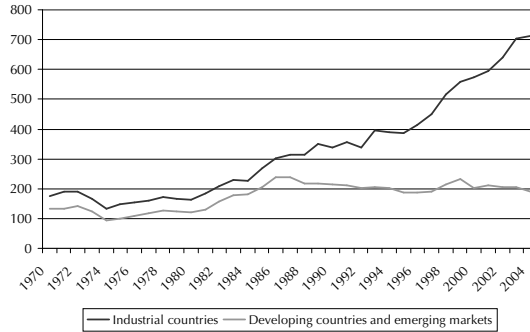


Source: IMF, Coordinated Portfolio Investment Survey (CPIS).

Notes: Countries included: Argentina, Aruba, Australia, Austria, Bahamas, Bahrain, Barbados, Belgium, Bermuda, Brazil, Bulgaria, Canada, Cayman Islands, Chile, Colombia, Costa Rica, Cyprus, Czech Republic, Denmark, Egypt, Estonia, Finland, France, Germany, Gibraltar, Greece, Guernsey, Hong Kong SAR of the PRC, Hungary, Iceland, India, Indonesia, Ireland, Isle of Man, Israel, Italy, Japan, Jersey, Kazakhstan, Korea, Lebanon, Luxembourg, Macau SAR of the PRC, Malaysia, Malta, Mauritius, Mexico, Netherlands, Netherlands Antilles, New Zealand, Norway, Pakistan, Panama, Philippines, Poland, Portugal, Romania, Russian Federation, Singapore, Slovak Republic, South Africa, Spain, Sweden, Switzerland, Thailand, Turkey, Ukraine, United Kingdom, United States, Uruguay, Vanuatu, Venezuela.

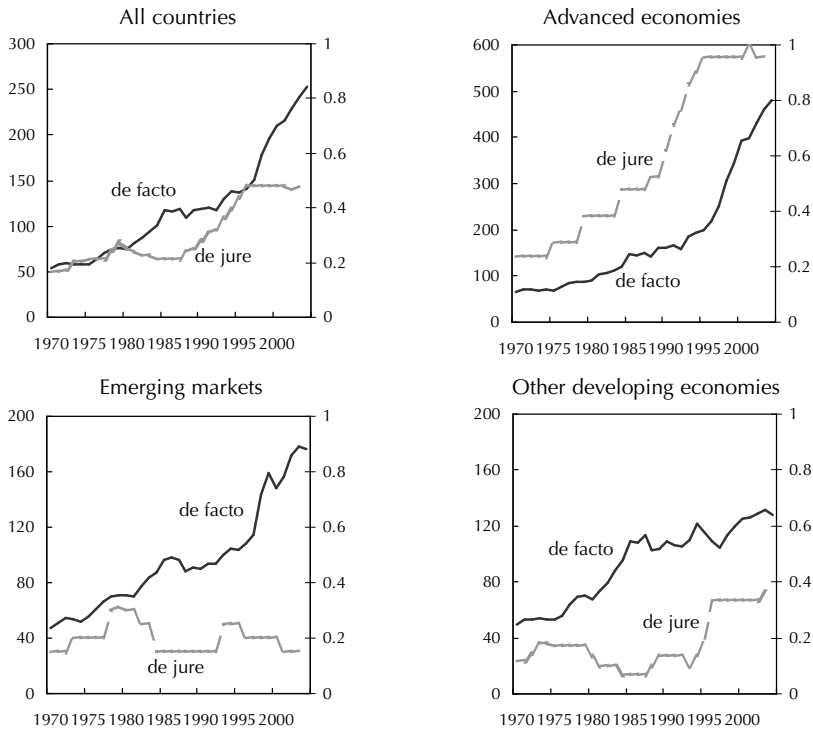
Figure 6.3 displays the ratio of the sum of external assets and liabilities to the sum of exports and imports. For industrial countries there is a clear upward trend, suggesting that their financial integration is advancing faster than their trade integration. For developing countries and emerging markets, however, the ratio has been roughly stable since the mid-1980s.

Figure 6.3 Sum of external assets and liabilities in percent of sum of exports and imports



Source: Lane and Milesi-Ferretti (2006).

Figure 6.4 De jure and de facto financial integration



Source: Kose et al. (2006)

Notes: This figure shows unweighted cross-country averages, within each group, of two measures of capital account openness. The de jure measure is based on the IMF 0-1 capital account restrictiveness classification, with 1 representing countries that have open capital accounts. The de facto measure is based on the ratio of gross stocks of foreign assets and liabilities to GDP, with the raw data taken from Lane and Milesi-Ferretti (2006). The country lists are in the appendix of Kose et al. (2006).

These data are measures of *de facto* integration, which are often more informative than ‘*de jure*’ measures, such as those based on capital account restrictions.⁸² The difference can be substantial, as Figure 6.4 (reproduced from Kose et al., 2006) illustrates.

Other *de facto* integration indicators are price-based and measure how precisely the law of one price holds for financial assets across borders.⁸³ Bekaert et al. (2005b), for example, show that despite the tremendous increase in international portfolio investment, the greater international alignment of equity returns is statistically significant for Europe but not for other regions.⁸⁴ Brooks and del Negro (forthcoming) plausibly attribute greater co-movement of equity markets to the greater cross-border activities of firms, so that financial integration and economic integration are not always clearly separated.

6.2 Drivers of international financial integration and effects on efficiency and growth

Several factors underlie the international financial integration process. First, technical progress – notably in information technology, telecommunication and risk management – substantially facilitates cross-border activities. Second, financial deregulation and liberalization have removed obstacles to international financial activities. Third, investors may find better risk–return combinations by using the wider range of international markets, and financiers may save capital costs by tapping different markets at different times. Last, financial consolidation in some countries has gone so far that, given domestic competition concerns, financial institutions can only reach the scale necessary to prevail in global markets by expanding abroad.

The potential benefits of financial integration are twofold. It reduces the cost of capital, enhancing competition and fostering productivity and growth. It also permits improved income and consumption risk sharing, so that consumers can better smooth their consumption over time. Industrial countries tend to reap those benefits from *de facto* financial integration and openness of capital accounts. The same tends to be true for emerging markets with sound macroeconomic policies, advanced domestic financial development, good economic institutions, high human capital and open capital accounts. Countries that are below relatively high thresholds for those variables, however, such as many emerging markets and developing countries, tend not to benefit from financial integration in these ways.⁸⁵

These insights are relevant for the financial stability, as more productive and faster-growing countries with better risk sharing will tend to exhibit greater stability. This particularly applies to the major industrial countries, which are the main focus of our report.

6.3 Capital mobility and financial stability

In theory, the effect of financial integration on financial stability, as defined in Chapter 1, is ambiguous. Several channels could enhance the stability of financial

markets and institutions. First, financial integration and the removal of capital controls provide access to a wider range of assets and therefore help to diversify risks. Second, integration can make markets larger and more liquid, thereby enhancing their resilience to shocks. Third, the greater liquidity, information acquisition and competitiveness of markets through the entry of foreign participants may contribute to better pricing of financial instruments. Last, competitive pressures arising from foreign financial institutions entering a country will strengthen market discipline and thereby favour robust and healthy financial institutions in the long term.

But financial integration may also create new channels for financial instability. First, more foreign assets and liabilities and a greater correlation of asset prices increase cross-border contagion risks. Second, if banks are not initially robust and healthy, then greater competition from foreign banks could increase their short-term incentives for risk-taking. Third, asymmetric information about foreign investments and herding behaviour may lead to excessive lending and sudden withdrawals of funds. This risk could be particularly pronounced for short-term debt denominated in foreign currencies, which poses considerable exchange rate risk to borrowers. Regarding the risk that financial liberalization may contribute to the occurrence of financial crises, Eichengreen et al. (1998, p. 21) conclude that 'it is not financial liberalization that is at the root of the problem but rather the inadequacy of prudential supervision and regulation, whose consequences are simply magnified by liberalization.'

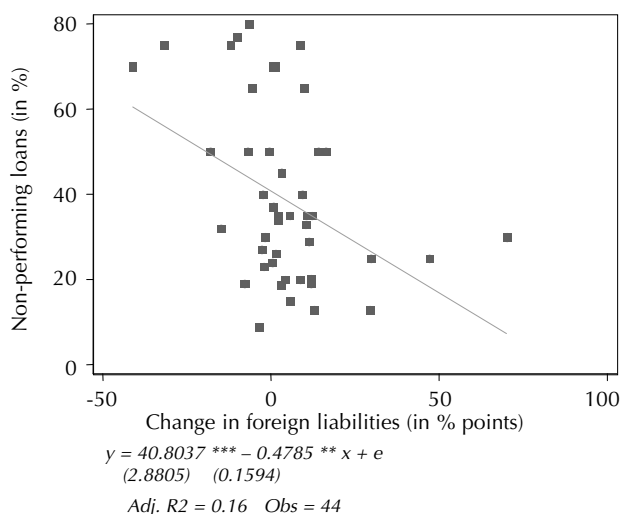
This is therefore an empirical question, and we now review some of the evidence.

6.3.1 Macroeconomic perspectives

One issue that has been extensively studied is whether capital controls, while limiting financial integration, reduce the probability or severity of financial crises. Eichengreen et al. (1996) find no effect of capital controls on single or contagious currency crises, except for the pre-euro European Monetary System, where they tended to increase the likelihood of currency crises. Edwards (2005) looks at the frequency or probability of 'sudden stops' (abrupt and major reductions in capital inflows to a country) and 'current account reversals' (large and abrupt reductions in the current account deficit of a country). He finds no systematic evidence that countries with capital controls experience a lower incidence or probability of 'sudden stops' or 'current account reversals'. Glick et al. (2006) find that countries with fewer restrictions on capital flows experience a smaller probability of currency crises than other countries. Edwards (2006) detects no evidence that the output costs of currency crises are lower for countries restricting capital flows.

Although they often occur simultaneously, banking crises tend to be more severe than currency crises in terms of output lost (Hutchison and Noy, 2005). Bonfiglioli and Mendicino (2004) find that the frequency of banking crises is about the same in countries with capital controls and restrictions on equity transactions as it is in countries without such controls and restrictions.⁸⁶ Moreover, the adverse effects of banking crises on economic growth are less severe in countries with less restricted capital accounts.

Given the scarcity of studies on the relationship between banking crises and

Figure 6.5 Non-performing loans in banking crises (y) and capital inflows before the crises (x)

Sources: (i) Database on banking crises see http://www1.worldbank.org/finance/html/database_sfd.html and Caprio and Klingebiel (1999). (ii) Foreign liabilities see Lane and Milesi-Ferretti (2006).

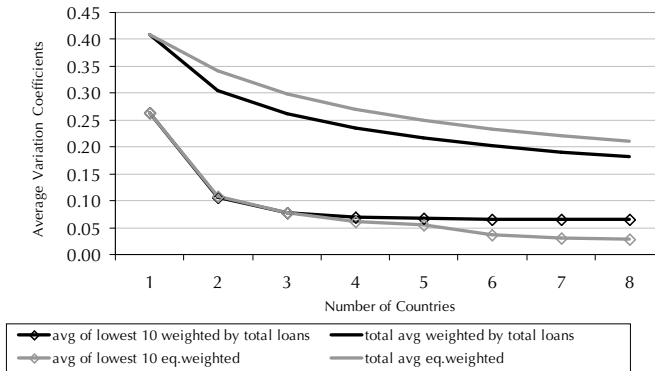
Notes: Non-performing loans are in percentage of total loans. Change of foreign liabilities is computed as the difference between the stock of foreign liabilities in percentage of GDP the year before the crisis and 3 years before the crisis. Crisis periods are defined in (i). Results are reported for "systemic" crises only. In the regressions standard errors of the coefficients are in brackets. *, **, *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

financial integration, we conduct a simple exercise in this report. We consider all 'systemic' crises between 1980 and 2004 in the World Bank's 'Banking Crises Database'. For each crisis country we have measures of financial openness before (and at the start of) the crisis (from Lane and Ferretti-Milesi, 2006). We focus on liabilities of domestic residents to foreign investors, as this proxies for the risk that withdrawals of foreign funds or the interruption of their provision could cause or worsen a crisis. We use a de facto measure of integration rather than a de jure measure, since – as illustrated above – official capital controls may give a misleading picture of the actual state of integration. From the World Bank database, we have the following measures of the severity of a banking crisis: non-performing loans as a share of total loans, assets of defaulted banks as a share of total banking assets and the fiscal costs of restructuring the banking sector as a share of GDP (all in %). This analysis provides a simple empirical look at the relationship between financial openness and banking crises; more detailed research is certainly warranted.

Figure 6.5 shows a scatter plot of non-performing loans against the change of foreign liabilities in the two full years prior to the crisis. Each point represents a banking crisis over a certain stretch of time. The figure suggests a negative relationship, which means that – on average – more capital inflows just before the crisis are associated with a less severe crisis. As reported in the appendix, we find the same result also for defaulted bank assets (Figure 6.A.1) and no relationship between the fiscal costs of a crisis and capital inflows (Figure 6.A.2). These results are consistent with the literature on financial openness and currency crises discussed above.

In the appendix to this chapter we perform the same exercise using the average

Figure 6.6 Scope for risk sharing of non-performing loans among industrial country banking systems



Source: Fecht et al. (2007a)

stock of foreign liabilities in the two full years prior to the crisis as a measure of financial openness or integration instead of the change of liabilities, a flow variable. It turns out that defaulted assets (Figure 6.A.3) and fiscal costs (Figure 6.A.4) are not related to stocks of foreign liabilities. The only exception is non-performing loans, which seem to be positively related (Figure 6.A.5). So, higher stocks of foreign liabilities seem to be associated with larger shares of non-performing loans in banking crises. But if there are strong inflows in the years before the crisis, then the share of non-performing loans is significantly lower. These two contradictory results must reflect the simple setup used.⁸⁷

Overall, there seems to be no systematic evidence supporting the view that more financially open countries are more frequently or more severely affected by financial crises than less open countries.⁸⁸ The bulk of the macro evidence suggests that there is either no systematic relationship between financial integration and stability or that more financially open countries are more stable. Some of the results showing no clear relationship might be caused by a mixture of cases, i.e., countries where integration contributed to stability and countries where it caused instability. The excellent survey by Williamson and Mahar (1998) discusses cases in which short-term capital inflows seem to have contributed to financial instability. Moreover, the sequence and speed of financially opening countries is highly relevant. Large capital flows into countries that are not prepared for them could exacerbate financial instabilities. These issues cannot be addressed in this report.⁸⁹

6.3.2 Finance perspectives

Most of the arguments brought forward in finance focus on cross-border banking.⁹⁰ Banks are typically subject to the risk that loans (or other assets) are not repaid on time. They can insure themselves against it by holding reserves or share this risk with other banks, e.g. through an interbank market. This risk sharing, however, is hampered by the fact that they are imperfectly informed about the non-performing loans of other banks, particularly foreign banks. When banks operate across borders, the interbank market becomes larger. This is the case in a monetary union like EMU or a highly integrated country like the United States. A large interbank market provides enhanced liquidity but can create greater incentives for 'free-riding' on the liquidity of other banks, which reduces the safety

cushion of reserves.

Fecht et al. (2007a) discuss how different mechanisms for sharing risk among banks affect efficiency and stability in such a situation and as the interbank market expands to other countries. The overall scope for risk sharing with respect to non-performing loans across industrial countries is illustrated in Figure 6.6, taken from that paper. The intertemporal coefficient of variation of non-performing loans declines, as the number of countries integrating their banking systems increases.⁹¹ The upper curves show coefficients of variation averaged over all combinations of countries and the lower curves coefficients of variation averaged over the 10 'best' combinations of countries. There seems to be significant room for sharing the risk of non-performing loans. As more countries integrate, the aggregate risk in the joint banking system *ceteris paribus* declines making it more stable. For the more 'optimal' combinations, a certain plateau is reached as of four countries. This is one channel through which financial integration can enhance the stability of banking.

Which are the best ways to achieve this? The answers to this question have a stability aspect and an efficiency aspect. Risk sharing through a secured interbank (repo) market limits contagion risk (stability benefits) but reinforces free-riding on liquidity and low reserves (incentive costs). This is only optimal for a small interbank market where the incentives for free-riding are small as well. Risk sharing through an unsecured interbank (deposit) market implies the highest contagion risk (instability costs) but also limits free-riding on other banks' liquidity (incentive benefits). This is optimal when the interbank market spans an economic area of intermediate size. In contrast, risk sharing through retail lending markets is optimal in very large economic areas. In such areas, it may be optimal to incur the large set-up costs of breaking into a foreign retail market and thereby limit both liquidity-free riding (incentive benefits) and interbank contagion risk (stability benefits).

This analysis offers two messages for large developed economies, such as the United States and the euro area. First, the significant growth of European repo markets in recent years may have negative aspects. Second, there may be benefits of further retail market integration in Europe, as it is already more advanced across states in the United States after branching deregulation and the Riegle-Neal Act. A more general message for all countries is that potential trade-offs between efficiency and stability in the process of international banking integration need not mean that integration should only be allowed when contagion risks recede or stay constant. Net welfare benefits of further integration can prevail, even if some instability risks are associated with it. In other words, policy-makers should not look at the efficiency and stability effects of financial integration separately.

Risk sharing can promote industrial specialization (Kalemli-Ozcan et al., 2003). There may be stability implications of banking integration when the enhanced risk sharing leads to such specialisation (Fecht et al., 2007b). Assume banks have a comparative advantage in lending to domestic sectors and the risks of delayed loan repayments can be shared in an unsecured interbank market. Then banks will find it optimal to specialize in domestic production sectors and share the enhanced liquidity risk associated with the less diversified exposures in the interbank market. This, however, increases contagion risk in the banking system. If the interbank market functions relatively well, it is welfare-maximizing for banks to

specialize, enhancing individual liquidity risk and contagion risk. This suggests that when the stability and efficiency effects of integration are assessed, one cannot take the structure of shocks as constant, as they change endogenously through greater specialisation.

6.4 Two current issues

Before drawing conclusions from our discussion on international financial integration and financial stability, we would like to address two topical issues in this field. The next section looks at the phenomenon of carry trades and the following one at the integration of China and India into global capital markets.

6.4.1 Carry trades

A matter of continuing concern for international financial stability is the phenomenon of carry trades. Simply speaking, carry trades relate to cross-border investments in high-interest rate currencies funded in low interest-rate currencies. They therefore rely on a 'bet' that exchange rates will not adjust to compensate for the difference between the two. Concerns emerge from a number of factors. First, the size of these trades seems enormous, yet information about their extent is sketchy. Second, as we discuss below, the profitability of carry trades is very sensitive to changes in the level and volatility of exchange rates. Third, interest and exchange rates that allow for profitable carry trades may be the result of imbalances that may unravel at some point. Fourth, if carry trades unwind in an abrupt fashion, the very large exposures involved could destabilize financial markets and institutions. For example, when carry trades unwound in October 1998, the yen appreciated by 13% against the dollar in three days, a severe shock that the financial system was nonetheless able to weather. This section describes the mechanics of carry trades, presents estimates of their size and estimates threshold levels at which large-scale unwinding could occur.

6.4.1.1 Carry trades and uncovered interest parity

A carry trade is a long position in a high-yielding financial instrument funded by borrowing in a low-yielding one. The interest rate difference is the so-called 'carry'. Suppose, for example, that a trader borrows in a low-interest rate currency such as the Japanese yen and invests the proceeds in a bond denominated in a high-interest rate currency such as the Brazilian real. Since the trader must ultimately convert the real back into yen to repay the loan, the trade will be profitable only if the yen does not appreciate against the real by more than the difference in interest rates.

The profitability of carry trade strategies therefore depends on the violation of uncovered interest rate parity (UIP). According to UIP, a currency that offers a relatively high yield is expected to depreciate against a currency that provides a lower yield by an amount that will offset the difference in yields. More formally, this condition can be expressed as

$$E_t\{s_{t+1}\} - s_t = i_t - i_t^*$$

where s_t denotes the logarithm of the spot exchange rate (units of domestic currency per unit of foreign currency), i_t and i_t^* are the nominal interest rates on a domestic and foreign risk-free asset, respectively, and $E_t\{s_{t+1}\}$ represents the expectation operator conditional on information available at time t .

Numerous empirical tests of UIP document that it does not hold.⁹² These tests suggest that investors can earn abnormal risk-adjusted returns through carry trades.

6.4.1.2 *When will carry trades occur?*

Since carry trades are risky, traders will only pursue them if they generate an expected return sufficient to compensate for the risk. The Sharpe ratio, defined as an investment's expected return in excess of the risk-free rate divided by its standard deviation of returns, provides a metric for comparing investment alternatives.

If investors decide whether or not to engage in carry trades based on the Sharpe ratio, they compare currency Sharpe ratios, SR_t^{forex} , with the Sharpe ratio SR_t^b of some benchmark investment such as the S&P500. If UIP holds, then $SR_t^{forex} = 0$, which would leave investors no reason to engage in carry trades. If, however, UIP does not hold and $SR_t^{forex} > SR_t^b$, there might be scope for carry trades.

Carry trade strategies may be partially self-fulfilling. A speculator who goes short a currency contributes to its depreciation. *Ceteris paribus*, the impact of speculators pursuing this strategy will render it profitable. Although the gradual and transparent nature of modern monetary policy usually shelters speculators from large and unexpected shifts in interest rates, carry trades can unwind if:

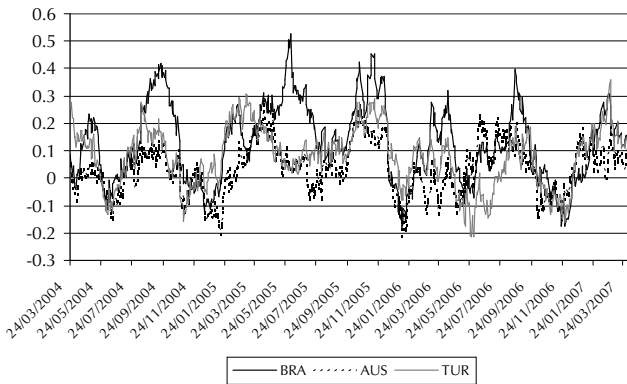
- (i) The interest rate differential tightens, eroding the expected profitability of the trades. This can occur if monetary conditions in the funding currency become tighter or if the interest rate in the target currency decreases due to a large demand for assets by international speculators.
- (ii) The high-yielding currency depreciates (in line with what UIP predicts). Since carry trade strategies are highly leveraged, large exchange rate fluctuations could put investors under serious stress, for example by decreasing the value of collateral.
- (iii) Exchange rate volatility increases, reducing the Sharpe ratio of carry trades to the point where their risk-return profile is no longer attractive.⁹³

6.4.1.3 *Estimated attractiveness and size of carry trades*

To assess the attractiveness of carry trades over the past few years, we plot in Figure 6.7 the difference in the *ex post* Sharpe ratios between selected exchange rates and the S&P 500.⁹³ This differential is computed assuming that the funding currency is the Japanese yen and the high-yielding currencies are the Brazilian real, the Turkish lira, and the Australian dollar. The indicator is above zero most of the time, suggesting that these carry trades often show a better risk-adjusted performance than the S&P 500. When we do the same exercise for the Swiss franc as the funding currency the results are very similar.

Assessing the magnitude of carry trades is not easy because financial institu-

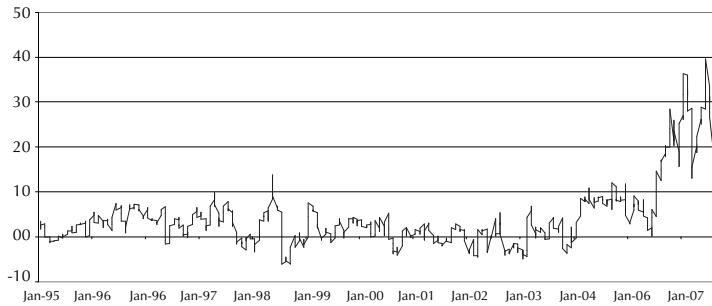
Figure 6.7: Differentials in Sharpe ratios between carry trade strategies (Japanese yen (JPY) vis-à-vis Australian dollar (AUS), Brazilian real (BRA), and Turkish lira (TUR)) and the S&P500.



Sources: DataStream and authors' calculations.

Note: We compute *ex post* Sharpe ratios dividing the returns of the asset by its standard deviation with a three month rolling window.

Figure 6.8 Net speculative future positions in foreign currency, US\$ billion



Sources: Commodity Futures Trading Commissions and authors' calculations

Notes: We estimate the value of net speculative carry positions by subtracting the net UK pound and Australian dollar futures positions from the net positions on Japanese yen and Swiss franc. Fixed exchange rates as of end 1998.

tions often pursue these strategies with over-the-counter derivatives that are not reported on their balance sheets. Different indicators provide different results, and discriminating among them is difficult. Proxies such as short-term loans of Japanese banks to non-Japanese borrowers, cross-border bank assets denominated in yen and foreign currency portfolio investments by Japanese non-banks may overestimate the size of carry trades or exhibit noise unrelated to carry trade activity.

Here we first try to evaluate the size of carry trades with net non-commercial currency futures positions registered on US derivatives exchanges (see Figure 6.8). This indicator is a proxy for speculative positions, including the sale of the low-interest rate currency forward when it is at a forward discount. Data on futures contracts are quoted in US dollars. To hedge the currency risk, the speculator needs two futures contracts. For instance, she will go long the funding currency (e.g. buy a future that will deliver Japanese yen against US dollars) and short the target currency (e.g. sell pound sterling in a US dollar amount equivalent to the amount spent in the first transaction).

Table 6.1 Recent market estimates of the size of carry trades

Date	Person	Affiliation	Estimate, US\$ bn.	Source
26 April 2007	Hiroshi Watanabe	Deputy Finance Minister, Japan	80-160	<i>The Economist</i>
6 March 2006	Stephen Jen	Head, Global Strategy, Morgan Stanley	190	Reuters
3 June 2007	Jim O'Neill	Chief Global Economist, Goldman Sachs	250	<i>Telegraph</i> (UK)
14 March 2007	Jesper Koll	Economist, Merrill Lynch	1,000	<i>Financial Times</i>

Table 6.2 Threshold values at which carry trades could unwind

<i>Funding Currency: JPY</i>				
	BRA	ICL	TUR	IND
Change in exchange rate (3 month)	-1.6%	-1.9%	-3.0%	-0.4%
Volatility (annualized)	15.6%	15.5%	14.7%	9.4%
<i>Funding Currency: CHF</i>				
	BRA	ICL	TUR	IND
Change in exchange rate (3 month)	-1.4%	-1.7%	-2.8%	-0.1%
Volatility (annualized)	13.3%	13.3%	12.4%	7.2%

Ceteris paribus, this transaction results in a widening of the difference between the net positions on the funding and target currency. We then estimate the value of net speculative carry trades by subtracting the value of the net futures positions on UK pound and Australian dollar (the only potential target currencies for which this data is available) from the net positions on Japanese yen and Swiss franc (which are commonly used as funding currencies).⁹⁵ Figure 6.8 suggests that carry trades in the US exchanges grew significantly in the second half of 2006 and the initial months of 2007, reaching about US\$ 40 billion, substantially above the values recorded before the LTCM crisis in 1998. The volume of carry trades subsequently decreased in the summer of 2007, presumably reflecting the increase in risk aversion provoked by the subprime crisis.

To put this number into perspective, Table 6.1 lists estimates of four observers, as quoted by the financial press. Their estimates range between US\$ 80 billion and US\$ 1 trillion, illustrating both that the futures data likely underestimate the magnitude of carry trades and the great uncertainty around their overall size.

6.4.1.4 Estimated unwinding thresholds

An important question for international financial stability is when carry trades might unwind. To operationalise this question, we measure the threshold values of exchange rate depreciation and volatility beyond which carry trades are less attractive than the S&P 500 benchmark.⁹⁶ We consider two funding currencies, the Japanese yen and the Swiss franc, and four target currencies, the Brazilian real, the Icelandic krona, the Turkish lira and the Indonesian rupiah.

As Table 6.2 illustrates, a modest change in exchange rates could suffice to make carry trades unattractive relative to US equity investments. For instance, for an

investor with a three-month horizon, the Brazilian real need only depreciate by 1.6% against the yen to render the real-yen carry trade unattractive. Similarly, increases in exchange rate volatility of between 7% and 16% can lead to the unwinding of carry trades. These figures suggest how risky these transactions are and how prone they are to a large-scale unwinding.

6.4.2 Integration of China and India into global capital markets

The 9% mini-crash (by emerging market standards) of the Shanghai stock market on 27 February 2007 restored volatility to global financial markets.⁹⁷ This widespread reaction to instability observed in a major emerging market economy raises a crucial question: How dependent is the stability of the international financial system on the stability of the emerging giants, China and India? Their importance for world growth, world trade and international competitiveness has been widely noted for some time. Moreover, Chinese official reserve accumulation, private savings and current account surpluses put it at the centre of the 'global imbalances' debate.⁹⁸ But since China and India have not played a significant role in recent financial crises, including the Asian crises of 1997, and since they have not received as much foreign portfolio investment (in relative terms) as other emerging economies, their importance for global capital market stability has not attracted as much attention. The events of late February and early March, together with increasing short-term capital inflows into China, suggest that it is worth assessing the integration of China and India into the global financial system and whether this development could become a source of international financial instability.

By 2006, China and India had become the fourth- and fourteenth-largest economies at market exchange rates and the second- and fourth-largest based on purchasing power parity. Together, China and India accounted for between 30% and 50% of world growth in the 1990s and the early 2000s. In 2006, China accounted for 8% of world exports and 6% of world imports, ranking number three in each category, behind Germany and the United States.⁹⁹

How financially integrated are China and India with the rest of the world? The two economies' share of foreign assets and foreign liabilities relative to the world total is much lower than their share of global GDP and trade. Whereas China's integration has increased by this measure, particularly in the 1990s, the same cannot be said for India, whose integration has decreased. In 2004, China's foreign assets and liabilities stood at about 100% of GDP and India's slightly over 50% of GDP. These ratios are much lower than that of the G7 countries (250%) and slightly below those of East Asia, Eastern Europe and Latin America.

A first question for financial stability is whether local or foreign factors could cause or accelerate a domestic financial crisis in China or India. As might be expected of economies that grow as fast as these two, overheating concerns emerged at some point in each country. China's very rapid credit growth has slowed since 2003. Although it has recently picked up, partly fuelled by the 'excess liquidity' created by a foreign exchange regime that allows for only small appreciations of the yuan, it remains nowhere near 2003 levels. Indian credit growth has been rapid since the end of 2004. In each country, monetary policy has responded with a recent tightening, but this in itself could attract still more short-term capital inflows.

There are also some important structural issues in the banking sector of China, such as lingering concerns about the amount of non-performing and problem loans,¹⁰⁰ underdeveloped risk management and control, low capital levels, state involvement and weak supervision. In addition, banks are more or less obligated to buy debt certificates issued to sterilise the liquidity impact of the massive foreign exchange interventions. These low-yielding assets could also weaken their balance sheets.

The recent partial opening of the Chinese banking system to foreign investors has imposed some market discipline in banking, promoting China's integration into global capital markets and the development of the domestic financial system. The experience of Eastern Europe, where foreign bank ownership is much more extreme, suggests that it can make positive contributions to the optimal financing of firms (Giannetti and Ongena, forthcoming). This process of opening up to foreign bank ownership may help China overcome some of its structural problems in banking.

The Chinese and Indian stock markets have seen tremendous appreciations, even after corrections in 2006 and 2007. The greater importance of the stock market for the Indian economy should make it a point of attention from a macro-prudential perspective. Moreover, as the global spread of volatility in late February and early March 2007 illustrates, the valuation of the Chinese stock market also needs to be taken into account. After record gains of about 290% in only one and a half years, it is widely perceived as over-valued.

Could 'hot money' from abroad play a role in domestic financial instability? The salient feature of Chinese foreign liabilities (as for other emerging economies; Prasad and Wei, 2005, Figure 3) is a strong bias towards foreign direct investment (FDI). This is likely related to foreign exchange controls, underdevelopment of domestic capital markets and an increasingly integrated global production system and should be stabilising. FDI into China has ballooned since the early 1990s. FDI inflows into India, though far smaller than those into China, have recently picked up significantly (Bussiere and Mehl, 2007). China is now the seventh most important recipient of FDI in the world, which roughly corresponds to its weight in world GDP. India ranks just 36th, well below its GDP weight.

India receives a greater relative share of portfolio equity investments, which may be related to its more-developed and less-fragmented stock market as well as to its less-discriminatory capital controls. This exposes it somewhat more than China to volatile international capital flows. India also receives a greater relative share (as % of GDP) of external debt than China. But for both economies, foreign debt has been heavily geared towards medium to long-term maturities (Prasad and Wei, 2005, Figure 5).

More recently, however, Chinese foreign debt has become more short term. The latest figures suggest that foreign currency denominated external short-term debt accounts for more than half of total external debt of China. This is likely driven by appreciation expectations for the yuan. The Chinese State Administration of Foreign Exchange (SAFE), seemingly aware of the risks of short-term capital inflows, recently tightened capital controls twice to force the early redemption of debt. In October 2005 it adopted a more restrictive regime for delayed import payments and in March 2007 it reduced the foreign short-term debt quotas of local banks. The tide may, however, be difficult to stop. The relatively successful con-

trols may be losing their bite, in particular when significant appreciation expectations for the yuan emerge. In the interest of financial stability, the inflow of short-term capital into China must be carefully monitored.

Overall, both China and India show some vulnerabilities. Both stock markets seem overvalued. Indian private credit has grown very fast for some time, and Chinese credit is picking up, though structural banking problems remain. India is exposed to portfolio investors and China's short-term foreign debt ballooned recently. The old recipe of capital controls may no longer be working in the context of significant appreciation expectations. The two economies seem exposed to significant financial stability risks. Mitigating these risks are large stocks of foreign exchange reserves and small public sector deficits. In China in particular it is hard to see a major financial crisis unfolding without a sovereign crisis.

The issue for international financial stability is whether a domestic financial crisis in China or India could spill over to other major countries. First, to what extent might such a crisis hurt foreign investors and create financial contagion? Industrial countries invest very modest shares of their external portfolios in China and India. The largest investors, in relative terms, are Spain and Luxembourg, whose holdings in China and India represent just 2.8% and 1.5% of their total foreign equity investments. This is different for a number of non-industrial Asian countries. Indonesia, for example, has significant portfolio exposures to both China and India. The large exposures of Hong Kong to China and Mauritius to India (and China) seem to be special cases.¹⁰¹ The new feature of foreign participations in the main Chinese banks may also be relevant. Although this increases the exposure of major global players to problems that may emerge in the Chinese banking system, the stakes tend to be small and dispersed and the 'big five' Chinese banks may be regarded as 'too big to fail'. Thus, the greater participation of global financial institutions in the Chinese banking system seems unlikely to become an important transmitter of Chinese financial instability to the rest of the world. Overall, the risk of financial spillovers from China or India to major industrial countries seems contained.

Domestic financial instability could lead to a slowdown of Chinese or Indian growth, creating a slowdown of world growth that harms other economies and/or their financial sectors.¹⁰² Given the importance of the two countries in world trade and growth, this is likely the most important channel through which a crisis would affect the rest of the world.

What about Chinese investments abroad and possible sales of foreign assets? A large part of China's and India's foreign assets are official reserves. The countries are the largest and the seventh-largest reserve holders in the world. A reversal of the substantial accumulation of official reserves financing the US current account deficit could cause disturbances in the international adjustment process. This issue and its implications for financial stability is addressed in Chapter 3.

A new aspect of this risk emerges through the phenomenon of sovereign wealth funds. China, for example, announced the creation of such a fund recently. It aims at diversifying official reserves away from low-yielding assets, such as US government bonds. Depending on the scale of the fund, its investment strategy and the speed at which reserve assets are diversified, it could contribute to disruptions in the adjustment process. Achieving greater transparency about the investments of sovereign wealth funds could help preserve financial stability.

A remaining issue is the linkages created by Chinese and Indian private investments abroad. If one abstracts from official reserve holdings, their investments abroad are much smaller than their foreign liabilities. Portfolio equity investments are very small. But private debt investments of China are large (even outside official reserves). Chinese and Indian FDI to the rest of the world are also small, though Chinese FDI has recently picked up. This partly reflects some liberalization of outward FDI that started in 2001. In particular, in December 2004 an 'experiment' started in which restrictions on the purchase of foreign currency for outward FDI have been lifted in 24 provinces. Enterprises are allowed to spend the profits and other income generated from outward FDI. These measures can help alleviate upward pressure on the yuan and help to diversify the asset side of the Chinese balance sheet. These measures also reflect a desire to gain access to strategic resources (energy and other commodities) to support the country's economic development. Up to now China's handling of international investment and financing has been characterised by 'equity financing and bond investment', which is not typically a profitable strategy. Apart from exchange rate considerations, a desire to change this pattern may explain several measures taken in 2006 to facilitate outward portfolio investment.

Overall, it can be expected that China (and India) will become much more important international private investors, but it will likely take quite some time until their scale in this regard matters for global capital markets, particularly regarding portfolio investments. The greatest risks that could emanate at present from China and India are that changes in reserve holdings (possibly through the growth of sovereign wealth funds) would disrupt international adjustment and that domestic financial instability would lead to a slowdown of world growth. Risks to domestic financial stability in China are mostly related to the present exchange rate regime (fuelling domestic liquidity creation and short-term capital inflows) and remaining structural weaknesses in the banking system and supervisory set-up. For India, private credit growth and stock market developments may be of greatest concern.

6.5 Conclusions and policy implications

International capital mobility and financial integration have increased tremendously in recent decades. De jure measures of restrictions on capital flows tend to underestimate the integration process. Among industrial countries this expansion has by far exceeded the growth of international trade in goods and services. The reasons for this development are manifold: technical progress, financial liberalization and deregulation, domestic concentration and competition policy etc. For industrial countries and higher-income emerging market economies it brings about significant benefits in terms of risk-sharing and growth. Countries below certain levels of human capital, financial development, quality of institutions and macroeconomic policies, however, may not systematically realize those benefits.

There is a widely-held view that unfettered international capital flows lead to recurrent financial crises. Theory suggests an ambiguous relationship between financial integration and financial stability. Recent macroeconomic studies find that capital account liberalizations are either unrelated to financial stability or are

negatively related to the frequency or severity of banking and currency crises. Still, because the situations of individual countries may differ, this conclusion should not be read as an unconditional recommendation to open capital accounts. In particular, for some developing and emerging market countries, the benefits of liberalizing may not outweigh the risks.

Theory suggests that the welfare benefits of banking integration could outweigh the welfare costs of the greater risks it implies. In particular, cross-border retail banking integration may be an important vehicle for risk sharing in banking sectors of large economic areas like the euro area or the United States. Supervisory structures and approaches must, however, keep pace with the increasing cross-border penetration in banking.

A topical issue related to the stability of the international financial system is the phenomenon of carry trades. Recent estimates of their size range widely, from US\$ 80 billion to US\$ 1 trillion. The profitability of carry trades relies on the violation of uncovered interest rate parity, which states that the interest rate differential between two currencies should be offset by changes in exchange rates. This condition is, in fact, often violated. Carry trades are attractive when their risk adjusted returns exceed those of other investments. By estimating Sharpe ratios for various carry trades and US stocks (S&P 500), we show that the attractiveness of carry trades is sensitive to changes in exchange rate levels and volatilities. In other words, the large and abrupt unwinding of carry trades is a risk.

An upcoming issue is the role that the 'emerging giants' China and India will play in the international financial system. At present their international financial integration (abstracting from official reserve holdings) is much lower than their role in world trade or GDP. Both economies now have some financial stability risks that need to be monitored carefully. Their stock markets have rallied strongly, credit is growing fast in India and the Chinese exchange rate regime and associated appreciation expectations for the yuan fuels domestic liquidity creation and short-term foreign debt inflows, as capital controls lose their bite. A domestic financial crisis in China or India is, however, unlikely to induce strong financial contagion to other major countries. In contrast to a few Asian countries, financial exposures of industrial countries are still too small to be of particular concern in this regard. If a financial crisis in China or India would strike, other international transmission mechanisms are probably of greater concern. First, a stop of Chinese foreign exchange interventions may create an international adjustment problem in the financing of the US current account deficit. Second, an economic slowdown related to a crisis in China or India could significantly hamper world growth, which has in recent years been very much driven by these two countries. But, at least in China, it is also hard to imagine a domestic financial crisis unfolding without a sovereign crisis.

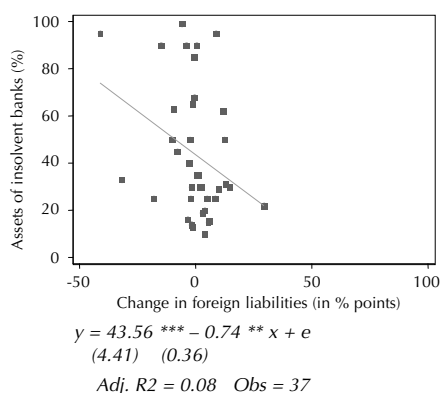
Overall, the most important advances in integrating China and India in global private capital markets are still to come. Significant financial liberalization, however, may have to wait for a number of domestic conditions to hold. Even though the recent mini crash in the Shanghai stock market had a surprisingly large effect on global volatility, the most significant international financial stability challenges that these major emerging economies pose lie ahead, in the decades to come.

Appendix 6A More evidence on the relation between financial integration and banking crises

This appendix presents additional results on the empirical exercise assessing the relationship between financial integration and the severity of banking crises. The following figures present scatter plots and simple univariate regressions (with a constant) illustrating the relationships between our three measures of banking crises and our two measures of financial integration or openness.¹⁰³

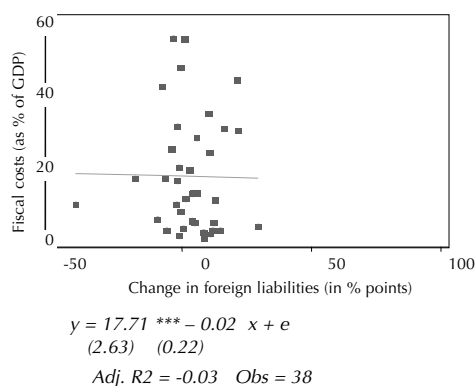
When we replace our flow measure of openness by the changes of foreign liabilities during the first two years of each crisis the results do not change. We chose not to report the details about these and other robustness checks.

Figure 6.A.1 Assets of defaulting banks in banking crises (y) and capital inflows before the crises (x)

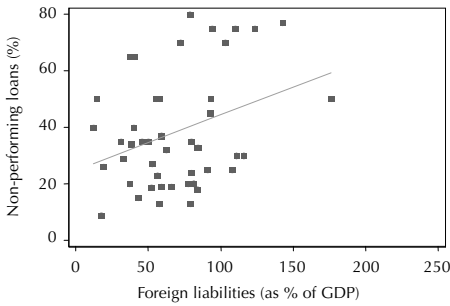


Sources and notes: See Fig. 6.5. Assets of insolvent banks are in percentage of total assets of the banking system.

Figure 6.A.2 Fiscal costs of banking crises (y) and capital inflows before the crises (x)



Sources and notes: See Fig. 6.5. Fiscal costs are in percentage of GDP.



$$y = 24.80^{***} + 0.20^{**}x + e$$

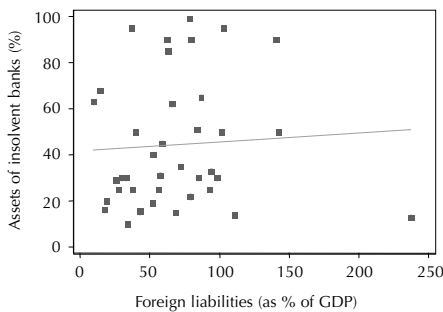
(6.47) (0.08)

Adj. $R^2 = 0.09$ Obs = 45

Sources: See Figure 6.5.

Notes: Non-performing loans are in percentage of total loans. Foreign liabilities before the crisis are the average stock of foreign liabilities in percentage of GDP in the 2 years before the crisis. Crisis periods are defined in (i). Results are reported for "systemic" crises only. In the regressions standard errors of the coefficients are in brackets. *, **, *** indicate statistical significance at the 10%, 5% and 1% levels, respectively.

Figure 6.A.3 Non-performing loans in banking crises (y) and foreign liabilities before the crises (x)



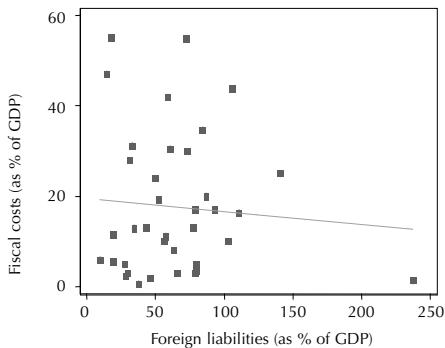
$$y = 41.55^{***} + 0.04x + e$$

(8.51) (0.11)

Adj. $R^2 = -0.02$ Obs = 38

Sources and notes: See Figure 6.A.3. Assets of insolvent banks are in percentage of total assets of the banking system.

Figure 6.A.4 Assets of defaulting banks in banking crises (y) and foreign liabilities before the crises (x)



$$y = 19.50^{***} - 0.03x + e$$

(4.71) (0.06)

Adj. $R^2 = -0.02$ Obs = 38

Sources and notes: See Figure 6.A.3. Fiscal costs are in percentage of GDP.

Figure 6.A.5 Fiscal costs of banking crises (y) and foreign liabilities before the crises (x)

7 Household Finance

This chapter reviews financial and demographic developments in the household sector over the past decade for the largest industrialized countries. After identifying several common trends, it addresses two key questions: Has the risk exposure of the household sector increased or decreased as a result of these developments? What are the implication for macroeconomic trends and ultimately for financial stability?

7.1 Recent trends in household finance

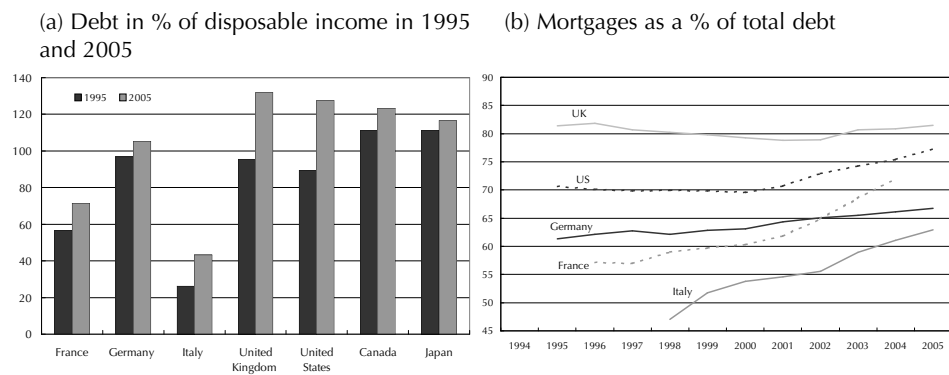
Five main trends characterize developments in household finance:

- (i) Household debt levels have steadily increased in most countries.
- (ii) Real and financial wealth have substantially increased, both in absolute terms and as a multiple of disposable income. Overall, *net total* wealth has also increased.
- (iii) Households have more direct exposure to market-based financial risk. The composition of financial portfolios has shifted in favour of riskier assets, both held directly and managed by institutional investors. Meanwhile, the portfolio weight of safer assets such as cash and deposits has declined.
- (iv) A gradual shift from Defined Benefits (DB) to Defined Contribution (DC) pension plans has further raised households' financial risk; moreover, this shift requires households to manage investments to provide for retirement.

Households' direct and indirect exposure to longevity risk has increased.¹⁰⁴ As people continue to live longer than expected, governments find it increasingly difficult to fund public pension schemes. This is increasing the need for private savings to support people in retirement.

7.1.1 Rising household debt

In recent years household debt has risen in all the major countries (with the partial exception of Japan; see Figure 7.1, panel a). The expansion was most sizeable in the UK (45% of disposable income) and the United States (30%), where the access to debt instruments is greatest, and sometimes leads to excesses (witness the

Figure 7.1 Household debt

Sources: For disposable income: OECD Economic Outlook n. 80, 2006. For debt, Banque de France for France; Deutsche Bundesbank for Germany; Banca d'Italia for Italy; Central Statistical Office for the United Kingdom; Federal Reserve System - Board of Governors for the United States; Statistics Canada for Canada; Bank of Japan for Japan. For debt: Italy: Banca d'Italia; Germany, Bundesbank, France: Banque de France; United Kingdom: The Blue Book; United States: Federal Reserve. For mortgages: Italy, Banca d'Italia; for the other countries: OECD Economic Outlook 80.

recent subprime crisis). The share of mortgage debt has been rising over time (see Figure 7.1, Panel b and Girouard et al., 2006), accounting for approximately 80% of total household debt in the US and the UK and around 70% in France and Germany in 2005 (the increase has continued in 2006). The aggregate level of debt differs considerably across countries, ranging from around 90% of disposable income in continental Europe to 120% in the United States and 130% in the UK.

The rise in debt mainly reflects buoyant housing markets, as well as persistently favourable financing conditions. These developments have been reinforced in many countries by financial liberalization and innovation, which have facilitated access to credit and relaxed financing conditions for first-time home buyers; this explains the surge in consumer credit.

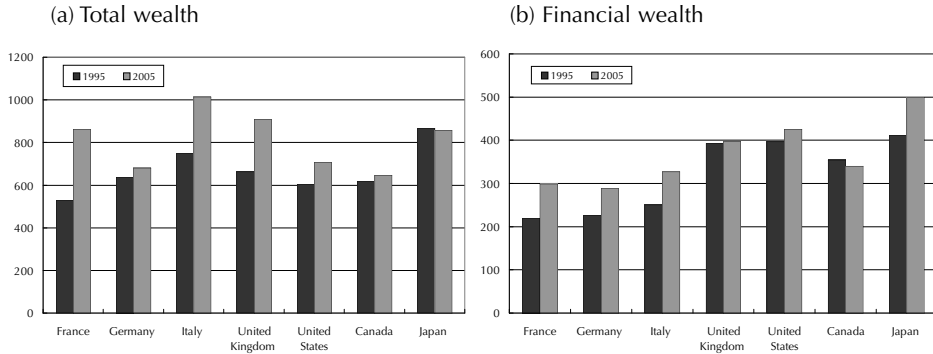
The homeownership rate has increased from 65% to 69% in the United States since the turn of the century. Borrowing against home equity has become easier and less costly.

7.1.2 Increasing wealth

Households' gross wealth in the G7 countries has increased steadily over the past ten years (see Figure 7.2). In 1995, the ratio of real and financial wealth to disposable income was between 5 and 9 times; in 2005 it was between 7 and 10. The rapid growth of household assets has outpaced the growth of liabilities, resulting in an increase of net total wealth (Figure 7.3).

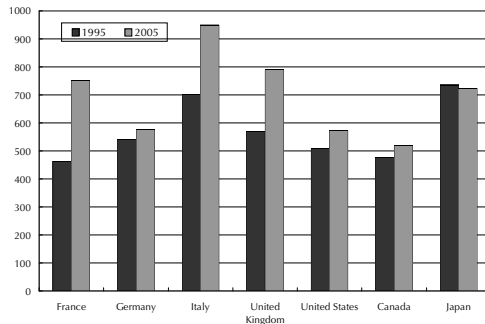
Wealth composition differs across countries depending on cultural and institutional factors¹⁰⁵ and the development of financial markets. The share of financial assets ranges between one-third (France and Italy) and more than a half (the US and Japan). There has been no clear-cut common cross-country pattern in the period 1996–2005. In continental Europe and Japan, households allocated slightly more than half of their savings flow to real estate and the rest to net financial assets. In the United States and the UK, investment in real assets exceeded total savings; hence, new debt has exceeded investment in financial assets over the period 1996–2005.¹⁰⁶

Figure 7.2 Total and financial wealth as % of disposable income (1995 and 2005) for G7 countries



Sources: for disposable income and total wealth, OECD Economic Outlook n. 80, 2006. For financial wealth, Banque de France for France; Deutsche Bundesbank for Germany; Banca d'Italia for Italy; Central Statistical Office for the United Kingdom; Federal Reserve System - Board of Governors for the United States; Statistics Canada for Canada; Bank of Japan for Japan.

Figure 7.3 Households' net wealth in 1995 and 2005 as % of disposable income

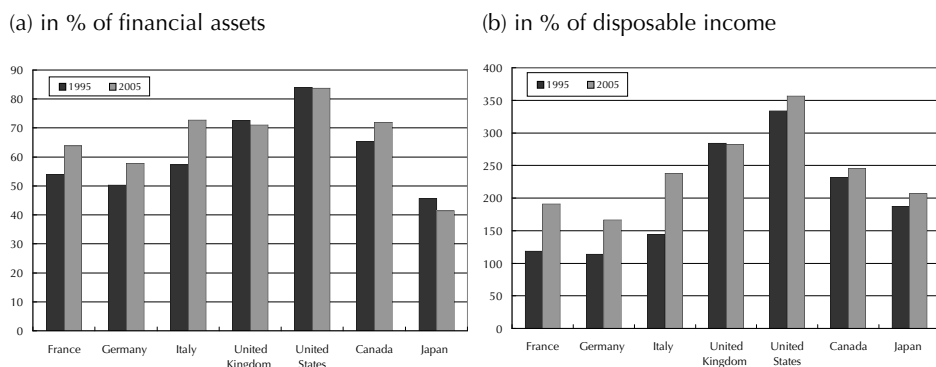


Source: OECD Economic Outlook n. 80, 2006.

7.1.3 Households' increased exposure to financial market risk

In the past decade several factors have contributed to households' increased exposure to financial risk. First, in many countries (Italy, France, Germany and Canada) households have increased the share of financial wealth invested directly or indirectly in risky, mostly market-based assets (bonds, shares, mutual and pension funds, insurance products; see Figure 7.4). In the United States and the UK this share was already very high and has remained stable (84% of the financial portfolio in the United States and 70% in the UK). In all countries, including Japan, the growth of financial assets has resulted in an increase in the ratio of risky assets to disposable income. This ratio is equal to 350% in the United States and 200% in continental Europe (Germany, France and Italy) and Japan.

Households have also significantly increased the weight of financial assets managed by institutional investors (e.g. mutual and pension funds, insurance companies), especially in countries with more bank oriented systems (an increase of 10

Figure 7.4 Composition of households' financial portfolios: risky assets

Sources: for disposable income, OECD Economic Outlook n. 80, 2006. For financial accounts, Banque de France for France; Deutsche Bundesbank for Germany; Banca d'Italia for Italy; Central Statistical Office for the United Kingdom; Federal Reserve System - Board of Governors for the United States; Statistics Canada for Canada; Bank of Japan for Japan.

percentage points on average for Germany, France and Italy). In 2004–5 the share of financial wealth managed professionally was between more than 25 and almost 60%, or between one and two and a half times disposable income. Given the growing amount of wealth invested in risky assets, the trend is likely to continue.

The growing share of households' assets managed professionally reflects both supply and demand factors. Increasing international financial market integration and financial innovation allow financial institutions to invest in portfolios fully diversified by country and sector and to slice and allocate risk more efficiently. Institutional investors have therefore been offering products with more sophisticated risk–return patterns that are better suited to the needs of individuals. Demand has also increased for specific products. Pension funds, for example, are becoming more important as a consequence of the projected reduction in public pension scheme payments and the resulting increased emphasis on second and third pillar strategies for retirement (respectively, compulsory and optional savings through company and individual pension funds). Finally, in the context of historically low interest rates and low risk aversion, households have likely turned increasingly to financial markets in search of higher returns.

Finally, indebted households are exposed to interest rate risk, especially if they have adjustable rate mortgages, which is the case for most contracts in the UK and, in the euro area, for almost half of new contracts. In the United States, variable rate contracts are concentrated among subprime borrowers, who represent less than 20% of the market but are also usually especially sensitive to increases in interest rates.

7.1.4 The shift from defined benefit pension plans to defined contribution plans

After experiencing underfunding problems in the past few years, firms throughout the world are shifting their pension plans from Defined Benefit (DB) to Defined Contribution (DC). In the United States, DC plans accounted for 55% of assets under management in 2000, compared with 35% in 1985. In the UK, 80% of

workers were still enrolled in DB plans in 2000, but a majority of funds have now closed and new entrants must adhere to DC plans. This trend has the dual effect of transforming a company's pension liabilities from an unknown quantity to a known one while transforming every pension plan participant – from the most junior clerk to the most senior executive – into his own 'portfolio manager'.

The gradual move from guaranteed-return to unit- or index-linked insurance products is also worth mentioning (IMF, 2004), since the effect is the same as the shift from DB to DC: a transfer of investment risk from firms to households. The income available at retirement from index-linked products, like DC plans, will depend on future investment returns, with no guarantee from an employer or an insurer. This trend differs from the shift from DB to DC plans in one crucial way: through their product choices, annuitants are volunteering to become their own portfolio managers rather than being assigned the task by their employers.

7.1.5 The increase in longevity risk

As more countries are reducing the payments (as a percentage of the worker's last wage) that will be made in the future by their public pension schemes, households will need to provide the resources for their retirement by participating in second and third pillar pension schemes (Visco 2002, 2006). As for the second pillar, pension funds can match assets and liabilities, but they cannot really hedge the risk that people will on average live longer than expected; in other words, if every cohort exceeds its life expectancy, as has occurred for decades, these intermediaries will have to pay more than expected, and liabilities may exceed assets. This risk, previously borne by public pension systems, is now being transferred to pension funds and, ultimately, to households. In practice, in PAYGO public pension schemes longevity risk is shared across generations, while in funded pension systems each generation carries its own risk.¹⁰⁷ On top of this, third pillar schemes and additional private savings add direct longevity risk to households.

Longevity risk is notoriously difficult to estimate. To give an example of its magnitude, a rough estimate of the net present cost faced by the Italian pension system for a shock comparable to those of the past would be a little under 320 billion euros, corresponding to about 10% of the present value of pension liabilities implicit in the current system.¹⁰⁸ As the role of the public pension schemes decreases in coming decades, this risk will be shifted to households. Households should in principle prefer to hedge or diversify away this risk. But at the moment the annuity market for individual savings is very small and many families are reluctant to annuitise their pension savings upon retirement.

7.2 Financial stability implications

What are the main implications of these trends for financial stability? Specifically, recall the two questions asked at the outset: has the risk exposure of the household sector increased or decreased as a result of these developments? What are the implications for macroeconomic trends and ultimately for financial stability?

7.2.1 Default risk

A number of indicators seem to suggest that, so far, the levels of indebtedness are broadly affordable and that most households could absorb adverse changes in interest rates, house prices and income (with the exception of the subprime segment in the United States; see Box 7.1). Foremost is the fact that net wealth has increased: the household sector should therefore be more resilient than before, having a larger buffer of assets to use against shocks. Repayment capacity is also high, as the fraction of disposable income devoted to servicing debt remains contained. In 2005, the aggregate debt-service ratio (inclusive of principal repayments) amounted to close to 19% of disposable income for US households, slightly less for the UK, and around 8% for euro area households (the ratio is even lower in some countries – for Italian households it is around 6%; see Girouard et al., 2006). Moreover, the debt burden appears well distributed across the population (with possible exceptions – see below). Survey data indicate that debt is mainly held by higher income households: the proportion of indebted households in the highest income group exceeds 80% in many countries (e.g., United States, UK, Canada, Sweden), but is much smaller in the lower income groups. Finally, besides the income distribution of debt-holders, one should consider that the continuous rise of mortgages as a percent of total debt implies that debt is increasingly collateralized.

Against this favourable scenario there is evidence that, in some countries, improved access to credit markets (e.g. through new mortgage products facilitating homeownership by borrowers with limited resources available for a down-payment¹⁰⁹) has allowed more low-income households with poor credit ratings to borrow (see Bucks et al., 2006). For instance, in the United States the share of low-income households holding debt has reached 50%; the proportion of disposable income devoted to servicing debt has been increasing due to the increasing share of lower-income borrowers. It is also important to recall that a large share of outstanding mortgages was taken out recently (in the United States, approximately 30% in the past two years). This, together with the currently high valuation of real estate and high loan-to-value, makes for a cautionary note.

Finally, in some countries – such as the UK and Italy – where variable rate contracts prevail, interest rate risk is borne mainly by households. The current low rate environment might be ending and, since these contracts are often subscribed by lower income households, a rate increase would hit them disproportionately.

All in all, default risk is increasing, but still contained – as long as there is no sudden, sharp downturn in the real estate market or increase in interest rates.

7.2.2 Wealth and consumption

The increase in wealth, coupled with an increase in households' exposure to riskier assets implies that in principle households are more exposed to financial risk and more influenced by changes in wealth. As a result, for a given wealth-to-consumption ratio, consumption has likely become more sensitive to the business cycle, possibly adding to macroeconomic fluctuations.

The extent of households' sensitivity to changes in asset values depends crucially on the size of "wealth effects". Overall, empirical evidence suggests that the marginal propensity to consume out of wealth tend to be larger for countries with

BOX 7.1 The US subprime market: how household defaults can create ripple effects

Definition and size of the market. Thanks to financial innovation that allows originators to offload credit risk quickly, and the generally low current interest rate environment, there has been a rapid expansion of non-agency subprime mortgages in the past few years. These loans are typically extended by specialized institutions (usually supervised only at the state level) to customers with poor credit ratings at high interest rates (although not necessarily from the first instalment). Typically little or no information is required, and these loans are characterized by higher-than-average delinquency rates. Thanks to securitization, issuers are able to pass on at least part of the risk and take advantage of the current abundant market liquidity.

Annual non-agency MBS issuance has not only doubled to more than \$1 trillion, but has also increased from one quarter to more than one half of total MBS issuance (Frankel, 2006). Subprime loans are worth approximately 10% of the total mortgage market and 20% of new loans; Alt-A mortgages, which are the next-riskiest category, are worth almost as much. Most subprime mortgages are adjustable-rate, with a large share that will reset interest rates to higher values in 2008. These loans are inherently risky, given that they are subscribed by households with a high probability of default and are less collateralized than standard mortgages. Even with the generous terms being increasingly offered by lenders, only 16 percent of all mortgages have equity (the difference between the current market value of the home and the outstanding balance of the mortgage) below 10 percent of the value of the loan (and 7% have negative equity); but for ARM mortgages taken out in 2004-06 the figures are respectively 50% and 25%.

Systemic implications. A spike in default rates and late payments starting in the last quarter of 2006 caused the bankruptcy of some of the main subprime operators and is raising several issues of systemic relevance. Three are most important: a collapse of the subprime market could precipitate a drop in housing prices that would affect the whole mortgage industry and probably the entire economy; defaults on loans made to finance subprime lending might threaten core institutions; the crisis of the subprime sector, some of whose participants apparently resorted to unsavory practices to generate more mortgages, could cause reputational damage that might harm the rest of the industry.

A significant drop in housing prices is more likely to occur in one of the following two cases: if a spike in defaults pricks a bubble, or if it meets a situation of falling demand and stable or rising supply. The consensus seems to be that there is no housing bubble; as for the general trend of the housing market, it is true that demand is falling, due also to the already high level of debt of households, but supply is slowing too. However, adding repossessed homes and homes likely to be repossessed to the backlog of unsold homes risks causing a housing glut that could negatively affect prices that are already softening if not declining. The consensus view might therefore prove too optimistic: the subprime crisis might still trigger a sharp reduction in housing prices, with severe adverse consequences for the whole economy.

As for the involvement of the rest of the financial industry, subprime lending operators have financed their operations with loans and then securitized their products. Now that they are collapsing, both types of instruments are defaulting, creating losses for traditional intermediaries. Whether this creates significant systemic risk depends on the...

BOX 7.1 (contd.)

...size of the subprime market relative to the total size of credit or mortgage markets, and on the concentration of exposures. The subprime market is large in absolute value, but only about 10% of the total mortgage market. The following back-of-the-envelope calculation helps to put the relative magnitudes in perspective: in the extreme event that a third of these loans default (so far the figures are much lower: past due loans were less than 15% at the end of 2006), and assuming a low recovery rate of two-thirds, this would imply a loss of 1% for the mortgage market as a whole, significant but probably not of systemic magnitude. As for the concentration of exposure, there are no data but some of the major banks are already provisioning for such an event and their share prices have suffered but have not collapsed. This is consistent with balance sheets and risk management that are able to absorb such a shock.

The reputational damage of the subprime crisis could be high. Some subprime lenders seem to have been practicing predatory lending, i.e., enticing people who really could not afford to buy a home by offering very low initial payments that eventually increase by 50% or more. The political backlash against such selling strategies will bring some much-needed reforms, but the risk is that the whole mortgage market might have to suffer from over-regulation as a result. It should not be forgotten that the vast majority of subprime borrowers are regularly servicing their debt. Excessive regulation would exclude from the market customers who would not otherwise be able to become homeowners.

market-based financial systems than for countries with bank-based systems (Ludwig and Sløk, 2004). The general view is that the long run marginal propensity to consume out of wealth is around 3–5% in the United States, somewhat higher for the UK and Canada and somewhat lower for euro area countries (Altissimo et al., 2005). The actual change in consumption from a given change in wealth also depends on the ratio of wealth to consumption and on the share of wealth held in assets that are subject to large, unexpected changes in asset prices that are perceived as permanent. Typically this is more true of real estate; therefore, the housing market is likely more important than the stock market in influencing macroeconomic conditions and consumption (see Cecchetti, 2006). The relevance of house prices to household consumption also reflects the fact that housing wealth is more evenly spread across income classes than financial wealth.

To summarize, since wealth has increased by a sizeable fraction of disposable income, the share of wealth-based consumption has grown by a few percentage points. Given that net wealth is between 5 and 9 times disposable income, a drop in asset prices of 20% would cause a drop in consumption of between 2% and 10% (most likely around 5–6% based on realistic combinations of parameters) – enough to cause a recession or a serious slowdown in growth.

7.2.3 Households and systemic risk

A first issue, highlighted by the recent subprime crisis, is whether household debt has systemic relevance. Within the traditional intermediation model, banks held loans until expiration, carrying credit risk. In the new intermediation model, where banks originate loans and then sell them, there is scope for successive lay-

ers of leverage. Since mortgages are an ideal starting point, because they are asset-backed and have had historically low levels of default, household debt is now at the bottom of a credit pyramid, which starts with banks, as in the old model, and then continues with buyers of asset-backed securities. In the traditional model, relatively small changes in households' financial situation would have affected only banks, which in any event used to set aside provisions. In the new model, any change in default rates is magnified many times over through leverage, and quickly translates into capital losses. Setting aside all issues of asymmetric information that might add a liquidity squeeze to the credit crisis, this means that the household sector can cause large losses for financial institutions very quickly even with relatively small shocks; in other words, it can generate instability, as it just did in the first half of 2007.

A second crucial issue, this time from the asset side of households, is whether the progressive transfer of risks from financial institutions and the corporate sector to households – through the shift from DB to DC pension schemes, the diffusion of unit- or index-linked insurance products, the shift from bank liabilities to riskier assets and the shift from depository intermediation to professional asset management – has affected systemic risk in the financial system.

Answering this question is no easy task (see, for example, Rajan, 2005 and Kohn, 2005). In principle, the system should be more stable, given that risks are increasingly spread over a large investor base. Hence, in case of crises a wide range of financial institutions and also the household sector would absorb risks that would otherwise hit a few financial intermediaries, in particular banks. This should contain the potential transmission of shocks from the financial sector to the economy. However, the increase in market-based risks borne by the household sector and their increasing reliance on professionals to manage their financial savings has increased the possibility of myopic or opportunistic behaviour that might end up generating avoidable risks. Think for example of the incentives faced by professional fund managers: since they are increasingly paid according to the excess returns that they generate, and since it is almost impossible to disentangle true ability from excessive risk taking, at least in the short run, there is a strong incentive to pile up unnecessary risk in order to generate higher returns.

The recent experience seems to support the optimistic view: the financial, macroeconomic and geopolitical shocks that have hit the global economy since 2001 have affected wealth, the cost of capital and asset prices but did not harm financial intermediaries to the point that they would stop financing the real economy.

However, one might question whether these shocks were large enough to harm the financial system, and whether their effect would be the same in adverse conjunctural conditions. In fact, the reaction of household investors to market turbulence is practically untested and one might conjecture that it could substantially add to market volatility. Moreover, given the progressive transfer of risks from financial institutions and the corporate sector to households, risks could become less visible to supervisors and regulators and possibly more difficult to contain. And despite the fragmentation of risk, it is possible that a systemic component of these risks could materialize. One cannot exclude the emergence of quasi-fiscal liabilities in cases where pension funds or insurance companies or even a multitude of households (each with an exposure that is small in absolute

value but large relative to their individual wealth) purchase such risk, which subsequently goes bad, and for which governments may need to take responsibility (Carstens, 2006). The subprime crisis in the United States might offer a test of such matters.

The increase in the amount of financial risks in households' portfolios raises a number of more general issues. First, the extent to which households are aware of the modifications in this source of risk is unclear. Are investors sufficiently informed about the menu of available assets, their expected returns and risk – interpreted in a broad sense to encompass both variation in returns, correlation with other assets' returns as well as the chance that the capital invested will be returned? Evidence from surveys (see OECD, 2005) and the behavioural finance literature suggest that households have low levels of financial literacy.¹¹⁰ Moreover some of the developments just described affect households indirectly, and their effects might emerge only in the long run (think for example of longevity risk) or in conditions of turbulence (e.g. in case of a large and unexpected increase in interest rates). If these trends were to be unrecognized, their effects would likely be magnified and could have serious adverse effects on the functioning of the financial system.

Even if households are fully aware of these risks, they are probably not able to manage them. Many households lack the knowledge and resources needed to manage risks efficiently. They cannot exploit economies of scale in risk management (in particular in information gathering and processing and trading costs) in order to achieve the desired combination of risk and return and secure a satisfactory income flow for retirement. Moreover, so far there is no obvious or efficient way to hedge longevity risk;¹¹¹ pension funds carry an implicit liability that, if realized, could bankrupt them and, in the end, fall either directly or indirectly on households.¹¹² Finally, for financial institutions such as banks, the transfer of risks to the household sector might simply change the composition of risks. Market and credit risks have been increasingly transferred out of banks' balance sheets, while reputation risks have increased. Managing this risk requires looking at specific transactions and monitoring their potential effects on the bank's reputation. This is no easy task, given the changing character of reputation risk and the need to analyse the reputational effects of events related to complex products in the distant future. It is also hard to assess the monetary consequences of reputation risk, and it is impossible to transfer it. The passing on of financial risks to households also exposes intermediaries to legal risks and operational risks and the political process (think for example of issues related to consumer protection). Are these complex risks clearly understood and recognized by supervisors?

7.3 Policy issues

The growing exposure of households to financial risk and their growing indebtedness raise relevant policy challenges. Foremost is the issue of *transparency and consumer protection*. The evaluation and correct use of new, complex and opaque products is increasingly difficult, and public policies aiming at increasing transparency of financial products would greatly improve households' welfare. This holds for both investment and debt instruments.

A second issue, closely linked to the first, is *financial education*: how to improve it, how to protect uneducated consumers. The aim is to promote public understanding of financial systems, which includes promoting awareness of the benefits and risks associated with different kinds of investments and debt and the provision of appropriate information and advice. Easy access to clear, simple, authoritative advice and information should help consumers decide how much to save, clarify their long-term objectives, determine their attitude towards risk, and identify which (broadly-defined) financial products or services might best meet their particular needs or preferences. Having gone through these processes, they would then be better equipped to shop around and make informed decisions, possibly with further help from expert professional advisors.

However, professional advisors might not deem it economically worthwhile to provide guidance to any but the upper-middle class and affluent, leaving those most in need of guidance to fend for themselves. Recognizing this problem, a few years ago a UK task force on this subject recommended that regulation should encourage the provision of simple financial products, which would be more economical for advisors to sell to a broader segment of the population.¹¹³ This recommendation squares with the view of experts in the field.¹¹⁴

The ultimate goal in fact is not to ensure that consumers have the ability to develop and directly carry out full-fledged portfolio strategies or complex debt arrangements. Rather, they should have the ability to understand and question the advice and literature they are given. To overcome issues of trust in the source of information, the task of improving financial literacy should be assigned to an independent, non-industry source such as a public authority, which could act in partnership with consumer organizations, financial services trade associations and agencies.

8 Financial Consolidation

Over the past 15 years the financial services sector has undergone massive consolidation throughout the world. This chapter first describes the main causes and patterns of this consolidation, then briefly assesses its impact on efficiency and competition. It concludes by considering the effect of consolidation on systemic and firm-level risk.

8.1 Drivers of consolidation

The main cause of the ongoing wave of M&A in financial services can be summed up in two words: more competition. Financial and technological innovation together with deregulation have spurred globalization and increased competition. Consolidation is a strategic response by financial institutions that must cut costs to become more efficient and must amortize the rising fixed costs of technology and distribution networks by rapidly achieving large volumes. Pressure by shareholders for higher returns and the goal of maintaining margins by increasing market share have further encouraged consolidation as a way to implement new growth strategies and to facilitate restructuring. With regard to financial stability, the relevant change induced by this competitive pressure has been the emergence of a few giant, multinational financial conglomerates that raise issues of individual and systemic risk.

Innovation has increased the importance of economies of scale and scope and therefore the search for larger size. The growing role of information technology has increased fixed costs and therefore the rationale for spreading them over a wider customer base (see Berger, 2003). Asset management likewise relies on research and marketing that entail fixed costs, hence consolidation in this particular sector. Financial innovation has increased the number of products available to customers, both corporate and household, and therefore the opportunities to bundle and cross-sell. Many deals are motivated by the desire to exploit these synergies. Finally, the growing importance of households as customers (their debt grew substantially in all major countries; see Chapter 7) makes a retail distribution network, which typically entails a fixed cost, an increasingly valuable asset. Although there is little empirical evidence that economies of scale persist beyond a modest threshold (see Berger and Mester, 1997 for the United States; Schure and Wagenvoort, 1999 for Europe; and the review in Amel et al., 2004), or that M&A is the best way to achieve them, they are the motive for consolidation that prac-

tioners most often cite (survey evidence in the G10 Report, 2001, and *The Economist*, May 2006).

Deregulation generally promotes competition and the removal of legal and regulatory barriers to consolidation, both within and across countries and across segments of the financial services sector. Over the past 20 years, the focus of regulation has shifted from strict regulatory controls aimed at preventing failure to a prudential approach that emphasizes risk-based guidelines and market discipline, allowing a greater role for competition as an engine of growth. The main measures, adopted in most industrial countries, have been¹¹⁵

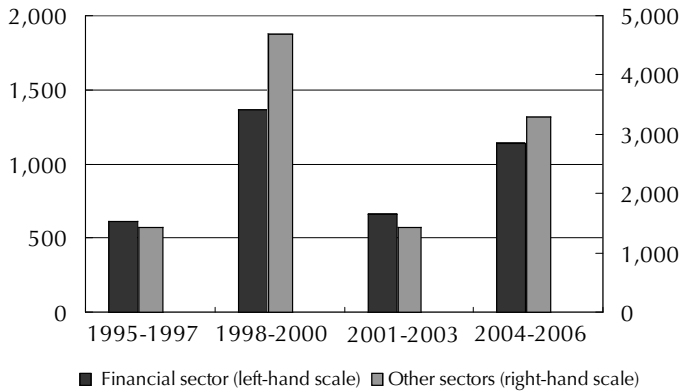
- enhanced price competition in the securities industry;
- the elimination of branching restrictions, which decreases barriers to entry in local credit markets;
- the substantial acceptance of financial conglomerates, which allows cross-segment consolidation; and
- privatization, which encourages formerly state-owned institutions to improve efficiency by restructuring and consolidating, increasing the level of competition.

Globalization in the financial services sector is mainly the result of technological innovation and deregulation, which have opened up new markets by lowering the financial and administrative costs of communication and have fostered cross-border growth. While some retail markets by their nature remain local (e.g. servicing households or small firms), wholesale providers have benefited greatly from globalization, particularly the integration and expansion of capital markets. (At a regional level, the introduction of the euro helped develop a single European capital market that now rivals the United States). As multinational firms demand an integrated supply of financial products, across both geographical and product lines, and as competitive pressure rises due to the increase in the number of players and the commoditization of many products, financial institutions have an incentive to consolidate, to attain a growing minimum sustainable scale and to offer a seamless distribution network.

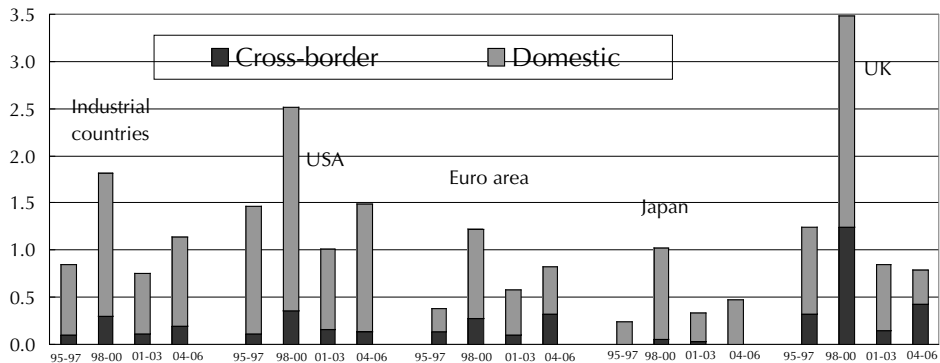
8.2 Patterns of consolidation

8.2.1 The M&A wave

The surge of M&A in the financial sector since the mid-1990s is part of a more general wave of consolidation. From 1995 to 2006 there were more than 100,000 transactions in all industries, worth almost US\$ 15 trillion (see Table 8.1). Of these, about 20 percent were in the financial services sector (mostly in banking; see Table 8.2). The geographical distribution of financial consolidation is skewed towards the United States, where 25% of the deals and 50% of their value took place. The boom years of 1998–2000 were followed by a 50% decline in deal volume. In the past three years, there has been a resurgence of M&A, which totalled 6,300 deals worth around US\$ 1.1 trillion (see Figure 8.1).

Figure 8.1 M&A volume worldwide (US\$ billions, current values)

Source: SDC Platinum, Thomson Financial.

Figure 8.2 M&A volume in the financial sector (% of GDP, 3-years periods in 1995–2006)

Source: SDC Platinum, Thomson Financial.

From 1995–8 to 2004–6, the average value of deals in the financial industry increased slightly, from US\$ 140 million to US\$ 180 million. The number of large deals, worth more than one billion USD, rose from 100 to 180, and the number of megadeals, worth more than US\$ 10 billion, increased from 10 to 17. This has led to the emergence of extremely large institutions, which are potential sources of systemic risk. Just to give an idea of the orders of magnitude, in 2006 the world's top ten banks all had assets in excess of US\$ 1 trillion, while in 1995 the largest bank barely had US\$ 500 billion.

Most mergers in the financial services sector have been domestic, within-industry deals, but there have been some changes lately. Cross-border deals are still a minority, but their overall value rose from 14% of M&A value in 1995–8 to 24% in 2004–6; in the euro area they reached almost 40% of the value of transactions, more than double their share in the three prior years. Cross-border transactions represent a higher share of total deals for euro area financial institutions (see Figure 8.2), largely due to the much smaller size of national domestic markets in Europe as compared to the United States and to the one-time effect of the creation of a single financial market following the introduction of the euro.

The share of cross-industry deals (i.e., between a bank, an insurance company or another financial institution) is relatively stable, between 20 and 25 percent of total value. This share has actually declined in the past three years, even though financial conglomerates seem to be on the rise. The share of cross-industry deals is higher in the euro area than in the United States; absolute values have been increasing but are still lower than at the peak of the consolidation wave, in 1998–2000.

8.2.2 The future of financial consolidation

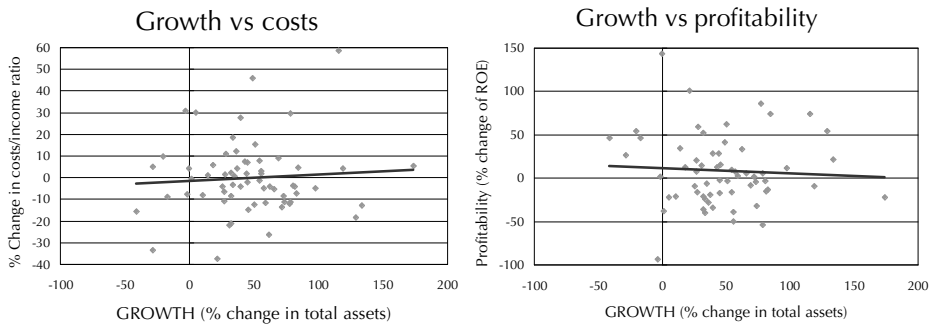
Although consolidation is still going strong, some factors might slow the process. One is domestic concentration: in many small and medium-sized countries the market share of the three largest banks is 60% or higher (Beck et al., 2006), and supervisory authorities are unlikely to allow a merger among them. Even in larger countries, the largest banks hold a substantial share of assets. Therefore, if they want to make significant acquisitions they must look for targets in other segments or countries.

Cross-country deals remain the exception to the rule, however, for good reason. First, in a sector dominated by informational asymmetries such as financial services, these transactions start at a disadvantage. This may explain why the sector's share of cross-border M&A is smaller than for other industries (Focarelli and Pozzolo, 2001). Second, differences in corporate culture, governance style, language and national custom make integration difficult (See Amel et al., 2004). Furthermore, differences in national regulation can make managing a transnational firm centrally quite complicated. Finally, differences in the institutional framework and in market structure might mean that the bidder's competitive advantage at home might not be transferable abroad (Berger et al., 2000).

A last factor that might hinder ever-increasing consolidation, especially among large institutions, is the increasing cost of complexity. As a firm expands in size, the number of products it offers and the range of markets in which it operates, it becomes increasingly difficult to manage consistently. Technology helps organize information flows, but at some point there might be a bottleneck in human resources and managerial ability. Cross-border deals, and in general all large transactions, face the issue of integrating widely different business practices and managing complexity, possibly with total risk that exceeds the sum of the risks faced by the two institutions before the deal. Consolidating IT platforms often proves a daunting and very costly task in large-scale mergers.

8.3 Financial consolidation, efficiency and competition

From a stability perspective, whether consolidation affects efficiency and competition is quite important. If financial institutions become more efficient, they might have a lower overall risk of failure. On the other hand, if competition decreases because of consolidation, the net effect is not clear. In the short run financial institutions might make more profits and therefore become more stable (Allen and Gale, 2004), but in the long run they might grow complacent, and actually become riskier.

Figure 8.3 Performance of top banks worldwide: 2005 vs. 2000

Source: Calculations based on Fitch-IBCA.

8.3.1 Efficiency

A merger can improve efficiency by exploiting scale or scope economies, by transferring superior managerial skills from the bidder to the target or by improving diversification.

One way to assess the potential effects of M&A on large institutions is to check how the largest banks did in terms of asset growth (that was achieved mainly through acquisitions), changes in efficiency (proxied by the cost-income ratio) and profitability (proxied by the return on equity, or ROE). Figure 8.3 shows no strong correlation. Even though some banks both increased significantly in size and improved in terms of cost efficiency or profitability between 2000 and 2005, most did not.

The results of the empirical literature are not too encouraging either. M&A does not seem to create significant efficiency gains and does not, on average, generate significant shareholder value (Amel et al., 2004), although it results in a significant increase in the average size of the largest institutions. There is some evidence of scale economies, but only up to a size well below that of the most recent large deals. Economies of scope are harder to pin down; there is no clear-cut evidence of their existence. Finally, diversification does not seem to add much value (DeLong, 2001).

These results suggest that mergers have often failed to achieve expected efficiency gains and seem to contradict the motivations for consolidation given by practitioners, which largely relate to scale and scope economies and to improvements in management quality. This might be because organizational diseconomies of scale offset any scale efficiencies arising from technologies or scope economies due to diversification. There are, however, other possible explanations.

One possibility is that the deals done may have suffered from strict regulation. For example, the limitations imposed by the Glass-Steagall Act on the range of US banks' financial activities up to 1999 could have impeded the realization of gains from cross-selling. If so, the wave of deregulation registered in the major countries in the 1990s might have increased the potential for scale and scope economies.

Second, the lack of clear-cut evidence regarding the effect of M&A could reflect difficulties in measuring the efficiency gains. During a merger wave, the construction of a satisfactory control sample of non-merging banks – a necessary

benchmark for comparison – may be difficult (Calomiris and Karceski, 2000). In any given year, there might be only a handful of banks not involved in mergers in the previous or following years. Moreover, the non-merging banks might be influenced by the consolidation of their competitors (they could react to the merger of rivals by improving their efficiency or by widening the range of products they offer customers). Thus, measured gains from mergers relative to a control sample might understate actual gains. Also, mergers may be associated with a redistribution of resources among various stakeholders. If M&As are associated with an increase in competition – as was the case in many countries in the 1990s – consumers could reap most of the benefits from consolidation.¹¹⁶ This distributional change implies that profitability ratios or stock returns would not increase even if the efficiency of the consolidating banks improves.¹¹⁷

A third possibility, which has not been fully analysed in the literature, is that the complete gains from mergers only emerge over time. Studies restricted to a short post-merger period might therefore fail to detect the efficiency gains of consolidation. Long lags in the improvement of performance may reflect difficulties in refocusing lending policies, rationalizing branches, integrating data processing systems and operations, and training the personnel of the target to market the new owner's products.¹¹⁸ Moreover, culture clashes may be especially harmful in banking, since relationships with customers depend heavily on soft information, which is more difficult to transfer than objective information such as balance sheet data (Rajan, 1992).¹¹⁹

Yet another possibility is that some M&A is driven by forces that undermine value maximization. Roll (1986) proposes the 'hubris hypothesis', whereby companies overpay for acquisitions because managers overestimate their ability to improve their operations. Some studies suggest that some M&A arises because of agency conflicts between managers and shareholders, reflecting managers' desire to increase their compensation (CEOs of larger institutions earn higher compensation). As evidence, CEOs with higher levels of stock-based relative to cash-based compensation are less likely to lead their institutions into making acquisitions or, if they do, to engage in non-value-destroying acquisitions (see Cornett et al., 2003). Moreover, managers without a large stake in their banks are more likely to get involved in mergers that are not value-maximizing.¹²⁰

8.3.2 Competition

As for competition, there are opposing forces at work. Innovation, deregulation and globalization have increased competition; consolidation, on the other hand, has reduced it. From a stability perspective what matters is that financial institutions do not take on additional risk in order to keep up with their larger competitors.

For retail banking and insurance products, for which markets are mainly local, the empirical evidence suggests that there are still entry barriers even though legal impediments have been reduced or eliminated. Switching costs and informational asymmetries remain important enough to allow banks to raise prices after a merger or acquisition. However, this might be more true for the loans market, that has intrinsically high informational asymmetries (Sapienza, 2002) than for the deposits market, where the product is more standardized. In the long run, banks

eventually return efficiency gains to consumers in the form of lower deposit rates (Focarelli and Panetta, 2003). In any event, institutions operating in retail markets are usually supervised and subject to prudential regulation. When proposed mergers are scrutinized before being authorized, the issue of whether the deal would significantly tilt the balance of risk and capital is carefully examined.

Wholesale markets are international and highly concentrated. The same few names dominate league tables for debt and equity offerings and advisory services in most countries. The main barriers to entry are reputation and placement power, and they are unlikely to decrease in the near future.¹²¹ This allows some degree of market power for the largest institutions (see Gande et al., 1999 for the effect of entry in the corporate debt market). There is no evidence, however, that the higher profits lead to less risk taking. Investment banks have been actually earning a higher share of their income from their proprietary trading operations.

Another way of looking at whether concentration affects risk is to see whether more greater market concentration makes it more difficult to replace a significant player, should it fail. Cetorelli et al. (2007) analyse US financial markets over the past decade from this perspective and find that concentration on the whole has not grown excessively, although linkages across markets have increased. This could increase the risk of contagion. Since there are very few markets with high concentration and low market share turnover, however, the demise of a major player is unlikely to cause significant systemic damage. Policy-makers should focus on protecting and increasing substitutability, by promoting standardization where needed and enforcing a stable set of rules.

8.4 Financial consolidation and individual risk

Consolidation influences individual risk mainly through two channels: by affecting diversification and by increasing operating complexity.

8.4.1 Diversification

An increase in diversification should reduce individual risk, all else being equal. It is also possible, however, that the static gains from diversification derived from uniting two portfolios lead the resulting institution to take on more risk to get back to the desired risk–capital ratio (Haubrich, 1998). In fact, larger institutions do take on more risk than smaller ones, offsetting the benefits of diversification that come with size (de Nicolò and Kwast, 2002).

The most common form of diversification is geographic. Benefits from domestic diversification depend on the correlation of economic activity between different regions. Where the correlation is low, such as in the United States, the benefits can be substantial (Benston et al., 1995). In Europe, diversification might reduce risk to the extent that the euro favours regional specialization. There is no evidence, however, that links regional patterns to financial sector M&A.

International diversification should yield even more gains in terms of static risk reduction. The low correlation of bank returns across countries suggests that cross-border deals would offer benefits, but there is little actual evidence on this – and the little there is concludes that the benefits are small (Amihud et al. 2002). Since

US banks are generally more efficient than foreign banks, both at home and abroad, at least some took advantage of international expansion (Berger et al. 2000), but it is difficult to disentangle the diversification effect from the simple transfer of superior managerial skills. Cross-border deals do not seem to bring many benefits to European banks (Cybo Ottone and Murgia 2000).

Product diversification yields little benefit in the US (Kwan 1998) but is more rewarding in Europe (Vander Venet 2002), especially for financial conglomerates and universal banks. Most studies look at the impact of diversification on efficiency or profitability, but not risk. Studies of cross-industry mergers in the European market, both simulated and real (e.g. Dinenis and Nurullah 2000), suggest that the reduction in risk is small.

Today the real benefit of diversification is probably limited, since derivatives that permit firms to hedge almost any sort of risk are available – and their markets are booming. The notional value of credit default swaps outstanding surpassed US\$ 30 trillion by year-end 2006 (Figure 9.3). Thus, financial institutions can efficiently achieve true diversification through derivatives, without the need for a merger.

8.4.2 Complexity

A second channel through which consolidation can affect individual risk is through an increase in operational complexity deriving from having ever larger institutions. This kind of risk, elusive and difficult to quantify, is nonetheless very real and relevant. It should be taken into account when designing strategies and allocating capital. The monetary consequences of this type of risk might be at least partially insured, but they are probably impossible to transfer.

According to some authors, the benefits of spreading fixed investments over a larger base are at some point outweighed by the costs of managing a sprawling firm. Larger banks might compensate for higher costs with better capital allocation and risk management, but they are left vulnerable to sudden market changes that require rapid changes in strategy.

Another vulnerability of larger institutions related to growing complexity is the increased reliance on hard information and technology to make lending decisions. There is ample evidence that the larger banks that result after mergers and acquisitions shun loans to small firms, largely because their organizational structure favours using hard information and credit scoring models rather than relationships forged by local loan officers (Bonaccorsi di Patti and Gobbi, 2007). Because arm's length lending is more pro-cyclical than relationship lending, this shift could increase earnings volatility.

There is also operational risk, i.e. the risk that due to lack of proper supervision, operating mistakes, fraud or crime the firm takes on unintended market or credit risk or suffers a significant direct loss. Examples abound over the past decade, from Barings to the Amaranth debacle. But since operational risk can take almost any form, it is little understood and studied. Larger institutions usually have better risk management and internal controls, but their sheer size and complexity make them more vulnerable to errors or attacks that might cause significant damage. Since they are selling increasingly long-term products, this kind of risk is projected into the future. Although challenging to quantify, operational risk is so rele-

vant that the new Basel Accord includes a non-trivial capital charge to reflect it.

Finally, the current shift among large institutions from holding credit and market risk to originating and transferring these risks through the derivatives market magnifies legal and reputational risk. Reputation is being leveraged as a way to attract customers, by promising high quality standards. But it is put increasingly at risk by the broadening range of products being offered. A problem with a new, marginal, less-well-understood product could have severe repercussions for core business activities.

8.5 Financial consolidation and systemic risk

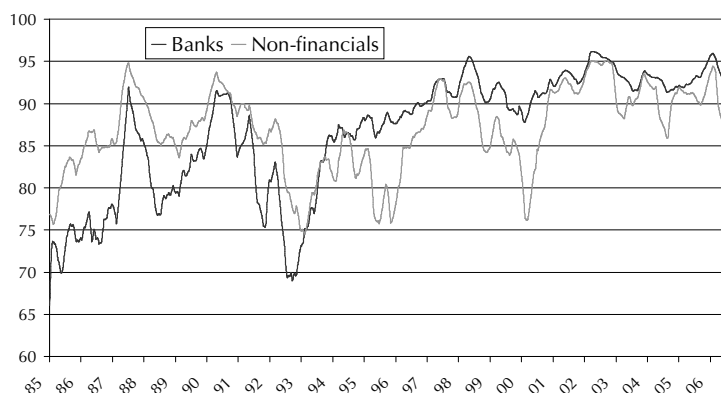
Financial consolidation affects systemic risk in three different ways: by creating large, complex institutions whose failure can have a systemic impact; by increasing the risk of contagion; and by affecting the workings of financial markets and payment systems.

8.5.1 Large, complex financial institutions

A convenient definition of a large, complex financial institution (LCFI) is the one used by the Federal Reserve. A LCFI has significant on- and off-balance sheet risk exposures, offers a broad range of products and services at home and abroad, is subject to multiple supervisors and participates extensively in large-value payment and settlement systems.

The main challenge LCFIs pose from a systemic perspective is how to wind down such an institution in an orderly fashion should it undergo a crisis, disposing of assets and eventually selling off parts or the whole entity without disrupting real and financial markets. Consolidation creates conglomerates that operate through many legal entities in many different countries, so the first issue is a legal one. It could be increasingly difficult to disentangle positions that make sense from a consolidated point of view but not at the subsidiary level. Problems increase when the firm has many supervisors, who might have conflicting goals. For example, the liquidation of a local subsidiary that is a major player in a small country might have unwelcome systemic effects, even though this is the most efficient decision for the conglomerate as a whole. Furthermore, differences in regulation and in the timing of its application might make international cooperation cumbersome, especially if it involves more than a handful of authorities.¹²²

Another factor that might complicate the orderly liquidation of LCFIs is their growing exposure to capital markets. This is one more consequence of consolidation, since large deals between publicly listed companies are commonly financed by issuing debt or equity (or both) or by swapping shares. When such an institution encounters trouble, the market value of its assets and liabilities plummets, sometimes leading markets to overshoot and destroy more value than warranted. This is particularly likely for activities that require active day-to-day management, continuous access to markets and high levels of market confidence, such as OTC derivatives and foreign exchange trading. Once it becomes clear that a firm is doomed, its securities become a one-way bet and prices must collapse before anybody is willing to hold them.

Figure 8.4 Covariance indicator: banks vs non-financials

Note: The graph reports the correlation of stock returns for the world's 100 largest banks and 100 largest non-financial companies.

8.5.2 Contagion

Consolidation also increases the risk of contagion, through an increase both in direct and indirect interdependence. Direct dependence comes from the extensive web of contracts that a LCFI has, from interbank lending (for banks) to derivatives and foreign exchange positions. Not only does consolidation breed conglomerates with links to many other firms, it also raises concentration and therefore increases contacts among the largest conglomerates, increasing the probability that a crisis at one of them will drag down others, starting a vicious circle that could lead to the collapse of the financial system. There is evidence that through the late 1990s, as concentration increased, interbank lending and derivatives exposures have substantially increased the level of interdependence (G10 Report, 2001). The growing weight of hedge funds and recent developments in financial markets might have attenuated this effect, but it is nevertheless likely that the main financial conglomerates still trade much with each other.

Indirect interdependence can be approximated by the correlation of stock prices of LCFIs, which reflects the market's view of the total impact of their interaction. Over the past 20 years correlation among stock prices increased for all shares, but more for banks (see Figure 8.4). This means that markets believe either that banks have become increasingly linked to each other, or that they are increasingly exposed to the same shocks, which pose systemic risk. Consolidation probably increased the first type of interdependence, but it might also have increased the second. Banks are individually more diversified after consolidation, but this only reduces idiosyncratic risk. Systemic risk might therefore have increased over the years either because the world is more unstable, or because idiosyncratic risk is decreasing.

A study of these correlations for the largest banks for a large sample of countries shows that correlation increases with concentration (De Nicolò et al., 2003). This result is consistent with the theory that larger banks have incentives to take on more risk, and similar risks, therefore increasing systemic risk. The actual probability of a systemic banking crisis seems to be negatively correlated with concen-

tration (Beck et al., 2004), however, as long as local institutions foster competition. The lesson might be that competition can complement financial stability, as long as it does not induce excessive concentration of firms and strategies.

8.5.3 Financial markets and payment systems

Consolidation affects financial markets and payment systems in ways that could increase systemic risk. This is compounded by the increasing reliance on capital markets due to the shift from holding credit and market risk to trading it, a basic tenet of financial conglomerates' current strategies.

Consolidation could reduce market liquidity, since larger institutions create an internal capital market for funds and go to external markets only for the balance. Furthermore, to the extent that financial conglomerates pursue retail, high franchise-oriented strategies, they will reduce the trading operations of their acquisitions, together with their global risk taking capacity, in order to focus resources where they are considered more valuable (Bookstaber, 1999). This deprives markets of both capital and appetite for risk, the two main factors that allow them to withstand a liquidity crisis. Finally, consolidation reduces the diversity of market participants, which acts as protection against the likelihood of a crisis (Wagner, 2006). The portfolio diversification commonly practised by professional investors is of little help if they share similar risk preferences and hold similar portfolios. When someone starts to liquidate a large position and prices drop, everybody reacts in the same way and the correlation among asset prices quickly increases, igniting a market crash with possible contagion effects on other markets.

Consolidation has reduced the number of major players in the payment system industry, in particular correspondent banks and global custodians. Specialized providers (including non-bank institutions), having invested heavily in technology, must grow to amortise costs. On the demand side, global investors want faster and more secure payment and processing systems. The result is an industry that is concentrating and integrating, in order to increase efficiency and protect profit margins. Consolidation beyond its current level might raise prices and slow innovation, but more importantly it raises the probability that a default (or temporary operational failure) by a primary participant blocks the whole infrastructure (although the probability of default might itself be lower; Berger et al., 2000). Real-time gross settlement systems reduce this risk but do not eliminate it. Furthermore, real time payment systems raise their own problems: the reduction of time horizons for payments, coupled with the increase in market-based, potentially more volatile, funding by banks increases the relevance of intrinsically risky financial instruments for liquidity management. Large, international banks are therefore more exposed to disruptions of liquidity flows. Although they are probably improving their liquidity management, the increasing complexity and interdependence of payment systems might amplify stress situations.

Meanwhile, since consolidation in this sector has fostered the emergence of few specialized institutions, credit and liquidity settlement risks are shifting from risk-averse utilities (the relatively transparent, rule-based interbank settlement systems organized as clearing houses) to more opaque private firms that are in the business of providing payment services and might have a preference for higher risk in exchange for higher expected returns. Risk management priorities might be shift-

ing from the collective protection of the clearing house to individual firm protection. During a market crisis an individual payment processor might want to protect its firm's interests first, therefore possibly destabilizing the system. Finally, the growing role of multinational conglomerates and specialized firms that have access to different markets at the same time has increased the interdependences and linkages among payment and settlement systems and across countries, thereby increasing the risk of contagion.

8.6 Policy implications

Consolidation has relevant policy implications, from the increase of moral hazard issues that accompany the emergence of LCFIs to the increasing role of market discipline, the need for adequate corporate governance rules and the necessity of coordinating national and sectoral supervisors.

8.6.1 Moral hazard and regulatory capture

The growing role of LCFIs raises the issue of whether they have become 'too big to fail'. The rescue of LTCM is a case in point. Although it probably prevented the meltdown of financial markets, the rescue might have been perceived as giving a free pass to reckless risk-taking by unregulated entities. For a few months after the bailout, the cost of liquidity decreased for most large institutions, even for those not directly involved with LTCM – evidence of moral hazard (Furfine, 2006). The rise of systemically relevant institutions therefore raises the issue of whether they should be subject to specific regulation and supervision that minimize their risk of failure. Traditionally, when markets were national and capital flows less relevant, the cost of preserving financial stability was compensated by rents given to intermediaries by granting them the exclusive right to deal in certain products. This might no longer be feasible in a globalized environment, since regulatory rents can only be obtained through extensive international cooperation. A possible solution, which would require extensive interaction with supervisors, is to require LCFIs to follow best practices.

The growth of LCFIs also raises the issue of regulatory capture (Stigler, 1971 first mentions this possibility). When financial institutions become very large and local markets very concentrated, their lobbying power increases. They share more common goals, making it easier to influence lawmakers and regulators as a single-issue group. Although regulatory capture has been known to go on especially in markets dominated by natural monopolies,¹²³ there is little or no direct evidence of this for the financial industry. Besides direct contributions, the practice of revolving doors (see Cohen, 1986 on how industry employment affects the FCC's decisions) might influence regulators' decisions. More concentrated markets offer fewer exit choices to officials who go to the private sector. Ensuring vigorous competition, besides improving general efficiency and making substitutability easier should a major player fail (Cetorelli et al., 2007), also lowers the probability of capture.

A related point concerns regulatory arbitrage. When banks compete across borders, those operating in countries with higher forbearance regimes enjoy an

advantage. This sets up a mechanism of convergence towards the lowest common denominator. This is more likely to happen if regulators in some countries have been captured and are therefore especially lenient (Acharya, 2003). In other words, in a globalized industry, capture needs only occur in some countries to affect the whole financial system.

8.6.2 Market discipline, information and governance

Since financial conglomerates interact increasingly with financial markets, market discipline offers one possible way to monitor them. By requiring high levels of disclosure, investors and counterparties would be able to assess risk in its different forms, price it and send signals to institutions whose condition is deteriorating. Two issues might inhibit this mechanism: the quantity and quality of information. The quantity of information required would have to grow exponentially, and it is unclear exactly what information would be relevant. Today leverage seems to be the most relevant issue, but during the Asian crisis it was exposure to those markets. To ensure a timely and changing flow of information would require deep organizational change.

As for the quality of information, the corporate scandals at the beginning of the decade and the large number of firms restating their earnings are evidence that the scope for manipulating information and misleading markets is too wide to make market discipline an entirely reliable tool. A minimum requirement would include timely and frequent information about total risk, leverage and concentration by region and sector, at a consolidated level and by major subsidiaries.

Corporate governance, in particular management incentives and the quality of internal controls and disclosure, is also an issue. High-powered incentives might tempt management to take advantage of the informational asymmetries inherent in the financial industry by assuming more risk than is warranted by the capital base, in an attempt to pass off higher returns as the result of skill rather than just the price of extra risk. This would have dire consequences for financial stability. Since consolidation has increased complexity, there are more opportunities for such behaviour, especially since risk is largely managed off-balance sheet. Incentives are needed to align management's interest with shareholders', but in order to avoid excessive risk-taking there should be internal controls, possibly independent of management, and high levels of disclosure. As organizations grow more complex, information flows analysed at the consolidated level become ever more relevant to keep the firm focused and within an acceptable range of risk.

A challenge comes from the increasing integration between wholesale and retail business. Most retail markets remain regional or national. As financial firms consolidate locally and combine retail and wholesale operations, there is a conflict between global competitiveness (for which size is essential) and national competition. For conglomerates seeking to grow without running afoul of local antitrust laws or breaking themselves up, the solution is to engage in cross-border consolidation, as this does not adversely affect competition in national retail markets, yet allows firms to attain the size necessary to compete efficiently in wholesale markets. The issue is how to balance this goal of efficiency with the greater riskiness of cross-border businesses.

8.6.3 International cooperation

The potential difficulties arising from multiple regulators and supervisors, the externality of systemic risk and the need to allocate the cost of a bailout efficiently all call for ex ante coordination and agreements among authorities. As conglomerates expand across national and industry lines, they are subject to multiple regulators and supervisors, whose sometimes-contradictory demands increase administrative costs. Furthermore, since systemic risk is a classic negative externality, there is a chance that nobody will accept responsibility for addressing systemic issues related to how a crisis might spread across countries and industries. The country of residence of the lead supervisor would be in charge of deciding whether to bail out a failing conglomerate. But even if a bailout is the efficient decision, the costs could be prohibitive. They might be incurred by many countries, even though the home country represents a relatively small market for the firm (this would be true of conglomerates based in small countries). So far, the web of Memoranda of Understanding, bilateral agreements and cooperation has proved effective. Although this issue is beyond the scope of this report, the rising role of multinational financial conglomerates may call for a more systematic multilateral approach.

Table 8.1 Mergers and acquisitions⁽¹⁾

	1995–1997			1998–2000			2001–2003			2004–2006		
	Number	Value \$ bn	% of GDP	Number	Value \$ bn	% of GDP	Number	Value \$ bn	% of GDP	Number	Value \$ bn	% of GDP
Australia	540	33.6	2.8	678	37.5	3.2	915	47.5	3.6	1,438	119.9	5.7
Belgium	141	10.4	1.3	199	35.0	4.7	137	15.3	1.9	170	27.9	2.5
Canada	1,068	56.4	3.1	1,463	178.7	8.9	1,439	95.9	4.1	1,616	186.7	5.5
France	782	74.8	1.6	833	180.0	4.2	537	87.9	1.9	872	218.8	3.4
Germany	1,446	40.4	0.6	1,690	339.7	5.4	1,018	76.0	1.2	951	107.6	1.3
Italy	410	20.2	0.6	545	160.2	4.5	498	57.6	1.5	639	138.9	2.6
Japan	328	50.2	0.4	1,420	192.0	1.5	1,969	93.9	0.8	3,197	184.6	1.4
Netherlands	299	9.7	0.8	363	100.2	8.6	234	29.9	2.2	300	64.6	3.4
Spain	262	13.9	0.8	663	61.6	3.4	620	27.7	1.3	522	90.3	2.7
Sweden	238	25.8	3.3	471	87.1	11.7	322	14.2	1.8	404	38.7	3.5
Switzerland	218	74.7	8.5	267	12.3	1.6	210	13.3	1.6	199	28.3	2.5
United Kingdom	1,834	202.0	5.5	2,330	597.4	13.8	1,685	199.4	4.1	1,868	435.2	6.5
United States	6,565	1,219.8	5.2	7,376	3,639.4	13.1	4,939	987.5	3.1	6,451	2,090.2	5.6
Total Main Industrial Countries ⁽²⁾	14,131	1,831.9	2.8	18,298	5,621.1	8.3	14,523	1,746.2	2.4	18,627	3,731.5	4.1
Euro Area	3,899	198.8	0.9	5,451	947.0	4.8	4,028	336.2	1.6	4,155	750.8	2.5
World	19,958	2,056.6		26,961	6,075.8		24,135	2,111.8		31,318	4,432.5	

Sources: SDC Platinum, Thomson Financial, IMF (for GDP).

Notes: (1) Mergers and acquisitions involving majority interests. (2) G10 countries, Australia and Spain.

Table 8.2 Mergers and acquisitions in the financial sector⁽¹⁾

	1995-1997			1998-2000			2001-2003			2004-2006		
	Number	Value		Number	Value		Number	Value		Number	Value	
		\$ bn	% of GDP		\$ bn	% of GDP		\$ bn	% of GDP		\$ bn	% of GDP
Australia	120	8.8	0.7	128	15.1	1.3	153	11.5	0.9	1,438	119.9	5.7
Belgium	27	7.9	1.0	42	22.0	3.0	26	3.4	0.4	39	21.5	1.9
Canada	113	7.2	0.4	173	17.4	0.9	158	15.0	0.6	148	13.4	0.4
France	152	26.6	0.6	108	47.7	1.1	69	33.1	0.7	112	37.1	0.6
Germany	194	17.6	0.2	181	12.2	0.2	163	35.7	0.6	148	40.3	0.5
Italy	115	12.1	0.3	125	75.1	2.1	101	24.9	0.6	143	87.6	1.6
Japan	72	33.9	0.2	333	132.2	1.0	310	40.9	0.3	394	65.1	0.5
Netherlands	42	1.5	0.1	48	18.2	1.6	27	17.0	1.2	39	22.5	1.2
Spain	53	2.4	0.1	94	31.7	1.8	105	4.5	0.2	67	14.3	0.4
Sweden	40	9.5	1.2	35	3.7	0.5	35	2.4	0.3	29	11.5	1.1
Switzerland	55	34.4	3.9	37	1.1	0.1	54	2.9	0.3	38	10.7	1.0
United Kingdom	336	45.8	1.3	344	151.3	3.5	339	41.0	0.8	318	53.4	0.8
United States	1,630	346.1	1.5	1,416	701.9	2.5	1,058	320.6	1.0	1,251	557.4	1.5
Total Main Industrial Countries ⁽²⁾	2,949	553.9	0.9	3,064	1,229.7	1.8	2,598	552.9	0.8	4,164	1,054.6	1.1
Euro Area	688	82.1	0.4	740	244.1	1.2	591	126.6	0.6	653	249.5	0.8
World	4,433	616.2		4,933	1,371.0		4,988	667.5		6,300	1,141.1	

Sources: SDC Platinum, Thomson Financial, IMF, for GDP (figures estimated for 2006).

Notes: (1) Mergers and acquisitions involving majority interests. The sectors refer to that of the company being acquired. (2) G10 countries, Australia and Spain.

Table 8.3 Cross-Border mergers and acquisitions in the financial sector⁽¹⁾

	1995-1997			1998-2000			2001-2003			2004-2006		
	Number	Value \$ bn	% of GDP	Number	Value \$ bn	% of GDP	Number	Value \$ bn	% of GDP	Number	Value \$ bn	% of GDP
Australia	42	1.9	0.2	34	1.1	0.1	24	1.5	0.1	37	0.7	0.0
Belgium	13	7.8	1.0	19	1.9	0.3	11	0.2	0.0	15	0.2	0.0
Canada	20	0.6	0.0	36	6.5	0.3	23	0.2	0.0	24	2.2	0.1
France	52	5.7	0.1	43	22.2	0.5	23	5.6	0.1	27	8.9	0.1
Germany	38	5.9	0.1	37	5.7	0.1	28	3.0	0.0	42	30.1	0.4
Italy	20	1.5	0.0	16	1.8	0.1	20	3.3	0.1	26	22.2	0.4
Japan	4	-	-	22	6.9	0.1	31	4.5	0.0	19	0.3	0.0
Netherlands	17	1.1	0.1	24	1.4	0.1	13	1.2	0.1	18	20.4	1.1
Spain	12	0.4	0.0	33	1.5	0.1	14	2.1	0.1	15	0.6	0.0
Sweden	7	0.4	0.1	8	1.0	0.1	10	0.8	0.1	14	9.1	0.8
Switzerland	26	0.2	0.0	21	0.0	0.0	17	2.1	0.2	19	10.3	0.9
United Kingdom	87	11.9	0.3	81	54.0	1.2	74	7.2	0.1	104	29.0	0.4
United States	78	28.5	0.1	109	102.0	0.4	115	52.9	0.2	137	50.9	0.1
Total Main Industrial Countries ⁽²⁾	416	66.0	0.1	483	206.1	0.3	403	84.8	0.1	497	185.0	0.2
Euro Area	191	28.7	0.1	215	56.3	0.3	148	21.4	0.1	191	99.5	0.3
World	880	87.2		1,128	275.6		1,091	136.1		1,530	278.1	

Sources: SDC Platinum, Thomson Financial, IMF for GDP (figures estimated for 2006).

Notes: (1) Mergers and acquisitions involving majority interests. The sectors refer to that of the company being acquired. (2) G10 countries, Australia and Spain.

Table 8.4 Cross-industry mergers and acquisitions in the financial sector⁽¹⁾

	1995-1997		1998-2000		2001-2003		2004-2006					
	Number	Value \$ bn % of GDP	Number	Value \$ bn % of GDP	Number	Value \$ bn % of GDP	Number	Value \$ bn % of GDP	Number	Value \$ bn % of GDP	Number	Value \$ bn % of GDP
Australia	59	2.1 0.2	53	2.8 0.2	74	5.1 0.4	103	8.9 0.4				
Belgium	9	4.6 0.6	11	13.3 1.8	11	0.2 0.0	20	0.3 0.0				
Canada	43	2.2 0.1	75	3.4 0.2	81	2.2 0.1	55	5.6 0.2				
France	65	7.4 0.2	33	3.4 0.1	24	2.2 0.0	37	17.7 0.3				
Germany	105	0.7 0.0	62	9.8 0.2	61	23.4 0.4	67	14.5 0.2				
Italy	46	3.1 0.1	41	8.3 0.2	40	3.2 0.1	47	3.3 0.1				
Japan	19	0.1 0.0	123	8.2 0.1	121	24.6 0.2	195	9.3 0.1				
Netherlands	17	0.3 0.0	23	10.8 0.9	8	2.9 0.2	16	2.9 0.2				
Spain	15	0.5 0.0	32	2.1 0.1	33	0.3 0.0	26	3.4 0.1				
Sweden	14	2.8 0.4	15	1.4 0.2	11	0.2 0.0	18	10.0 0.9				
Switzerland	18	10.6 1.2	11	0.9 0.1	19	1.8 0.2	15	0.4 0.0				
United Kingdom	148	3.8 0.1	135	45.5 1.0	139	15.1 0.3	131	12.7 0.2				
United States	304	70.5 0.3	422	174.6 0.6	339	46.4 0.1	358	67.9 0.2				
Total Main Industrial												
Countries ⁽²⁾	862	108.8 0.2	1,036	284.5 0.4	961	127.5 0.2	1,088	156.8 0.2				
Euro Area	306	21.0 0.1	263	62.3 0.3	223	34.6 0.2	270	53.2 0.2				
World	1,618	137.0	1,857	331.7	2,074	170.7	2,653	234.3				

Sources: SDC Platinum, Thomson Financial, IMF, for GDP (figures estimated for 2006).

Notes: (1) Mergers and acquisitions involving majority interests. The sectors refer to that of the company being acquired. (2) G10 countries, Australia and Spain.

9 The New Financial Instruments

The past three decades have witnessed an explosion of financial products that enable firms to hedge their risks and, when they deem it appropriate, to assume more risk. Innovations of the 1970s and 1980s focused on market risk transfer. More recent developments have focused on credit risk. By enhancing the tradability of risks, new financial instruments make markets more complete. In theory, risks can now be transferred to the agents who are most willing and best equipped to bear them. This has the potential to enhance the productivity of financial intermediation, much as new technologies boost the productivity of the manufacturing and service sectors. Just as free trade in goods and services allows all parties to benefit through specialization, the increased ability to transfer risks can make all parties better off. As with free trade, the process produces winners and losers.

Although there is no perfect way to measure the pace of financial innovation, one proxy is the increased importance of the securities and investments industry relative to the overall economy. In 1977, the first year for which industry-level GDP data are available for the United States, the securities and investments industry accounted for just 0.3% of national income; today that share is 1.6% and growing. Stated differently, the real output of the industry has increased at triple the trend GDP growth rate of 3.1%, a reflection of the dynamism of capital markets. Two types of financial products instrumental in this growth are derivatives and securitizations.

9.1 Derivatives

Derivative securities, or 'derivatives', are financial instruments whose value derives from – is a derivative of – the performance of an underlying asset such as a stock, bond, currency or commodity. Some derivatives, such as futures and options, are traded on organized exchanges (Table 9.1). Others, such as swaps and forwards, are customized contracts whose terms are negotiated. These contracts, which are not exchange-traded, are called 'over-the-counter' (OTC).

9.1.1 Exchange-traded derivatives

Futures, for example, are exchange-traded derivatives that allow buyers and sellers to lock in a guaranteed price at some later date. Locking in a price reduces uncer-

Table 9.1 Four major types of financial derivatives

Derivative	Market	Definition
Forwards	OTC	Obligate the holder to buy or sell a specific amount of an underlying asset, reference rate or index at a specified price on a specific future date.
Futures	Organized exchanges	
Options	OTC and exchanges	Grant the purchaser the right, but not the obligation, to buy or sell a specific amount of the underlying at a particular price within a specific period.
Swaps	OTC	Agreement between counterparties to make periodic payments to each other for a specified period.

Source: US GAO

tainty, which can benefit both sides to a transaction ex ante. For example, an energy company planning to sell the fuel it produces can benefit as well an airline or trucking company wishing to avoid fuel price spikes.

Although futures exchanges are nothing new – the Chicago Mercantile Exchange (CME) began in 1898 as the Chicago Butter and Egg Board – their emphasis began to shift when the CME launched the first financial futures contract in May 1972. By 2005, financial contracts accounted for 93% of trading volume on global futures exchanges; agricultural, energy and metals contracts comprised just 7% of trading volume.

Futures trading continues to grow rapidly. The number of futures contracts traded worldwide increased from 475 million in 1990 to 1.8 billion in 2001, a 13% compound annual growth rate. From 2001 to 2005, the pace of growth accelerated to 22%. Trading volume was up another 31% in 2006, to 5.3 billion contracts.¹²⁴

Futures trading is increasingly global. There are approximately 60 futures exchanges located in some 25 countries. Since 1990, the share of trading occurring outside the US has grown from about 40% to 60%. Table 9.2 lists the five most active derivatives exchanges.

9.1.2 OTC derivatives

Over-the-counter derivatives have also experienced rapid growth. BIS data show that the notional value of contracts outstanding rose fivefold from mid-1998 to mid-2006, when it stood at US\$ 370 trillion, over eight times world GDP.¹²⁵ Interest rate swaps, which accounted for more than half of this volume, illustrate

Table 9.2. Top five futures exchanges by volume

Exchange	Billions of contracts, 2006
Chicago Mercantile Exchange	1.10
Eurex	0.96
Chicago Board of Trade	0.68
Euronext.liffe	0.43
Mexican Derivatives Exchange	0.27

Source: Futures Industry Association.

Note: Does not include options on futures

the power of a simple idea. In a plain vanilla interest rate swap, two counterparties agree to exchange payment streams, one fixed and the other tied to a benchmark interest rate. These contracts, like exchange-traded derivatives, allow institutions such as banks, insurers and pension funds to transform a series of future cash flows to create a better match between assets and liabilities. As with energy futures, these trades can be mutually beneficial *ex ante*, allowing each party to reduce its risk exposure.

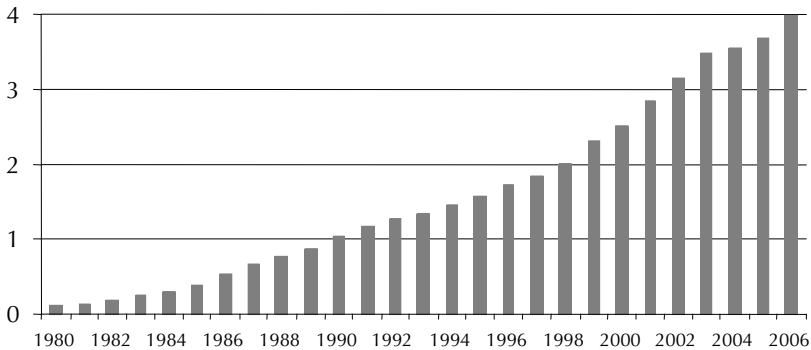
9.2 Securitization

Securitization is the process of pooling a portfolio of loans, leases or other financial commitments and then dividing that pool into portions that are sold as securities on the secondary market. The most familiar example of this process is mortgage-backed securities (MBS), a financial innovation that has served as a template for other types of securitization. In the early 1970s, government agencies such as the Federal National Mortgage Association ('Fannie Mae') and the Federal Home Loan Mortgage Corporation ('Freddie Mac') began pooling mortgages and selling them to investors as MBS.

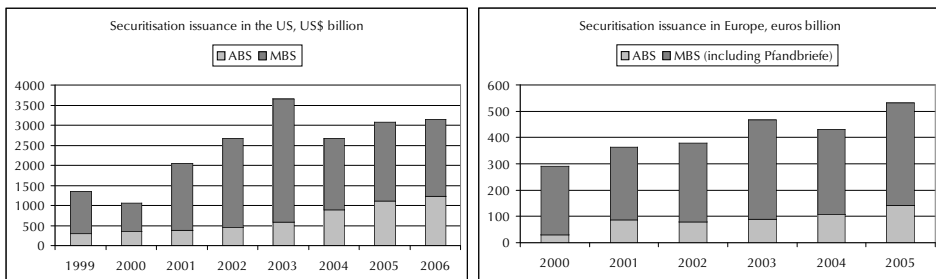
The earliest MBS were simply proportional shares of a pool of mortgages. Although investors purchasing MBS were insulated from the risk that mortgage holders would default on their loans, they faced a more esoteric risk, known as *prepayment risk*. Approximately 14% of Americans move each year.¹²⁶ Thus, of the thousands of homeowners whose mortgages are in a loan pool, a certain number will sell their homes, prepaying their mortgages in the process. Another group will refinance their mortgages, likewise paying back the entire loan. Yet another group of homeowners will opt to pay down their mortgage loans on an accelerated basis. Thus, MBS investors had no way of knowing the timing of the cash flows they would receive.

Because mortgage loan contracts allow the borrower to decide whether to refinance and, if so, when, they contain an embedded option. When interest rates are low, borrowers are most likely to refinance. This causes a rapid repayment of principal to MBS holders at a time when it is difficult to reinvest the proceeds profitably. Conversely, when rates are high and MBS holders could more profitably reinvest repayments of principal, refinancing activity slows, as do principal repayments.¹²⁷ In the wake of extreme interest rate volatility in the early 1980s, the timing of mortgage prepayments grew highly erratic, prompting many investors to avoid the securities.

To make MBS more palatable to investors, a new structure called *collateralized mortgage obligations* (CMOs) emerged. CMOs mitigate prepayment risk by redirecting cash flows from underlying collateral pools to bond classes called *tranches*. This structure creates securities with different exposures to prepayment risk, providing a variety of risk/return profiles designed to suit a range of investors. CMOs broadened the appeal of the mortgage market by creating tranches whose timing of cash flows was more or less assured. The Real Estate Mortgage Investment Conduit provision under the 1986 tax reforms allowed CMOs to be tax exempt if certain conditions were met. These developments boosted the volume of MBS to unprecedented levels (Figure 9.1). Thirty years ago, 5% of home mortgages were

Figure 9.1 Outstanding volume of US agency mortgage-backed securities, US\$ trillion

Source: SIFMA

Figure 9.2 Annual securitization in US and Europe

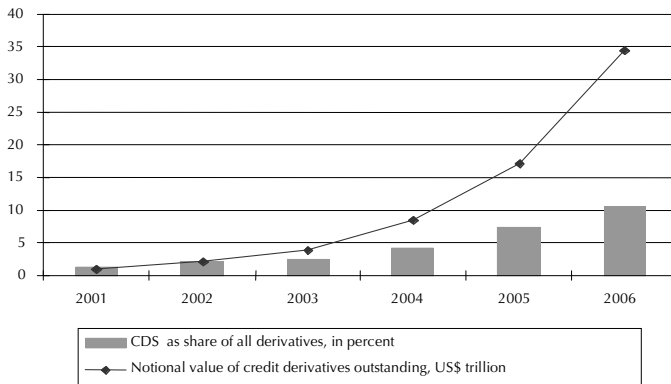
Source: SIFMA

securitized and MBS were a \$40 billion market. Today, 30% of home mortgages are securitized by US agencies in what is now a \$4 *trillion* market.

The asset-backed securities (ABS) market, which securitizes credits such as home equity; credit card receivables; and corporate, automobile and student loans, has grown to US\$ 2.1 trillion in the United States. New ABS issuance was US\$ 1.2 trillion in the United States in 2006, and US\$ 150 billion in Europe in 2005 (Figure 9.2).

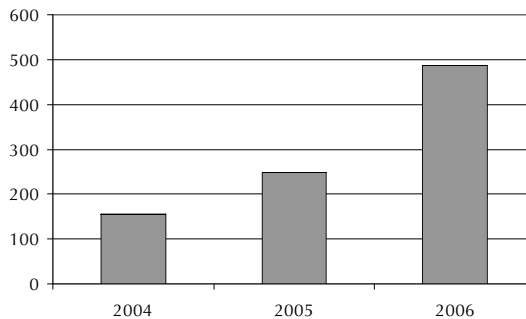
One reflection of the fundamental change that securitization has wrought in US financial markets is that the US\$ 6.5 trillion market for mortgage-related securities, including both agency and non-agency issues, is the largest segment of the fixed income market – larger than either the corporate (US\$ 5.4 trillion) or Treasury (US\$ 4.3 trillion) markets. Similarly, the ABS market is now nearly as large as the municipal bond market. What were once specialty asset classes are now mainstream, creating new mechanisms for raising funds. Interestingly, securitization has won much less acceptance in Europe, where volumes have stagnated since 2003.

Figure 9.3 Notional value of global credit default swaps outstanding, US\$ trillion, and their % share of the derivatives market



Sources: ISDA, authors' calculations

Figure 9.4 Global issuance of CDOs, US\$ billion



Source: SIFMA

Notes: Includes deals by big companies from all around the world. Includes Cash Flows CDOs, Hybrid CDOs, Synthetic Funded CDOs and Market Value CDOs. Unfunded synthetic tranches are not included in this analysis. SME deals are classified as ABS and are not included

9.3 Credit risk transfer instruments

An important development in recent years is the emergence and increased use of credit risk transfer (CRT) instruments. CRT instruments allow agents who are exposed to counterparty risk to sell all or part of the risk to others better able to bear it. Today, for example, a bank can originate a loan and then transfer the resulting credit risk. The same applies to securities exposed to credit risk such as bonds and to portfolios of credit risks. The wide use of CRT instruments has changed how the financial system functions.¹²⁸

One major class of CRT instruments is credit derivatives. A credit derivative is an OTC contract that transfers the risk of a credit event such as a default or a bankruptcy from one party to another. The most common type of credit derivative is the credit default swap (CDS). The CDS market has more than doubled in size in each of the past three years, reaching a notional value of US\$ 34.5 trillion at year-end 2006 (Figure 9.3). Since 2001, the CDS share of the overall derivatives market has grown from 1% to more than 10%, a growth pattern similar to that observed in the first decade of interest rate derivatives trading.¹²⁹ Approximately 70% of the notional value outstanding in CDS are single-name instruments. Multi-name instruments, an increasing share of the CDS market, comprise the balance.

Another major type of CRT instrument is the collateralized debt obligation (CDO), a security backed by bonds, loans or other assets. The tripling of global CDO issuance from 2004 to 2006, a pace of growth much faster than for total ABS securitization, illustrates the dynamism of this market (Figure 9.4).

9.4 Implications for financial stability

It is a daunting task to draw conclusions regarding the net impact of derivatives and securitization on financial stability. Regulators have pondered this question for decades, producing report upon report. These efforts have deepened our understanding of how these new financial products operate and the markets in which they trade. Even so, reasonable market participants continue to disagree:

These instruments [derivative products] allow users to unbundle risks and allocate them to the investors most willing and able to assume them. A growing number of financial and non-financial institutions have embraced derivatives as an integral part of their risk capital allocation... [T]he profitability of derivative products has been a major factor in the significant gain in the finance industry's share of American corporate output during the past decade – a reflection of their value to non-financial industry.

– Alan Greenspan¹³⁰

[D]erivatives are financial weapons of mass destruction.

– Warren Buffett¹³¹

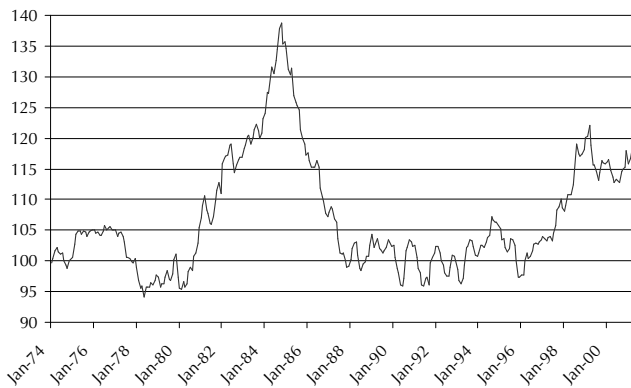
9.4.1 Positives

New financial products facilitate better risk diversification, greater market liquidity and more accurate pricing. These qualities should all reduce the likelihood of financial system imbalances that could cause instability, while enhancing the resilience of financial systems to outside shocks.

As Alan Greenspan notes, the emergence and growth of derivatives has facilitated improvements in the allocation, diversification and management of risk. Securitization offers similar benefits. Thirty years ago, a homeowner's mortgage or car loan was typically held by a bank; today it often sits in the retirement accounts of thousands of people, nestled alongside a variety of other fixed income securities.

These developments have enabled banks to stabilize their profitability. By holding fewer loans on their books and focusing more on steady fee-generating businesses, they have increased their profits and made these profits more predictable. In the decade through mid-2006, US commercial banks earned an average return on equity of 14.2%, up from 11% in the previous decade and 12% in each of the two decades before that. Moreover, ROE has become much less cyclical in the past ten years. In each year – even the recession year of 2001 – ROE has been within a percentage point of the decade-long average.¹³²

Another advantage of the new financial instruments is that they provide firms a way to manage key risk exposures. In 1971, the Bretton Woods system of fixed exchange rates collapsed, exposing companies to significant currency risk (Figure 9.5). Firms' desire to hedge against currency fluctuations stimulated financial

Figure 9.5 The trade-weighted dollar (1995 = 100)

Source: Federal Reserve Bank of Atlanta, available at www.frbatlanta.org/econ_rd/dol_index/index.htm

innovation and, one year later, the Chicago Mercantile Exchange launched futures contracts for all major currencies. Catastrophe bonds also responded to a need. After Hurricane Andrew in 1992, insuring against similar catastrophes became expensive and coverage was often not available. Catastrophe bonds provided extra capital to the insurance industry, helping it to manage this risk.

New financial instruments enhance market liquidity. CRT instruments make formerly-illiquid assets, such as loans, more tradeable. Securities such as catastrophe bonds allow insurance risks to be traded. The founding and growth of options exchanges have transformed a small, fragmented and highly illiquid OTC market into a dynamic market in which options on thousands of stocks and stock indexes are traded.

Together with improvements in liquidity, new financial instruments promote the better pricing of financial assets and risks. The emergence of CRT instruments, for example, has gone hand in hand with better models for pricing credit risk. Mortgage and insurance securitization have stimulated major advances in prepayment and catastrophe risk models, enhancing institutions' ability to value and manage the risks in their portfolios.

9.4.2 Negatives

Like Gilbert and Sullivan's constable who lamented that 'a policeman's lot is not a happy one', it is the lot of regulators and supervisors to focus less on happy outcomes than on the likelihood and severity of potential difficulties. How might new financial products pose greater risks of instability?

The proliferation of new, sophisticated financial instruments has tremendously increased the complexity of financial transactions. One example is the new CRT instruments. Modelling and managing credit risk and designing dynamic hedging strategies, as needed for writing credit derivatives and issuing collateralized debt obligations (CDOs), are arguably more complicated than modelling and managing most market risks. A major challenge in the modelling and management of risks in credit portfolios is the treatment of credit correlations. Current models do not provide reliable tools for assessing those correlations (see e.g. Tarashev and Zhu,

2006). The importance of this point is illustrated, for example, by the drastic changes in credit correlations observed around the rating downgrades of Ford and General Motors in May 2005, even though the new credit markets ultimately weathered the episode. In addition, many of the new credit products combine elements of credit and market risk. The development of models permitting the integrated measurement and management of market and credit risk has only just begun (see Rosenberg and Schuerman, 2005, for an important start).

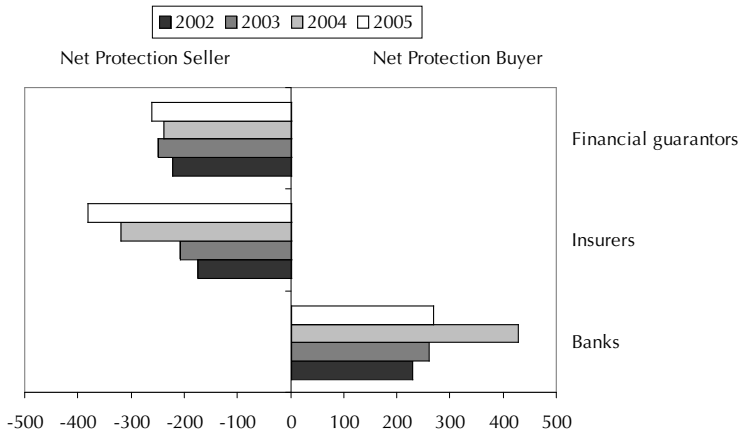
The increasing complexity of financial transactions has probably increased operational risk. One source of operational risk is the large backlog of unconfirmed trades in the credit derivatives market (see e.g. Geithner, 2005, who calls for the shortening of confirm times and more use of automated platforms), possibly related to underinvestment in back-office capacity.¹³³

Derivatives dealers and end users can encounter problems in times of financial stress due to illiquidity, ambiguous valuations and imperfect hedging. If many market participants try to exit similar positions simultaneously due to unfavourable developments, the market for a particular contract can quickly dry up. A related problem is that there is no objective pricing for some derivatives. Instead of being marked to market, they are 'marked to model'. This leads to the anomalous situation in which two counterparties to a trade each assign it a different value. Each counterparty might even carry the trade at a profit on its books – a logical inconsistency. This kind of ambiguity in pricing sometimes causes sudden, substantial declines in the reported value of funds specialising in illiquid securities. A final point to note is that many hedges that derivatives traders employ are imperfect, or 'proxy', hedges. These can go awry during a market meltdown.

The growing complexity of new financial instruments also increases information requirements. Long time series and wide cross-sections of systematic, reliable credit histories develop gradually. The data available to test risk models is limited.

Another information-related question concerns the growing separation between those who originate loans and those who ultimately bear the risks. Does a loan officer's behavior change once he is evaluated more on the volume of loans he writes and less on their performance? If a bank extends credit and then sells all or part of its exposure, how strong is its incentive and ability to monitor and control the risk behaviour of the borrowers? In securitizations, this moral hazard problem has been addressed by having the issuer retain the highly risky first-loss piece, or equity tranche. This tranche is, however, increasingly traded away. Will this cause the credit risk of borrowers to increase? Consider, in this context, the rapid growth of the US subprime mortgage market, which now faces problems. Subprime loans, loans to people with low credit scores, grew from US\$ 120 billion, or 5% of new mortgages written in 2001, to about US\$ 605 billion, or some 20% of new mortgages, in 2006 (see Box 7.1 for more on the subprime market).¹³⁴

The advent of CRT instruments has changed the incentives of lenders. In the past, banks making loans would have a strong incentive to work with borrowers to prevent them from defaulting. Today, a lender can hedge its credit risk exposure with CRTs, reducing or eliminating this incentive to stave off defaults. Some investors, such as those who purchase credit default swaps for nonhedging purposes, will actually have the incentive to increase the likelihood of default, since this improves their returns.

Figure 9.6 Net positions in credit derivative market, US\$ billion

Source: Fitch Ratings

Notes: Survey conducted by Fitch among market participants. The survey includes 49 banks and broker dealers, 18 insurance and reinsurance companies and 8 financial guarantors. Financial guarantors are institutions providing financial guarantees and credit enhancement products to investors, financial institutions and other participants in the global capital markets.

Very little information exists about transactions and positions in the new structured finance markets. Some information (Figure 9.6) exists about where credit risk flows through the credit derivative markets. The figures show that banks are net protection buyers (credit risk shedders) and insurers and financial guarantors are net protection sellers (credit risk buyers). The role of insurance companies as buyers of credit risk is continuously increasing over time, which raises the question of how much of the expertise needed to manage credit risk, a traditional forte of banks, insurers possess. What one cannot see from this figure is that banks are actively trading credit risk among themselves. Another limitation of the data in Figure 9.6 is that it does not identify who ultimately bears the credit risk. This information is needed for a full assessment of the risk allocation and financial stability implications of the new credit markets and the likely impacts of various types of financial instability. Rajan (2005), for example, claims that households now indirectly hold an increasing share of credit risk in modern economies. The pockets in which these now-more-widely-dispersed risks are located is an important policy issue.

A final issue for the stability implications of new financial instruments is market liquidity. This is less of a concern for the major CDS index products, such as CDX and iTraxx, whose diversity of traders creates 'two-way volume' that will not disappear in periods of high volatility. This can be fundamentally different in single-name CDS markets, even the most liquid ones. In times of high volatility, protection buyers typically outnumber protection sellers by a substantial margin. This 'one-way volume' causes liquidity to decline sharply or to vanish completely. Tailor-made structured finance products, such as single-tranche 'bespoke' instruments and CDOs, lack a secondary market liquidity. They are therefore only suitable for buy-and-hold investors such as insurers or pension funds.

9.5 Policy questions

Given the many benefits of innovative financial instruments, the appropriate question is, 'How can we make these instruments safer?' In this, we are guided primarily by the work of the Federal Reserve Bank of New York, the Counterparty Risk Management Policy Group (CRMPG), and similar public and private sector groups active in maintaining the health of the financial sector.

First, market-driven, but regulatory and supervisory-authority-guided, approaches are necessary for successful financial risk management. There is an ongoing dialectic between financial innovation and regulation. The financial sector is very dynamic, with frequent new product and process innovations. As new instruments are designed, regulation must keep pace to assure that markets remain under control. This regulation must be governed by principles and focused on maintaining levels of capital commensurate with the risks undertaken. It should not be based on a rigid set of rules, because that would stifle innovation.

Second, the working groups on financial risk management need to be broad-based, with a diverse group of market participants. Hedge funds, investment and commercial banks, insurance companies, perhaps even smaller financial institutions, should be involved in discussions of best practices. Any information sharing will need to protect proprietary information and ensure that no firm gains a competitive advantage. These groups should work to promote transparency, particularly between counterparties.

Finally, it is well to keep in mind that all the financial risk management solutions must be global. The financial markets have been global for quite some time. National regulatory and supervisory agencies must acknowledge this and work together for the common health and vitality of the system. Risk management is only as strong as the weakest link.

9.6 Prospects

This approach seems to be working. The CRMPG offers one example. Its original members were 12 global financial firms and it was chaired by Gerald Corrigan, now of Goldman Sachs, but formerly President of the Federal Reserve Bank of New York. In the wake of the Long Term Capital Management debacle, the group met to reach agreement on how to improve risk management procedures to avoid similar problems in the future. Because of its recommendations, banks can now better measure their aggregate counterparty risk exposures, documentation standards have improved, the use of collateral to mitigate risk has increased, and stress testing procedures are standard practice. Progress has also been made on documenting the backlog of unconfirmed credit derivative trades, increasing the use of electronic trade documentation, and improving the settlement protocol, although further improvement is needed.

It is also encouraging to note that the derivatives market appears more under control today than it was in the 1990s. From 1993–5, there were several major derivatives disasters: Procter & Gamble, Barings, Orange County and Metallgesellschaft. The problems have not disappeared, but do seem to have grown less frequent. This is likely due to several causes:

- Major derivatives dealers have adopted many best practices, as enumerated in a series of guidelines, notably the July 1993 Group of Thirty report *Derivatives: Practices and Principles*.
- Risk management techniques and practices has grown more sophisticated and have been broadly adopted. Many firms have appointed 'chief risk officers'.
- Regulators and supervisors have collaborated with one another and market participants to improve their effectiveness.

Regulators and other market participants must remain vigilant. That said, the financial community – broker/dealers, end users and regulators – has ably managed the development of the derivatives market in recent years. At year-end 1992, it took much time and effort merely to determine the size of the global derivatives market, which was a staggering US\$ 12.1 trillion. Today the market is much better understood and 30 times larger. This has two implications: First, derivatives have met the market test of fulfilling a genuine purpose. Second, the lower frequency of major disasters in the face of this rapid growth suggests that people are using derivatives more responsibly.

10 The Growth of Hedge Funds¹³⁵

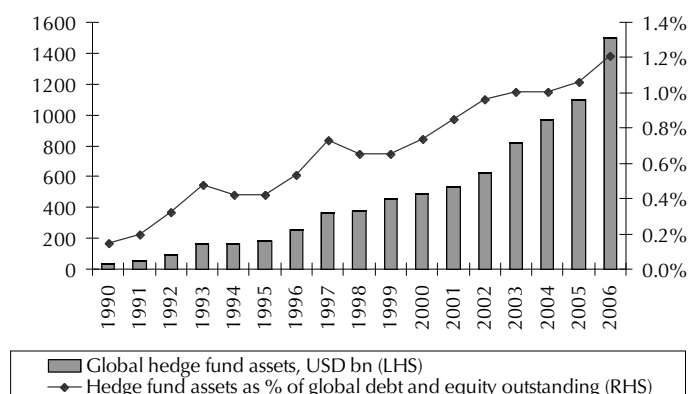
10.1 What are hedge funds and how do they affect market stability?

A hedge fund is a privately-offered investment vehicle that pools the contributions of investors in order to invest in a variety of assets, such as securities, futures, options, bonds and currencies. Hedge funds have attracted growing attention from policy makers, financial market participants and the general public due to their rapid growth and substantial scale, their importance to banks as clients and the impact of their trading activity on global capital markets. In light of their rapid growth and the market disruptions caused by Long Term Capital Management (LTCM) in 1998, some observers have asked whether hedge funds pose systemic risks. A thorough review of the avenues through which hedge funds could cause systemic problems indicates that a major financial markets disruption emanating from the hedge fund sector, though possible, is unlikely. Post-LTCM, regulatory authorities have encouraged banks to monitor their hedge fund clients through constraints on their leverage, an approach that has thus far proven effective.

Hedge funds support the robustness of markets in many ways. They provide attractive investment alternatives and improve economy-wide risk sharing. In addition, they promote financial market stability by assuming risks that other market participants are unwilling or unable to bear; by providing liquidity; and by facilitating price discovery. Of course, hedge funds could raise problems through their dominant role in some markets, active trading strategies, use of leverage and relative lack of transparency. Counterparties must therefore be cognizant of the risks they bear from hedge funds. Also, regulators must continue to promote better hedge fund risk management and transparency through their regulation of counterparties while remaining vigilant about potential systemic risks emanating from the sector. On balance, however, hedge funds enhance market stability and are unlikely to be the source of a systemic failure.

10.2 Size of the hedge fund sector

Although a lack of uniform definitions and reporting standards makes it difficult to measure the exact size of the hedge fund industry, its growth in recent years has been unmistakably rapid. According to the Hedge Fund Research (HFR) database, the industry grew from 610 funds managing US\$ 39 billion of assets in 1990 to

Figure 10.1 Hedge fund assets have been growing rapidly

Sources: Hedge Fund Research, World Federation of Exchanges (FIBV), Bank for International Settlements (BIS) and Swiss Re Economic Research & Consulting.

Table 10.1 The ten largest hedge fund managers, year-end 2006

Fund manager	Location	Assets, US\$ billion
JPMorgan Asset Management	New York, NY	33.1
Goldman Sachs Asset Management	New York, NY	32.5
Bridgewater Associates	Westport, CT	30.2
D.E. Shaw Group	New York, NY	27.3
Farallon Capital Management	San Francisco, CA	26.2
Renaissance Technologies Corp.	East Setauket, NY	26.0
Och-Ziff Capital Management Group	New York, NY	21.0
Barclays Global Investors	London, UK	19.0
Man Investments Limited	London, UK	18.8
ESL Investments	Greenwich, CT	17.5*

Source: Institutional Investor's *Alpha* magazine, June 2007.

Note: * denotes estimated assets.

3,873 funds with US\$ 490 billion ten years later. As of the end of the third quarter of 2006, 9,228 funds managed some US\$ 1.4 trillion, representing annualized asset growth of 19% since 2000 (Figure 10.1). Other industry consultants estimate that assets in global hedge funds reached about US\$ 2 trillion by year-end 2006, with nearly US\$ 1.5 trillion in US funds, roughly US\$ 450 billion in European funds and US\$ 150 billion in Asian funds.¹³⁶

As the industry has grown, so too have the number of extremely large funds. At year-end 2002, the largest hedge fund, Moore Capital, had US\$ 8 billion in assets. Just three years later, 31 funds managed this much in assets and Moore, whose assets had grown to US\$ 10.2 billion, was not even among the ten largest (Table 10.1). In recent years, despite the rise in the number of funds, the industry has become more concentrated. The asset share of the 100 largest hedge fund managers has risen from 54% in 2003 to 69% in 2006.¹³⁷

Although their assets represent little more than 1% of the total debt and equity outstanding worldwide, hedge funds have significant impact on financial markets. Because many hedge funds trade frequently and employ leverage, they

account for about 30% of trading in the US equity and fixed income markets.¹³⁸ Hedge funds dominate some markets. For example, they account for about 70% of the long value in the convertibles market, 55% of emerging market bonds trading, 80% of trading in high-yield derivatives and 85% of distressed debt trading.¹³⁹ In a survey of the main London banks that provide prime brokerage services to hedge funds, the Financial Services Authority found that the funds' average leverage ratio is 2.4:1 (GBP 2.4 in assets per GBP 1 of capital).¹⁴⁰

10.3 Types of hedge funds

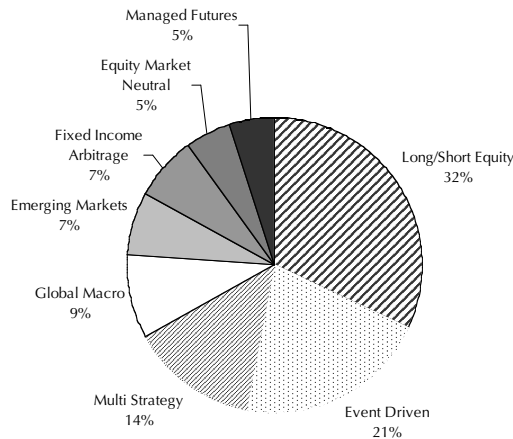
The investment styles of hedge funds vary widely. The major strategies fall into three general categories.

1. **Market trend/directional strategies** take positions based on market or security trends.
 - a. **Macro funds** make directional bets based on macroeconomic fundamentals in the equities, interest rates, currency and commodities markets.
 - b. **Long/short funds** buy securities they believe to be underpriced and sell securities they deem overpriced. Unlike mutual funds, these funds commonly employ leverage, take short positions and use derivatives. Some of these funds are market-neutral (i.e., $\beta=0$); most are net long.
2. **Event-driven strategies** seek to exploit mispricing caused by discrete events.
 - a. **Distressed securities funds** attempt to exploit mispricing of securities involved in, or at risk of, bankruptcy or reorganization.
 - b. **Risk/merger arbitrage funds** seek to profit from trading the stocks of companies involved in mergers, takeovers, or buyouts.
3. **Arbitrage strategies** seek to exploit small pricing inefficiencies between closely-related securities.
 - a. **Convertible arbitrage funds** generally take long positions in a company's convertible debt, preferred stock, or warrants while selling the company's common stock short.
 - b. **Fixed-income arbitrage funds** seek to exploit small pricing inefficiencies in similar fixed income instruments.
 - c. **Statistical arbitrage funds** use statistical models to try to find pricing inefficiencies.¹⁴¹

More than half of hedge fund assets are invested in long/short equity and event driven strategies (Figure 10.2). The risk profiles of hedge funds vary widely. Many employ variations or combinations of basic strategies.

10.4 Benefits of hedge funds

The benefits that hedge funds offer investors are well known. Less well understood are the ways that hedge funds promote risk sharing and financial market stability.

Figure 10.2 Long/short equity funds are the biggest category (as at June 2006)

Sources: TASS Research, 'Commentary on TASS Asset Flows', second quarter 2006; Swiss Re Economic Research & Consulting.

Note: These categories follow TASS's definitions and do not exactly match the above categories.

10.4.1 Benefits to investors

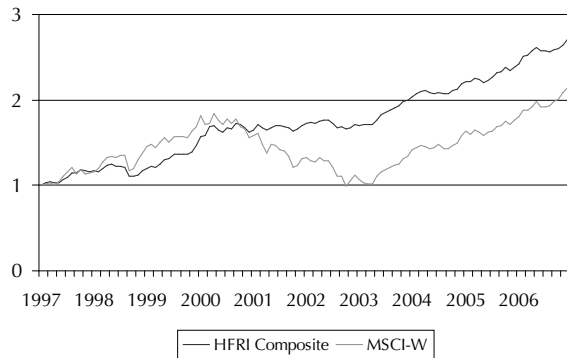
A well-diversified portfolio of hedge funds appears to have the potential to earn attractive returns with less risk than equities. In the decade up to year-end 2006, the HFR Fund-Weighted Composite Index generated a higher annual return than the MSCI-World Equity Index (10.6% versus 8.1%) with half of the risk (Figure 10.3).¹⁴² Moreover, the 'beta' of the HFR with respect to the MSCI-W was 0.4, which means that each percentage point change in returns to the MSCI-W was typically associated with a 0.4% change in the HFR composite's returns. A low beta such as this suggests that allocating some of a portfolio to hedge funds in lieu of stocks can potentially reduce the volatility of the portfolio's returns. Historical return figures should, however, be viewed with caution. Due to biases in the data sets on which they are based, hedge fund indices overstate returns and understate risk.¹⁴³

In weighing the benefits of hedge funds, two further caveats are in order. First, unlike other indices for which vehicles exist enabling investors to track their returns, there is no way for investors to replicate the performance of hedge fund indices; many of the funds in these indices are closed to new investors. Second, hedge funds are far less liquid than equities.

10.4.2 Promotion of risk sharing

Smoothly-functioning institutions that facilitate risk sharing, such as equity, derivatives and insurance markets, allow risks to be shifted to the parties most willing and best equipped to bear them. This helps an economy to function more efficiently. Some hedge funds further promote market efficiency and strengthen corporate governance through the informed and active use of their shareholder rights. These 'activist' funds call for changes in management and offer input on corporate strategy, dividend policy and capital structure.¹⁴⁴

Figure 10.3 Cumulative returns to hedge funds and global equities,
Jan. 97–Dec. 06 (Dec. 96 = 1.0)



Sources: Hedge Fund Research, MSCI Barra.

Hedge funds have become an important source of risk capital. Hedge funds absorb credit risks from other financial institutions, notably banks, thereby distributing these exposures across a broader range of investors holding diversified portfolios (Chapter 9 discusses CRT instruments, which facilitate this risk transfer). In the fledgling market for insurance-linked securities such as catastrophe bonds and life bonds, hedge funds have become increasingly active investors. Some funds have been launched to invest exclusively in insurance risk. Over time, hedge funds will become an important financing source for insurers, complementing reinsurance in areas such as peak catastrophe risks, for which industry capital is insufficient.

10.4.3 Enhancing financial market stability

The improved risk sharing that hedge funds facilitate can enhance market stability. By assuming some of the escalating volume of credit and catastrophe risks in the marketplace alongside banks and insurers, hedge funds join other institutions in serving as shock absorbers, potentially limiting the spread of damage from recessions, credit crises and natural catastrophes.

Hedge funds can help improve market stability in tumultuous times in other ways as well. When liquidity dries up and other market participants avoid trading a particular security, hedge funds often enter the fray, in areas such as distressed debt. Increased trading contributes to market liquidity, which reduces risk premia, and thus the cost of capital.

When the market price of a currency or security deviates sharply from its 'fundamental' value, hedge funds seek opportunities to arbitrage the difference, thereby fostering price discovery. Hedge funds have more flexibility than other financial institutions to act in this manner because their investment strategies are subject to relatively few regulatory constraints. Many of their investors are either risk tolerant or subject to 'lock-ups' that require them to keep their investments with the fund for a set period. Hedge funds also have bank lines of credit that they can access when a compelling investment opportunity arises.

10.5 Systemic risk concerns

Hedge funds, like other financial institutions, pose two types of risk to investors and the financial community at large: systemic and non-systemic. Systemic risk refers to the risk that one financial institution's failure to meet its financial obligations will cause other institutions to fail to meet theirs as well. In extreme cases, a financial crisis could ensue, destabilizing capital markets and the real economy. Other risks are known as non-systemic.

10.5.1 Non-systemic risk

Many of the risks to which a hedge fund is exposed are specific to that fund. Risks such as operational risk and the risk of fraud directly affect a hedge fund's investors and the banks lending to the fund. Regulators in many countries, especially the United States and UK, have taken the approach that since the funds are restricted to large, sophisticated investors, it is these investors' responsibility and not the government's to perform due diligence on the funds in which they invest. Moreover, fraudulent operators are subject to prosecution under existing laws.

In recent years, there have been numerous instances where hedge funds have lost hundreds of millions, or billions, of dollars (Table 10.2). Of 26 episodes reported in various public sources, two fund categories – fixed income arbitrage and global macro – together accounted for 49% of the reported incidents and 60% of assets lost (Figure 10.4), well above their 16% combined share of assets (Figure 10.2). This is consistent with findings that these two strategies have among the highest attrition rates in the hedge fund universe.¹⁴⁵ Ten of the 26 cases (or 38%) were fraud-related.

10.5.2 Systemic risk

Systemic risk has traditionally been of more concern to regulators than non-systemic risk.

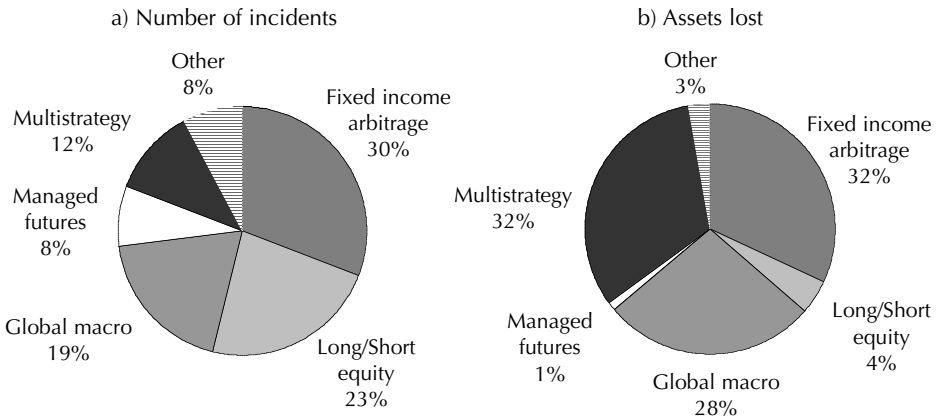
As hedge funds have become more significant financial market participants, policy-makers have raised concerns that they may contribute to systemic risk. One way this might occur is if a failing hedge fund were to cause the collapse of a large financial institution with direct exposure to it. This could, in turn, cause further financial systemic disruption. During the collapse of LTCM in the autumn of 1998, 17 counterparties, mostly large banks, would collectively have lost between US\$ 3 and 5 billion had LTCM not been bailed out by a group of these counterparties. Many of the counterparties had direct exposure to LTCM, mostly arising from over-the-counter (OTC) derivatives.¹⁴⁶

The LTCM crisis illustrates why market turmoil can be averted even when a fund with extensive counterparty risk exposures fails. First, counterparties should recognize that they are at risk and act in their self-interest by interceding, as occurred in the LTCM episode. Second, banks' risk management procedures with regard to individual exposures might prove highly effective, as was the case during the LTCM crisis. The replacement value of instruments net of collateral was a small percentage of banks' overall trading portfolios. Banks' risk management was, however, lacking in one regard: in assessing the risk of lending to LTCM, the banks

Table 10.2 Selected hedge fund disasters and large losses

Fund	Strategy	Year	Est. Loss (US\$, mn)	What went wrong?
Amaranth	Multistrategy	2006	~6,400	Excessive exposure to energy prices
Long-Term Capital Management	Fixed-income arbitrage	1998	3,600	Excess leverage during Russian default crisis
Tiger Management	Macro	2000	2,600	Bad bet on yen lost US\$ 2 billion
Soros Fund	Macro	2000	2-5,000	Major losses on Internet and technology stocks
Bear Stearns funds	CDOs	2007	1,565	Losses in subprime
Sowood Capital Management	Multistrategy	2007	1,500	Losses in loans and CDS
Fenchurch Capital	Fixed-income arbitrage	1995	1,264	Failed shift from US-only to European markets
Princeton Economics Inter'l	Macro	1999	950	Market losses, fraud
Vairocana Ltd.	Fixed-income arbitrage	1994	700	Market losses, bet on falling rates
Lipper	Convertible arbitrage	2001	700	Market losses, fraud
Askin Capital Management	Fixed-income arbitrage (mortgage-backed)	1994	660	Failed hedge, market losses, margin calls
Bayou Fund	Multistrategy	2005	657	Fraud
Lancer	Long/short equity	2003	600	Fraud
Beacon	Fixed income arbitrage	2002	500	Losses on mortgage derivatives, failed to mark to market
Manhattan Investment Fund	Long/short equity	1999	400	Fraud
MotherRock	Energy fund	2006	230	Loss from natural gas market
Global Systems Fund	Macro	1997	125	Wiped out by collapse of Thai baht
Dillon Reed Capital Management	MBS	2007	123	Losses in mortgage securities
Argonaut Capital Management	Macro	1994	110	Market losses
Basis Capital Yield Alpha Fund	Multistrategy	2007	80+	Losses in subprime
Maricopa Investment	Long/short equity	2000	59	Market losses, fraud
Cambridge Partners	Long/short equity	2000	45	Fraud
HL Gestion/Volter	Managed futures	2000	40	Market losses, regulatory intervention
Ashbury Capital Partners	Long/short equity	2001	40	Fraud
ETJ Partners	Relative value	2001	21	Market losses, fraud
Ballybunion Capital	Long/short equity	2000	7	Fraud

Sources: Alexander Ineichen, UBS Warburg, 'The Myth of Hedge Funds: Are Hedge Funds The Fireflies Ahead of the Storm?' *Journal of Global Financial Markets*, 2(4), Winter 2001, pp. 34-46; Jeff Joseph, Rydex Capital, 'Investing in a Hedge Fund of Funds: What Really Matters,' *Senior Consultant*, 7(8), p.1; Berkshire Asset Management, 'Hedge Funds', July 2003; *New York Times*, September 2006; Swiss Re Economic Research & Consulting.

Figure 10.4 Distribution of large-scale hedge fund losses across strategies

Source: Table 10.2

relied too heavily on the reputations of the fund's partners but lacked a clear picture of the fund's overall risk profile.¹⁴⁷

Aside from causing the failure of a major counterparty, a failing hedge fund can disrupt the financial markets indirectly. Timothy Geithner, President of the Federal Reserve Bank of New York, characterizes the common dynamic of past financial crises as:

[T]he confluence of a sharp increase in risk perception, and the subsequent actions taken by financial institutions and investors to limit their exposure to future losses. As asset prices declined and volatility increased in response to increased concern about risk, firms moved to call margin, to reduce positions and to hedge against further losses. These individual actions had the aggregate effect of inducing even larger price declines and further heightening perceptions of risk, ultimately propagating and amplifying the effects of the initial shock.¹⁴⁸

In the wake of LTCM, the Basle Committee found that the potential to disrupt markets indirectly was of greater concern than the possibility of having a direct impact on financial institutions. The Committee identified several reasons why hedge funds pose a risk to financial markets:

1. Because of their use of leverage, hedge funds might exacerbate market movements if they are forced to sell securities to meet margin calls.
2. Forced selling might be additionally exacerbated by that fact that hedge funds often take similar positions and invest in more illiquid securities.
3. The disruption could be further aggravated if broker-dealers making margin calls front-run the hedge funds.
4. Hedge fund manager compensation schemes encourage risk taking and a focus on short-term gains.

These factors combined to cause substantial financial market disruption in the autumn of 1998 during the downfall of LTCM. Unlike the case of LTCM, however, other large-scale hedge fund losses have had little or no systemic impacts.

Amaranth, a highly regarded US\$ 9 billion multi-strategy fund, lost 65% of its assets in less than two weeks. The fund lost 35% of its value during the week of 11 September 2006 employing a highly leveraged natural gas spread strategy. Amaranth tried unsuccessfully to sell its positions to other financial institutions over the weekend of 16-17 September. On Wednesday, 20 September, it sold its positions to JP Morgan Chase and Citadel Investment Group at a US\$ 1.4 billion discount from the prior day's market-to-market values.¹⁴⁹

The losses, though unnerving for market participants, posed little systemic risk because they occurred in a relatively small and isolated market. LTCM's problems, by contrast, played out in the US Treasuries market. Amaranth and LTCM were both undermined when pursuing strategies that could conceivably have been profitable under certain scenarios. In each case, the failure was one of risk management. The trades were undertaken at such a large scale that when the markets moved against them, the funds were unable to exit their positions without moving the markets. A greater sensitivity to this liquidity risk, as well as a more careful focus on extreme scenarios, could have helped prevent these debacles. Amaranth demonstrates that a hedge fund can experience large-scale failure without causing systemic risk.

The Tiger and Soros funds offer further examples of large-scale losses with no systemic impact. The Tiger funds ran into problems with a yen trade that lost US\$ 2 billion in 1998. Tiger suffered further losses due to a bear market in value stocks. As investors rushed to buy Internet, technology and telecom stocks in the late 1990s, Tiger's old economy holdings languished. Fund manager Julian Robertson announced the liquidation of the funds on 30 March 2000. The Soros funds suffered the opposite fate. The funds reportedly lost billions of dollars in March and April of 2000 by joining the technology stock bubble at precisely the wrong time.¹⁵⁰

10.5.3 Causes for comfort about systemic risk

Although hedge funds can and do fail, sometimes spectacularly, these failures have generally not entailed systemic risk. There are other causes for comfort as well.

Market practices have improved since the LTCM crisis. The banking system is cushioned by more risk-adjusted capital, which would help to stabilize financial markets in the event of another crisis. In the United States, for instance, tier-one risk-based capital ratios have stabilized at about 8.5%, well above the 6.5% levels that prevailed in the early 1990s.¹⁵¹

Hedge fund risk management has improved through the efforts of bank supervisors, banks and securities firms; the involvement of institutional investors; and the institutionalization of hedge funds.

- Bank supervisors have promoted best practices in risk management among the banks that lend to hedge funds. The banks have in turn promoted better risk management at the funds.
- After the LTCM episode, risk managers at banks and securities houses formed the Counterparty Risk Management Policy Group, which developed recommendations and diligently implemented them.

- As institutional investors have increased their allocations to hedge funds, the question of hedge fund risk management has come increasingly to the fore. A recent survey of hedge fund investors found that sound risk management is now among their chief concerns.¹⁵²
- The emergence of larger, more institutionalised hedge funds has better aligned the interests of hedge fund managers with their investors.

There is reason to suspect that the role of hedge funds in financial crises has been exaggerated. Many funds use no leverage, and most use very little. According to an August 2005 report by service provider Van Hedge Fund Advisors, approximately 20% of hedge funds used no leverage while 50% used leverage (borrowed money) of less than one-to-one (including short positions as leverage).

In many cases of market disruption, such as the Mexican and Asian currency crises, hedge funds were not a leading cause of problems. Research on the role that hedge funds and foreign investors played in Malaysian currency markets and the Korean stock market during these countries' crises found no support for the theory that hedge funds were a major source of trouble.¹⁵³ Similarly, the International Monetary Fund (IMF) found no evidence that hedge funds profited abnormally from the Brazilian (1999), Turkish (2001) or Argentine (2001) currency crises.¹⁵⁴ Rather than driving these currencies downwards, funds were engaged in negative feedback trading (i.e. buying on dips), which might actually have improved market liquidity and stability.

Finally, the absence of major systemic crises in the United States from 1998 to 2006 is an encouraging sign that risk management has improved. During that time, the financial infrastructure weathered challenges including a major bear market and operations failures due to 9/11 without major systemic fallout. Because hedge funds are far larger today than just a few years ago, the current market turmoil will provide a real-life stress test regarding hedge funds' potential to cause systemic risk.

10.5.4 Three causes for concern

Mechanisms through which hedge funds can create systemic risk include style convergence, multiple layers of leverage and proprietary trading activities by banks.

One major concern is the possibility of many hedge funds with similar models and trading styles disrupting markets by trading in a similar fashion, leading them to start selling at the same time after some trigger. Fung and Hsieh (2000) found evidence of 'style convergence', through which funds can arrive at similar trades, possibly for different reasons.¹⁵⁵

The impact of this herding could be amplified by the layers of leverage employed. Of particular concern is the practice of investors borrowing to invest in funds of funds or other hedge fund vehicles, funds of funds then borrowing to invest in hedge funds and hedge funds then borrowing and using derivatives and other instruments to leverage their positions.¹⁵⁶ This practice could make funds vulnerable to large-scale losses. This use of leverage is particularly problematic in that banks might aggravate financial market distress by withdrawing liquidity during difficult periods.¹⁵⁷ Thus, multiple hedge fund failures could cause a cascade of margin calls, destabilizing markets.

Non-linear, option-like models can explain much of hedge funds' returns. Using this method, it was found that hedge funds have significant common risk exposures and that equity funds exhibited significant positive beta exposure to equity markets, with return distributions resembling short-put positions. This supports the common view that hedge funds are 'short volatility'.¹⁵⁸ Selling volatility can be an extremely risky strategy with potentially large negative returns, even with a dynamically-hedged delta-neutral position.¹⁵⁹ Also, IMF research found that even 'market neutral' or 'relative value' trading strategies, which are long some securities and short others in the same asset class, can experience a sharp increase in risk at times of extreme returns and often have correlations with other asset classes. This higher risk can occur even if the portfolio holds a large number of uncorrelated positions, a common hedge fund risk management technique, because these positions can suddenly become correlated during periods of market stress.¹⁶⁰ Several large market-neutral 'quant' funds suffered sharp sudden losses in the summer of 2007 because they simultaneously exited similar positions.

Proprietary trading desks at major banks, which engage in trading strategies similar to those of hedge funds, are growing in size and importance. In each year from 2003 to 2005, NYSE member firms earned more revenues from trading than from equity commissions. In the first nine months of 2006, they earned twice as much revenue from trading as from equity commissions.¹⁶¹

10.6 Regulatory outlook

Many regulators in the United States and other major markets believe that the best way to monitor hedge fund activity and its impact on financial markets is indirectly, through their sources of funds. Securities and banking regulators oversee the relationships of hedge funds with the commercial banks and broker-dealers that lend to and transact with hedge funds. Banks must regularly assess the creditworthiness of their hedge fund borrowers and counterparties. Brokers must actively monitor the positions of hedge funds and manage their exposure to them. These financial institutions can help further reduce systemic risk by sharing information about their counterparty exposures to hedge funds.

Market participants would also benefit from greater emphasis on tail risk, which is of particular systemic relevance. Getmansky et al. (2004) offer a proposal to reduce the systemic risk posed by hedge funds: the creation of an independent organization along the lines of the US National Transportation Safety Board (NTSB). When a plane crash occurs, NTSB experts determine the cause and prepare a report that includes recommendations for avoiding future recurrences. These reports have led to new rules that have significantly improved the safety record of commercial air travel. An international 'Capital Markets Safety Board' that investigates, reports and archives information on hedge fund (and other financial sector) debacles may likewise offer valuable benefits in combating systemic risk.

Regulators have reached no international consensus on the need for further oversight. Whereas many US and British regulators are reluctant to create new hedge fund regulations, officials in many continental European countries seek fuller disclosure or a ratings system for the funds.¹⁶² In December 2004, the SEC adopted a rule requiring hedge funds to register as investment advisors, thereby

allowing regulators to examine hedge funds' accounts and records. The reasons it cited for the rule were the growth of the hedge fund industry, an increase the number of fraud cases and a growing number of hedge fund investors with no previous experience investing in the funds. In June 2006, the US Court of Appeals for the District of Columbia Circuit overturned the rule. It is uncertain how useful a registration requirement would be. Such a requirement could create moral hazard by lulling investors into a false sense of security about what registration means. Hedge funds could move offshore to avoid registering. Finally, because of resource limitations, the SEC might find it difficult to monitor the industry closely.

11 Conclusions and Policy Implications

This report has examined the main factors at the root of the dramatic changes to the financial system of the past two decades: the integration of previously segmented national markets, the wave of financial consolidation and the resulting increase in the number of large complex financial institutions (LCFIs), the development of markets for new financial instruments and the emergence of new intermediaries. The interaction of these forces has reshaped the financial landscape and is changing the structure, liquidity and volatility of financial markets, with potentially large consequences for financial stability. The main results of the analytical chapters are as follows.

11.1 Macroeconomic imbalances

Macroeconomic imbalances can endanger financial stability. The present configuration of current accounts and exchange rates embodies such imbalances. Although this situation might persist for a while longer, it is not permanently sustainable. The multilateral surveillance process launched by the International Monetary Fund a year ago has yet to show any concrete results in dealing with global macroeconomic imbalances.

The inevitable dollar depreciation and changes in capital flows may be gradual. If expectations or market perceptions change sharply, however, there may be abrupt changes in exchange rates and interest rates and a 'sudden stop' of capital flows to the United States. These in turn could be associated with abrupt, widespread declines in asset prices. The variables to watch – and that the markets are indeed watching – are financial development in the emerging markets and in Europe, the savings-investment balance in emerging markets, and the relative growth rates of the US, Europe and Japan. Even if these variables move gradually, market views on them may shift suddenly, and that could cause international financial instability.

There are other macroeconomic concerns that cannot be ignored. These include the systemic risks posed by a fall in macroeconomic liquidity, a reversal of the carry trade, deflation of housing market bubbles, and emerging market vulnerabilities. In the current financial turmoil, there are risks of greater exchange-rate volatility and 'sudden stops' for countries with high current account deficits.

11.2 Volatility

In recent years a combination of real, financial and policy-related factors (many of which are long-run rather than conjunctural, see Chapter 5) has led to a period of 'financial quiescence', in which volatility has been low simultaneously across different asset classes and markets. The current financial turmoil has raised volatility, but no more than in other recent volatility 'spikes'.

Low volatility today does not, however, imply that the system is permanently more stable. Volatility could quickly rebound if, for example, the low volatility environment is mostly a result of the high growth and low inflation experienced in recent years. Moreover, some of the very factors that helped reduce volatility, such as derivatives and hedge funds, may induce sudden volatility spikes in the midst of a low volatility environment, which could undermine financial stability. And low volatility may stimulate excessive risk taking, because of the expectation of low future volatility.

The current environment is one of great uncertainty about financial market volatility: are we in a new low volatility regime? If so, what are the characteristics of this new regime? In this environment, market operators and policy makers are learning and adapting, which makes them prone to error.

Increases in market volatility will affect financial stability mostly to the extent that financial institutions are unprepared. This is more likely when innovation is rapid, since it takes time to integrate new products and strategies into complex risk management systems. Supervisors and regulators should monitor and adapt to the latest developments in financial markets. To that end, they should consider the feasibility of collecting aggregate information on the magnitude and distribution of risks, the characteristics of investors holding them, the structure and liquidity of markets and the workings of new products. They must also ensure that financial institutions understand and are equipped to manage the risks they bear. This involves checking the soundness of risk management practices, operations and internal controls.

11.3 International financial integration

International capital mobility and financial integration have increased tremendously in recent decades. For industrial countries and higher-income emerging market economies, this brings significant benefits in terms of risk-sharing and growth. But countries whose human capital, financial development, quality of institutions and macroeconomic policies are below certain thresholds may not realise these benefits.

Theory suggests an ambiguous relationship between financial integration and financial stability. Many recent macroeconomic studies find that capital account liberalizations are either unrelated to financial stability or are negatively related to the frequency or severity of banking and currency crises. We provide some tentative evidence suggesting that *de facto* financial openness is either unrelated, or negatively related, to the severity of systemic banking crises. These 'averages' could be read as a recommendation for unconditional opening of the capital account, and in general a free flow of capital is perceived to be welfare enhancing.

However, individual countries' situations differ, implying the need for a tailored approach to capital account liberalization. In particular, opening the capital account may well require an appropriate sequencing of policy changes. A number of conditions related to domestic macroeconomic policy, economic institutions, regulation and supervision may have to be fulfilled before financial liberalization can proceed safely in developing and emerging market countries. The need to sequence changes should not be taken as an excuse for delay, however, given the benefits of capital account freedom.

Theory suggests that the welfare benefits of banking integration could outweigh the welfare costs of the new risks it implies. This is because cross-border retail banking integration may be an important vehicle for risk sharing in the banking sectors of large economic areas like the euro area and the United States. Supervisory structures and approaches must keep pace with the increasing cross-border penetration in banking.

Carry trades are attractive when their risk-adjusted returns exceed those of other investments. We show that the attractiveness of carry trades is sensitive to changes in exchange rate levels and volatilities, but much less so to changes in interest rates. So a large and abrupt unwinding of carry trades is a risk. But it is not clear whether, beyond losses to investors, this would entail any systemic risk.

An upcoming issue is the role the 'emerging giants' China and India will play in the international financial system. At present their international financial integration (abstracting from official reserve holding) is far lower than their role in world trade and production. Both economies now face some challenges to financial stability. Their stock markets have rallied strongly, credit is growing fast in India and short-term foreign debt inflows have increased markedly in China. But because European and American financial exposure to China and India is limited, a domestic financial crisis in either country is unlikely to induce strong financial contagion to other major countries. A stop of Chinese foreign exchange interventions may, however, create an international adjustment problem in the financing of the US current account deficit. Moreover, an economic slowdown related to a crisis in China or India could significantly hamper world growth, which might weaken financial stability.

11.4 Household finance

In the past decade the household sector in most countries has become increasingly exposed to financial risk, reflecting: a steady increase in debt levels; a rise in real and financial wealth; a larger weight of risky assets in financial portfolios; and a gradual shift from Defined Benefit to Defined Contribution pension plans. Households' direct and indirect exposure to longevity risk has also increased. The extent to which these changes have affected systemic risk in the financial system is unclear.

The growing exposure of households to financial risk and growing household indebtedness raise policy challenges. The issues of transparency and consumer protection are foremost. Consumers find it difficult to understand and evaluate new financial products, many of which are complex and opaque. Poorly informed decisions can expose households to unanticipated risks.

More broadly, policy should seek to improve financial education and protect uneducated consumers. Easy access to clear, simple, authoritative advice and information will help consumers

- determine how much to save and how to allocate their savings across different asset classes;
- clarify their risk appetite;
- set long-term objectives; and
- identify which (broadly-defined) financial products or services might best meet their needs.

Consumers would then be better equipped to make informed investment decisions, whether independently or with the assistance of professional investment advisors. The aim is to promote public understanding of the benefits and risks, as well as the embedded costs, associated with investing in different types of financial products. With the vast array of financial products and services available to consumers, it is increasingly important that both financial literacy and consumer protection mandates be vigilantly pursued by financial regulators as well as self regulatory organizations and relevant trade groups. Regulation should ensure that only the most suitable products are offered to consumers, consistent with their financial risk-bearing capability and financial sophistication. These standards should be applied across all financial products, whether in the form of securities, derivatives or insurance. With fully informed investors, greater transparency of product attributes and rigorously applied suitability standards, the resulting product offerings from financial institutions will, through the forces of supply and demand, reflect the underlying needs of consumers.

11.5 Financial sector consolidation

Consolidation has impacts on individual and systemic risk, with policy implications related to moral hazard, the role of market discipline, the need for adequate corporate governance rules and the coordination of national and sectoral supervisors.

The growing role of large, complex financial institutions (LCFIs) raises the issue of whether they have become ‘too big to fail’. It also raises the issue of regulatory capture. When financial institutions become very large and local markets very concentrated, their lobbying power increases significantly and it may become easier to influence lawmakers and regulators as one single-issue group.

A more subtle point that relates to regulatory capture is the drive towards international standards within an increasingly globalised industry. When banks compete across borders, those operating in countries with lower regulatory standards are at an advantage; this may set up a mechanism of convergence towards weaker standards. Because the industry is global, capture in some countries can affect the entire financial system.

Since financial conglomerates interact increasingly with financial markets, market discipline offers one possible way to monitor them. By requiring high levels of disclosure, investors and counterparties would be able to assess risk in its different

forms, price it and send signals regarding institutions whose condition is deteriorating. A minimum requirement would include timely and frequent information, at a consolidated level and by major subsidiary, about: total risk; leverage; liquidity; and concentration along geographic and sector lines.

The potential difficulties arising from multiple regulators and supervisors, the externality of systemic risk and the need to allocate the cost of a bailout efficiently all call for ex ante coordination and agreements among authorities. As LCFIs expand across national and industry lines, they are subject to multiple regulators and supervisors. It is possible that no single regulator will accept responsibility for addressing systemic issues related to the spread of a crisis across countries. The country of residence of the lead supervisor may be in charge of deciding whether to bail out a failing conglomerate. But even if a bailout is the efficient decision, the costs could be prohibitive. They might be incurred by many countries, even though the home country represents a relatively small market for the firm (this would be true of conglomerates based in small countries). So far, the combination of Memoranda of Understanding, bilateral agreements and cooperation has proved effective, but it has not yet been severely tested. Although this issue is beyond the scope of this report, the rising role of multinational financial conglomerates may call for a more systematic multilateral approach.

Our analysis of both cross-border consolidation of financial institutions and related aspects of international financial integration suggests that liquidity pools are now more likely to be international. Thus the evaporation of liquidity in one national market may quickly extend across borders – a specific form of contagion. Conversely, LCFIs with cross-border reach can access pools of liquidity wherever they may be. This suggests that not only regulators, but also the major central banks must cooperate more closely in dealing with liquidity shocks.

11.6 New financial instruments

Given all the benefits from innovative financial instruments, the appropriate question is how to make these instruments safer. In this, we note the contributions of the Counterparty Risk Management Policy Group (CRMPG) in raising risk management standards in the area of derivatives. We also recognize the efforts of public- and private-sector groups active in maintaining the health of the financial sector, most recently the Federal Reserve Bank of New York, the US Securities and Exchange Commission and the UK Financial Services Authority that jointly brought together the major derivatives dealers to resolve the issues related to credit derivatives confirmation backlog.

Market-driven, but regulatory- and supervisory-authority-guided, approaches are necessary for successful financial risk management. The financial sector is very dynamic, with frequent new product and process innovations. As new instruments are designed, regulation must keep pace to assure that markets remain under control. This regulation must be governed by principles and focused on maintaining levels of capital commensurate with the risks undertaken. It should not be based on a rigid set of rules that would stifle innovation.

Second, working groups on financial risk management need to be broad-based, with a diverse group of market participants. Finally, financial risk management

solutions must be global. The financial markets have been global for quite some time. National regulatory and supervisory agencies must acknowledge this and work together for the common health and vitality of the system. Risk management is only as strong as the weakest link.

This approach has brought progress. The CRMPG offers one example. In the wake of the Long Term Capital Management debacle, this group of 12 global financial firms met to reach agreement on how to improve risk management procedures to avoid similar problems in the future. Because of its recommendations, firms can now better measure their aggregate counterparty risk exposures, documentation standards have improved, the use of collateral to mitigate risk has increased, and stress testing procedures are commonplace. Further substantial risk management improvements were documented in a second CRMPG Report published in 2006. Also, much progress has been made on documenting the backlog of unconfirmed credit derivative trades, increasing the use of electronic trade documentation, and improving the settlement protocol.

The derivatives market appears more under control today than it was in the 1990s. From 1993–5, there were several major derivatives disasters: Procter & Gamble, Barings, Orange County and Metallgesellschaft. The problems have not disappeared, but they do seem to have grown less frequent. This is due to several causes:

- Major derivatives dealers have adopted many best practices, as enumerated in a series of guidelines, notably the July 1993 Group of Thirty report *Derivatives: Practices and Principles*.
- Risk management techniques and practices has grown more sophisticated and have been broadly adopted. Many firms have appointed 'chief risk officers'.
- Regulators and supervisors have collaborated with one another and market participants to improve their effectiveness.

The financial community – broker/dealers, end users and regulators – has ably managed the development of the derivatives market in recent years. At year-end 1992 the worldwide volume of derivatives outstanding was already a staggering US\$ 12.1 trillion. In the subsequent 15 years, the market has grown 30 times larger. Thus, derivatives appear to be meeting the market test of fulfilling a genuine purpose. The lower frequency of major disasters despite this rapid growth suggests that people are using derivatives more responsibly.

11.7 Regulating hedge funds

Many regulators in the United States and other major markets believe that the best way to monitor hedge fund activity and its impact on financial markets is indirectly, through their sources of funds. Securities and banking regulators oversee the relationships of hedge funds with the commercial banks and broker-dealers that lend to and transact with hedge funds. Banks must regularly assess the creditworthiness of their hedge fund borrowers and counterparties. Brokers must actively monitor the positions of hedge funds and manage their exposure to them.

These financial institutions can help further reduce systemic risk by sharing information about their counterparty exposures to hedge funds.

Market participants would also benefit from greater emphasis on tail risk, which is of particular systemic relevance. According to a recent proposal, the systemic risk posed by hedge funds could be reduced by creating an independent organization along the lines of the US National Transportation Safety Board (NTSB). When a plane crash occurs, NTSB experts determine the cause and prepare a report that includes recommendations for avoiding future recurrences. These reports have led to new rules that have significantly improved the safety record of commercial air travel. A 'Capital Markets Safety Board' that investigates, reports and archives information on hedge fund (and other financial sector) debacles may likewise offer valuable benefits in combating systemic risk.

Regulators have reached no international consensus on the need for further oversight. Whereas many US and British regulators are reluctant to create new hedge fund regulations, officials in some continental European countries advocate fuller disclosure or a ratings system for the funds. In December 2004, the SEC adopted a rule requiring hedge funds to register as investment advisors, thereby allowing regulators to examine hedge funds' accounts and records. The reasons it cited for the rule were the growth of the hedge fund industry, an increase in the number of fraud cases and a growing number of hedge fund investors with no previous experience investing in the funds. In June 2006, the US Court of Appeals for the District of Columbia Circuit overturned the rule. The FSA has a somewhat similar registration regime for hedge funds located in the UK. The FSA focuses its regulatory oversight primarily on the 35 or so largest and most 'systemically relevant' funds, however.

On balance, it is uncertain how useful registration requirements will prove to be. Registration regimes do give the regulatory authorities an opportunity to understand the workings of these funds, with a special emphasis on risk management. However, such a requirement could create a moral hazard by lulling investors into a false sense of security about the implications and meaning of registration. Of course, hedge funds could move offshore to avoid registration, but that might be taken as a signal that the hedge fund's practices could not withstand regulatory scrutiny. Clearly, if a regulatory body puts into place a registration scheme, it must ensure that it has the staff resources required to implement the requirement. Finally, but importantly, we note that hedge funds do not seem to have played a significant role in setting off the current financial turmoil. Some have suffered from it and others have profited, but their problems have had little systemic impact.

11.8 Towards a new intermediation model

The recent changes of the financial system detailed above constitute an important wave of financial innovation that has changed the way the financial system intermediates savings in major markets. Against the backdrop of low volatility and the rapid growth of new intermediaries and new instruments, the business model of banks is evolving from the traditional buy-and-hold model (BH) – in which banks are funded with short-term deposits and invest in loans held until maturity – to

the originate-to-distribute (OTD) model, in which banks originate loans and then repackage and sell them to other investors, distributing risks throughout the economy. Most of these risks are passed to other banks, insurance companies and leveraged investors, who are the main buyers of structured finance (SF) products.

The OTD model, and in particular the wider distribution of risks within the global financial system, offers many potential benefits. It makes many assets more liquid, frees additional resources for investment and reduces the volatility of asset prices. Because it distributes risk across a diverse universe of investors, it should in principle reduce the exposure of the financial system to systemic events. But the recent developments in the US subprime market suggest that the OTD model also has weaknesses that might entail new forms of risk or magnify existing ones (see Box 11.1). The following paragraphs briefly review the problems facing the main components of the financial industry in the new model, then summarize the main drivers of risk and end with some policy implications.

11.8.1 Bank behaviour

Once they can quickly sell, for a fee, even the equity tranche of their loan portfolio (thus retaining no risk), banks have fewer incentives to monitor borrowers in order to minimize credit risk. Their incentives shift towards screening borrowers *ex ante* and originating loans with risk–return characteristics that match those of SF buyers, many of whom have a strong risk appetite. This may lead to offering loans to borrowers with poor or no credit records, some of whom lack a full understanding of the loan terms¹⁶³ – a recipe for landing some borrowers in trouble after their loans have been resold. On the other hand, this is not a business model that can survive over time, hence the incentives to screen borrowers *ex ante* and to commit credibly to SF buyers about the credit risks involved. When, however, these instruments are new, excesses may occur, as undoubtedly has happened in the events leading up to the recent turmoil.

Furthermore, if loans are to be evaluated by statistical models that use hard, quantitative information, banks have less incentive to screen potential borrowers based on soft information. In this sense, they risk losing their unique role in the old intermediation model. Smaller, traditional banks can pick up some of this business, reducing concerns about credit rationing to more opaque borrowers. Once a loan is sold, the lending relationship that the bank keeps with the borrower entails costs but little value. Because the bank has little incentive to cultivate the relationship, some situations that could have been improved through renegotiation based on soft information will instead deteriorate, increasing the probability of default.

11.8.2 Information

Banks that package loans into illiquid, complex products face a moral hazard problem: how is the buyer to know the ‘true’ value of SF products if they cannot be traded? The solution has been to bring in rating firms as third party certifiers, just as in markets for standard debt securities. However, rating SF is a different business from rating traditional securities.

First, while for traditional debt securities, ratings firms examine the credit qual-

ity of a single firm, making extensive use of soft information, in the case of SF, this type of analysis is limited at best and often nonexistent. The analysis for the ratings of SF products depends primarily on models of how the underlying assets would perform under a variety of circumstances. Originators, recognizing the limited transparency of the caliber of the underlying assets, may have an incentive to put lower quality assets into the pool. To overcome both of these problems, these securities are usually overcapitalized, but this only pushes the problem one step further, to determining whether the overcapitalization is sufficient. Moreover, rating firms cannot compare their evaluation to similar SF products since they are illiquid and possibly custom tailored, so they suffer from model risk.¹⁶⁴ It is clear that SF differs from traditional debt products and that the data used to model these new products are often limited.

Second, the effects of the potential conflicts of interest – the fact that ratings companies are paid by firms to assess the riskiness of the securities they issue – may be stronger for SF products than for standard ones. In traditional bond markets the availability of daily market prices makes it easier to detect an overly optimistic rating, which could cause reputational damage to the ratings firm.¹⁶⁵ Therefore, in these markets the potential reputational loss is likely to counterbalance the incentive of ratings agencies to please their clients by issuing favorable ratings. This ‘reputational equilibrium’ may not hold to the same extent for SF, however. SF instruments are complex structured products that are illiquid and less transparent. Due to these characteristics, absent a crisis, misvaluations may take time to be discovered, if they are discovered at all. Moreover, the market for SF is growing exponentially, so that ratings firms have strong incentives to capture this highly profitable business. Having a reputation for being too conservative might cost a large share of the fastest growing market in decades.¹⁶⁶ Thus, SF differs from traditional bond markets in ways that may systematically tilt the reputational equilibrium toward underestimating risk.

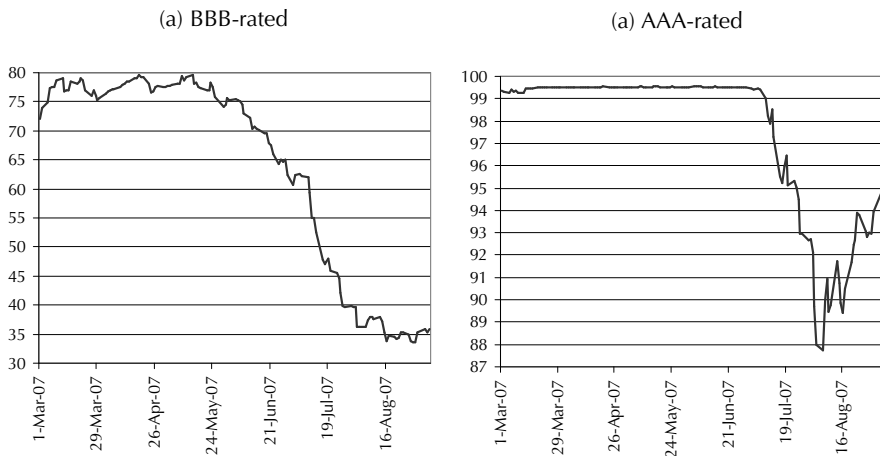
Discrepancies between the ratings and the effective riskiness of SF products may to some extent be unavoidable, as any set of rating methods (such as those defining the minimum requirements to obtain a particular rating for a tranche) are likely to be ‘gamed’ by issuers to generate spreads on their products. Moreover, in the rapid expansion of the SF market, where operating procedures and market practices are relatively new, ratings firms, like other parties involved, may have received only part of the necessary or available information on the quality of the assets to be sold. This may have induced mistakes in their risk assessment.¹⁶⁷ And some recently issued SF products are subject not only to default risk, but also to market risks (such as changes in credit spreads or exchange rates).¹⁶⁸ That may weaken the relation between the rating and spread of SF products and is likely to confuse the many investors who are unaware that ratings reflect only credit risk, not market risk.

These agency problems can intensify some losses of information that may arise in the shift from the BH to the OTD model. For example, some observers argue that the current financial turmoil – in particular, the loss of confidence in SF products, the rise in the perceived risk of major banks and the evaporation of liquidity in interbank markets – was triggered by the speed and severity of the rating downgrades in the SF market,¹⁶⁹ which undermined confidence in their rating methodologies for SF.

BOX 11.1 The summer 2007 financial turmoil

Commencing in July 2007, financial markets confronted a sudden rise in general uncertainty as evidenced by rising funding costs and a broad withdrawal of liquidity from a range of counterparties and markets. Why did this occur? There was no fall in macroeconomic liquidity, nor any obvious exogenous shock. The turmoil seems to have been the result of endogenous factors related to instability, which fueled the interplay between liquidity risk and credit risk.

Growing worries about the size and distribution of losses on US subprime mortgages and leveraged loans triggered a reversal in US market sentiment that quickly spread to Europe and parts of Asia. Although the subprime market is not large relative to financial markets as a whole, the disturbance led to a general repricing of risk that continues as we write. As it became harder to assess the risk of structured products, liquidity in that market eroded. Declining asset values and difficulties in measuring counterparty risk exposures led to margin calls. Market participants met the calls by unwinding large exposures to structured credit products, causing their prices to decline further. Others sold more liquid assets, triggering sharp price declines and spreading uncertainty across markets. Rising volatility and concerns about hidden exposures related to structured finance activities increased the perceived risk of banks. In the flight to quality that ensued, the price of Treasury bills rose sharply and interbank markets grew illiquid.

Figure 11.1 ABX mortgage indexes

Sources: Markit and CDS IndexCo.

May sell-off in Treasuries. Some observers trace the crisis to a large sell-off of US Government Treasury securities following the May Treasury refunding. Interest rates on the 10-year Treasury Note rose sharply, from approximately 4.7% in early May, prior to the auctions, to 5.2% in late June and early July. Investors, perhaps large central banks, appear to have bought Treasury Bills instead of rolling over 3- and 10-year Treasury Notes in May. The spike in 10-year Treasury yields increased the 'reset risk' for subprime mortgage loans and called into question the credit quality of asset-backed securities that contain subprime paper in the underlying pools, as did many such structured securities. The resulting market uncertainty is evidenced by a decline of the...

BOX 11.1 (contd.)

...ABX BBB-rated index, which includes securities backed by subprime mortgages and other real estate lending, from 80 in early May to 60 in early July (see Figure 11.1, panel a).

Gridlock in the interbank market. The asset-backed commercial paper (ABCP) market has also been seriously impaired. Investors have lost confidence in ABCP because of the depressed market values of some of the assets that back the ABCP programmes, such as mortgage-backed securities (MBS). Many banks had created off-balance-sheet structured investment vehicles (SIVs) and 'conduits'. They funded their investments with short-term ABCP, a classic maturity mismatch, in recognition of which the banks had offered contingent credit lines. The SIVs dropped particularly out of favor, even though SIV portfolios on average include only 2% subprime MBS and 22% prime (mostly 'AAA') MBS. The most vulnerable ABCP programmes are winding down. In the last three weeks of August, US ABCP outstanding dropped \$185 billion, a 16% decline. Meanwhile, investors fled to US Treasuries, causing the three-month Treasury bill yield to decline by nearly 100 bps, to 3.8%, by the end of the month.

As it became clear that some banks had suffered major losses and were subject to potential illiquidity problems due to their exposure to SIVs and conduits, banks grew reluctant to lend to one another because of their inability to distinguish between those affected by the turmoil and those unaffected. This adverse selection led to the hoarding of liquidity, which rendered the interbank market dysfunctional¹⁷⁰ and caused the initial problem to spread throughout the financial system.

Keynes (1936) likened such uncertainty to '... a game of Snap, of Old Maid, of Musical Chairs-a pastime in which he is victor who says Snap neither too soon nor too late, who passed the Old Maid to his neighbour before the game is over, who secures a chair for himself when the music stops.' In this environment, market observers have once again begun focusing on the 'TED spread', the difference in rates of 3-month Eurodollar deposits and US Treasury bills. Elevated readings indicate heightened risk aversion and concerns over bank counterparty risk. After ranging from 30 to 93 bp through July, the TED spread widened to 247 bp on August 20 (see Figure 11.2) - a level not seen in nearly two decades. The TED spread narrowed to end August at 187 bp and declined further in mid-September, after the 50-basis-point cut by the Federal Reserve. ...

Figure 11.2 TED spread, in basis points



Sources: Federal Reserve Board of Governors, authors' calculations.

BOX 11.1 (contd.)

Subprime mortgages. The liquidity glut of the past few years created favorable conditions for borrowers, as investors seeking higher yields became less discriminating about credit risk (see chapter 5). One result was a sharp deterioration of covenant packages in leveraged loans; another was that people with low credit ratings qualified for mortgages on liberal terms (e.g., low down payment, low introductory rates; see Box 7.1).

Late in 2006, defaults on subprime loans in the United States began to rise, due in part to rising interest rates and a slowing housing market. As the performance of subprime loans originated in 2006 continued to deteriorate in the first half of 2007, rating firms downgraded over 800 tranches of home equity asset-backed securities as well as collateralised debt obligations holding mezzanine tranches of subprime mortgages. Investors mandated to invest exclusively in investment grade credits were forced to sell the downgraded securities.

The value of mortgage securities continued to deteriorate. The ABX BBB-rated index fell to 35 in late August (see Figure 11.1). The AAA-rated ABX index also fell, from 99 to 88, before rebounding.

One high-profile consequence of this sell-off was the failure of two Bear Stearns hedge funds that once held more than US\$ 20 billion in debt, mostly backed by subprime mortgages. The funds were near being closed down in mid-June, when Bear Stearns provided almost US\$ 1.6 billion in rescue financing to save one of them. A month later, the firm announced that despite the cash infusion the funds had lost most of their value.

The speed and severity of the rating downgrades increased in July 2007, which surprised many investors and undermined confidence in structured finance ratings. Market liquidity in structured products evaporated, making it even more difficult to value portfolios containing such products.

Difficulties spread to Europe. In early August, BNP Paribas suspended three investment funds worth US\$ 2.2 billion because it had become impossible to value them due to the 'complete evaporation of liquidity'. IKB Deutsche Industriebank, which specialises in loans to small and mid-size German firms, encountered problems with its portfolio of fixed-income securities linked to mortgages and could no longer sell commercial paper to fund itself. It received a US\$ 4.8 billion industry bailout. Further high-profile cases include the troubles of the major US mortgage lender, Countrywide, and the Bank of England's bailout of Northern Rock, a large UK mortgage lender.

Central banks responded to market conditions by loaning banks more than US\$ 200 billion to facilitate the orderly functioning of financial markets.

Leveraged loans. In the wake of these events, trading and issuance have slowed dramatically in many parts of the credit market. One major logjam is in the high-yield and leveraged loan segments. New high-yield bond issuance in the US came to a standstill in July 2007, and the pipeline in the leveraged loan market is clogged. ...

BOX 11.1 (contd.)

...In June and July, the extensive issuance calendar for leveraged loans proved impossible to place, causing (LCDX 5 year) CDS spreads to widen dramatically, from 110 basis points in early June to 360 basis points at the end of July. By late July, the market for new collateralised loan obligations had virtually shut down, making it difficult to sell loans. Standard & Poor's estimates that the blocked deal pipeline is US\$ 215 billion in the US and, when high-yield bonds are included, perhaps as much as US\$ 500 billion in the US and Europe.

The freezing of markets and the tightening of credit need not signify that the banks are illiquid. Central banks have repeatedly injected liquidity, but the banks appear to be hoarding it because of concerns over counterparty risk, the backlog of leveraged loans on their books (on which they may have to take haircuts), and their commitments to honour contingent credit lines. Events in the credit markets have so far not had significant effects on equity markets, or on emerging market finance. But a significant number of hedge funds recorded substantial losses in July and August, and several have folded. Prime brokerage for hedge funds is highly concentrated in a few major institutions that might be hurt if the failures become widespread.

The unpacking and valuation of asset exposures will take some time, and it is too soon to assess the consequences of that process for financial institutions, markets, and aggregate economic activity. We cannot yet determine whether the current shock to liquidity in some markets will significantly reduce funding liquidity. It has not yet brought any generalised fall in asset prices, a central feature of a true 'financial crisis'.

11.8.3 Illiquid products and mispricing

SF products are made of components such as mortgages or other assets (think for example of MBSs, ABSs, CLOs and CDOs) and are intrinsically difficult to price, due to their complexity, opaqueness and illiquidity. Their pricing relies heavily on statistical models, with all their limitations (in particular the difficulty of dealing with the consequences of rare events). Furthermore, for many SF products the data needed to estimate default rates in a variety of economic environments are not available. Finally, estimated prices are sensitive to the assumptions made and the data used; two similar models might give very different results. Pricing therefore suffers from model risk, i.e., the possibility that the estimated price differs widely from the price at which parties are willing to trade. Since SF products are booked at the model price until traded, this might lead to sudden, large adjustments and the subsequent appearance of severe losses.

Illiquid products facilitate little transfer of information through trading, which may increase the scope for exploiting informational asymmetries: between banks and rating firms, between rating firms and investors, between hedge funds and their prime brokers, etc. The awareness that this market is at least potentially subject to adverse selection and moral hazard makes it more likely to break down when these problems are exacerbated – as happens when financial turmoil increases overall uncertainty.

11.8.4 Unregulated investors

The OTD model implies a transfer of financial activity from regulated to unregulated intermediaries, e.g., from the banks selling SF products to investors such as hedge funds or investment vehicles (such as SIVs and conduits). This shift may alter the incentive to take risks. For example, the typical remuneration structure of hedge fund managers, which rewards them highly for profits but does not penalize them for losses, provides strong incentives for 'risk shifting' behaviour. This makes the manager more inclined to assume credit risk, liquidity risk and maturity mismatch risk and to increase leverage. For SIVs and conduits, the increase in risk is a likely consequence of their insufficient capital base, which may induce the manager to assume leverage, as well as liquidity and duration risk by combining liquid short term liabilities with illiquid, long duration SF assets (the classical ingredients of a bank run).

These developments may induce some investors to provide liquidity at times of turbulence. But they may also imply that under the OTD model, the financial system is exposed to rare, extreme events, whose likelihood is difficult to assess, as in the case of the drying up of liquidity in the ABCP market observed in August 2007. In other words, the system is likely more efficient, but tail risk may have risen.

11.8.5 A more market-based system

Since the new OTD model is more market-based, it depends more on market infrastructure and arms-length transactions. Market infrastructure (payment and settlement systems, etc) has improved over the years, but it clearly has trouble keeping pace with innovation. The backlog in settlements of derivatives transactions that was cleared in 2006–7 after some prodding by regulators is but one indicator of the delays that might be accumulating. Due to externalities, financial institutions generally lack a clear incentive to invest in infrastructure to a socially-optimal extent. Money markets and wholesale settlement systems are still not fully integrated across borders, and best practices and technology should be more widespread than they are. Operational risk, while hard to quantify, has likely increased with the sheer size and complexity of these markets and the increasing need for technology and skilled human capital.

The rise in arms length transactions means that all material terms must be spelled out in legally binding agreements, thus increasing legal risk, which has many facets. In particular, contracts might have omitted provisions for some potential events, or might be unclear, therefore leading to increased litigation and uncertainty. Dispersed ownership of risk makes renegotiation in case of negative events more difficult and slower, thereby amplifying losses. Finally, conflicts across jurisdictions are notoriously difficult to resolve, especially if the many parties involved (the underlying borrower, the originator, the certifiers, the buyers, etc.) reside in different countries.

11.8.6 Complexity

Complexity, a key characteristic of the OTD model, is a potential source of risk. More steps and more participants in the intermediation process imply potentially complex principal-agent relationships among banks, arrangers, rating firms and

investors and more opportunities for something to go wrong. More-complicated products entail exposure to more types of negative events and a reduced ability to evaluate risk and to price it accordingly. The combination of these two characteristics implies that even small shocks can have systemic implications, by propagating across institutions or precipitating other negative events and letting prices and markets spiral down. Once again, tail risk may emerge.

Moreover, the opaqueness of SF and uncertainty regarding the main players' strategies and positions may induce market participants to refrain from providing liquidity when it is most needed, thereby inducing or exacerbating a crisis. Thus, the OTD model, being more sophisticated than traditional intermediation, is probably more efficient in managing risk on average, but its complexity may make it more fragile and more prone to exacerbate the effects of negative shocks and turn them into systemic events.

11.9 Policy implications

We have seen that the OTD model may engender additional risks, as it provides opportunities for banks to originate and sell riskier loans, for ratings firms to understate risk and for hedge funds and other investors to bear greater risk. Yet the model can also provide substantial efficiency gains for the financial system and the entire economy. What policies might reduce fragility of this model, while preserving as much as possible its stability-enhancing benefits?

Some have suggested that the authorities should obtain and disseminate relevant and timely information. In particular, information on who holds SF instruments and whether risk is too concentrated is thought to be a public good that might require some form of intervention, e.g., setting up some sort of credit registrar for asset-backed securities that would record the buyers and sellers. Having the authorities obtain aggregate information of this type might assist them in their supervisory role. However, creating a registry and disseminating such information risks creating moral hazard and misinformation, which makes such a recommendation highly problematic to many observers.

Perhaps a more fruitful endeavor would be greater oversight of ratings firms. The US Securities and Exchange Commission has recently been mandated by Congress to regulate ratings firms with a focus on mitigating conflicts of interest and enhancing the integrity of the rating process (for example, through the consistent application of ratings methodologies across similar products). As part of this process, regulators should question whether ratings firms can provide a range for the risk of every structured product, rather than a point estimate. This would make clear that there is a degree of uncertainty about the methodologies used. A further possibility would be to develop a separate scale for rating SF instruments, reflecting their fundamentally distinct nature. Given the information asymmetries associated with SF products and the OTD model of finance, ratings firms are likely to continue to play a pivotal role as information providers. Therefore, any meaningful endeavor to enhance the performance of ratings firms without creating an implicit government guarantee of their ratings will help improve the OTD model. Rating firms' incentive problems can possibly be addressed by moving to a business model financed by investors. (As long as this is not a mass market, with

many small, dispersed investors, it might be feasible.)

Information and trading are closely related: more trading would reveal more information, especially on the riskiness of the assets being traded. In order to promote trading, more transparency (or less suspicion about the existence of asymmetries) is clearly needed. One way forward would be to promote greater standardization of OTD products, such as CDOs, to improve transparency. The approach taken by ISDA in creating standard terms in the swap and derivatives markets might be a model for SF products. This would create greater understanding of these products and reduce contractual and legal uncertainty. Greater standardization and certainty will promote more active trading.

As for incentives, it is difficult to modify directly the behavior of unregulated parts of the market, such as hedge funds and conduits. But it is possible to encourage some of their major counterparties (e.g. prime brokers) and investors (e.g. pension funds) to require more disclosure and accountability of hedge funds with respect to strategies and risk appetite. One element could be a more aggressive insistence that prime brokers know better the strategies and, if feasible, the positions of their counterparties, as recommended by the Financial Stability Forum. We recognize that no single prime broker will have access to all information on any single counterparty. However, continued encouragement from the official sector for improvements in prime brokers' risk management is critical for credible market discipline, which is the preferred approach in managing and enhancing the OTD model. With respect to investors, such as pension funds, a better understanding of hedge fund strategies and risk appetite would enable investors to choose asset managers whose incentives are more aligned with their own. If investors better understand what is being offered and choose less risky options, they can influence the general direction of the industry. Investors should also question fee structures that fail to align the interests of hedge fund managers with their interests.

Additionally, given the complex nature of SF products, authorities need to ensure that regulated entities are accurately pricing products and comprehending risks in their portfolios. Authorities must discourage regulated entities from relying exclusively on external ratings and promote their use of mark-to-market pricing where reliable and, if needed, the disciplined use of mark-to-model pricing. Regulators should encourage the involvement of accounting firms in verifying these valuations and models, as they work with company management on financial statements. Regulators can assist by adopting risk-based capital requirements, such as Basel II and Solvency II.

Originators' potential incentives to shirk in monitoring the performance of underlying assets could be reduced by requiring them to hold a share of the risks that they shed. Originators already hold the 'equity tranche' in many cases and also hold direct exposures (through loans) and indirect exposures (through guarantees and lines of credit). Capital requirements for exposure to institutions holding these risks should be evaluated and potentially revised to take into account that risk might be understated.

Credit risk transfer issues require more focus. Transactions that do not definitively transfer risk should not be treated as if they do. The recent experience with assets and liabilities of off-balance sheet entities (SIVs and conduits) returning to bank balance sheets by virtue of liquidity backstops and other contingent com-

mitments exemplifies this problem and represents a significant liability that was not fully disclosed and understood.

More generally, the right approach is not to try to reverse the move to the OTD model, but rather to make it work properly by pushing the system even more towards a well-behaved market-based model. The most promising path to international financial stability is through ongoing, incremental improvements in financial instruments, institutions and markets. The path to stability is a slippery one. Measures that enhance stability tend also to reduce risk premiums, which encourages investors to assume more risk. History indicates that we cannot revoke the business and credit cycles or eliminate manias and panics. Policy-makers and regulators can, however, work to prolong periods of international financial stability while making the inevitable periods of instability as brief and painless as possible.

Discussion and Roundtables

Session 1: Financial Volatility and Its Causes

Ugo Panizza, UNCTAD

Ugo Panizza noted that bond and equity market volatility in the G7 plus Australia in 2004–5 was lower than during the period from 1970–2005, but actually higher than the 60- and 150-year trend. He questioned if the four main explanations used to justify the recent decrease in volatility could help explain long-term trends.

Panizza highlighted four causes of the recent decline in volatility. First, real factors such as improvements in firm balance sheets, high profitability, and the great moderation have fit the long-term trend of moderating volatility. Second, both real and financial volatility in the 1970s were exceptionally high and have fallen recently, with declining financial volatility lagging behind real volatility. The report does a very good job explaining why this lag occurred. Third, financial factors such as innovation, integration, institutional investors and liquidity have also played an important role; the increase in liquidity is consistent with the increase in risk exposure that comes with financial innovation and might be especially important for explaining the decline in volatility since the 1970s. Panizza also argued that hedge funds seem to contribute to lower volatility by completing markets for risk. If one considered low volatility a public good, then the social return on hedge funds might be even higher than the private return. Finally, the practice of monetary policy has improved significantly since the 1970s. The question, here, is why improvements in monetary policy took so long to decrease real volatility.

Panizza then noted that low volatility has led to historically low spreads on emerging market debt. In 2006, predicted spreads on EM debt were 200 bps higher than actual spreads. Speaking in May 2007, he argued that structural changes such as improved risk management, increased risk tolerance, and improvements in investment management may be responsible for this decline, but financial markets might be mispricing risk and that spreads may suddenly jump.

Panizza wondered if the greater willingness to take risk was the principal cause of lower volatility. He also emphasized that in the long-run volatility is likely to remain low, but that there would certainly be spikes along the way. These spikes are particularly risky for some asset classes. Emerging markets would be especially hurt by a flight to quality if volatility increased. He quoted his own finding that EM spreads increase by 100 bps in the VIX index returns to levels of the 1990s. The future, according to Panizza, is not what is used to be.

Jean Imbs, *Université de Lausanne and CEPR*

Jean Imbs thought that things are not as rosy as they appear even if the provides overwhelming evidence that real and financial volatility has decreased recently. His intention was to provide a simple intuitive theory that could reconcile some contradictions between the findings of the Geneva Report and the academic literature.

Exploring the link between financial and real volatility, Imbs observed that the financial deepening of the last twenty years had resulted in the lifting of financial constraints for many firms. This implies that the economy is converging to a first best outcome where production only fluctuates with real shocks. The resulting elimination of the financial accelerator is consistent with the great moderation of inflation and the business cycle. The other side of the coin is more intensive use of finance by firms. This means that the deepening of financial markets should lead to lower macroeconomic volatility but greater volatility at the microeconomic level. US data support both arguments.

Although these observations do not fit well with the conclusions of the Geneva Report, the two are not necessarily contradictory. While the report stresses that volatility has fallen across various aggregates, which is consistent with a fall in the magnitude of aggregate shocks, it is silent about real or financial volatility at the firm level.

Imbs hypothesized that shocks may have shifted from the aggregate to the firm level. This implies that there are two countervailing influences on financial stability. Referring to the variance decomposition, he noted some evidence that the covariance term (i.e., common shocks) had decreased while there was little evidence that the individual variance term (i.e., individual shocks) had also fallen. Recent studies show that volatility at the firm level has decreased for publicly traded firms but has increased for firms with financial constraints. This implies that the net effect of the variance term is ambiguous. Imbs also pointed out that the volatility of the use of leverage and of profitability of firms might have increased in recent years. Given the probable increase in firm level volatility, there would need to be a large decrease in macro shocks to observe a net decrease in financial volatility. This may be an explanation for why the great moderation in macroeconomic volatility that has occurred in the past two decades took so long to translate into lower financial volatility.

He concluded by arguing that there is a good reason why real and financial volatility have different trends, which implies that there are not obvious contradictions between his idea and the Geneva report. Imbs also warned that low macroeconomic volatility could also turn around quickly.

Angel Ubide, *Director of Global Economics, Tudor Investment Corporation*

As a participant in financial markets rather than a central banker, Angel Ubide sought to challenge the view that high levels of monetary liquidity is the principal factor causing low yields. In his view, portfolio shocks lead to the exogenous creation of liquidity.

Ubide stated that there are two ways of looking at liquidity. Traditionally, liquidity is defined in monetary terms and is created by central banks, so it is a function of the interest rate set by the central bank. Alternatively, liquidity exists in the form of derivative securities and is a function of risk and portfolio trends. The

creation of liquidity through derivatives is independent of monetary policy and depends on the risk preferences of the market at a given point in time. He reckoned that derivatives were currently a more important source of liquidity than monetary policy, and probably accounted for about 90% of the creation of new liquidity.

Derivatives create liquidity by opening up new markets where participants have been previously waiting to take positions. The emergence of these markets is usually characterized by an excess demand for the new security, which leads to lower lending standards. They also provide an avenue for increased activity in the real economy.

The excess demand in derivatives markets has many sources. First, institutional investors such as private pension funds and sovereign wealth funds want access to high yield assets and drive up prices in many markets, such as commodities. Second, changes in pension fund regulation in some countries have led to a decline in long-term yields. Third, hedge funds tend to use higher multipliers when lending.

However, Ubide stressed that these developments may represent a permanent improvement in the functioning of financial markets. He noted that lower transaction costs, improved monetary policy frameworks, the 'buy the dip' mentality of market participants, and better risk management have all contributed to a decline in spreads. Market participants are now able to take larger positions without necessarily increasing their risk.

Ubide then turned to the carry trade, remarking that economic theory suggests that betting against the carry trade could deliver higher returns. However, market participants rarely do so because of Value at Risk measures and mark to market accounting, which put a premium on smooth returns. In addition, monetary policy has contributed to the carry trade. The increased focus on forward-looking information, asymmetric responses to deflation by central banks, and the enlargement of the euro area all promote the carry trade. In a way, the existence of the carry trade is an indication that these policies are working.

Concluding, Ubide stated that portfolio shocks are likely to lead to persistently low volatility and there is likely little that monetary authorities can do about it. But, he cautioned that new markets might not be able to assess risk on their own. Excess demand will inherently lead to excessive exuberance. He also opined that the existence of household borrowing in foreign currency is the major reason that policy makers should care about the carry trade. These developments signal the need to stress test portfolios at higher volatility levels than is currently done and increase the emphasis on counterparty monitoring.

Hung Tran, Deputy Director, Monetary and Capital Markets, IMF

Hung Tran first noted that the report is in line with the IMF's *Global Financial Stability Reports* of the last five years. He then argued that the report did not differentiate between two concepts, financial stability and resilience. By stability, the report means the capacity of the financial system to withstand shocks without impairing economic activity. Tran argued that this corresponds to resilience. The distinction is important for policy recommendations.

Structural improvements and a sustained benign environment have strengthened systemically important institutions. Today corporations and financial sector

institutions are more profitable, better capitalized and better manage risk – therefore financial systems are more resilient to shocks. He emphasized that regardless of whether the current benign state of financial stability structural is permanent or temporary, financial markets, payments systems, regulation, and infrastructure need to be improved now so as to make them better able to cope with future shocks. Like other discussants, Tran agreed that the system is likely to be stable most of the time, but global shocks might be more severe than in the past because of the potential for spillovers. He would have liked the report to fully explain why the probability of extreme events has risen.

Tran also argued that new instruments such as credit derivatives and structured credit products could both amplify and dampen volatility. They can dampen volatility in good times by smoothing the credit cycle and making risk assessment more transparent and timely. However, these instruments are likely to amplify volatility in times of stress. This makes it very important to know the composition, diversity, behaviour and positions of market participants to analyze how they will react in times of stress. Furthermore, he noted that while the volatility of individual countries and asset classes has declined, there seems to be an increase in correlation among asset classes and countries over time. This implies that the volatility of a globally diversified portfolio has increased, and with it correlation risk for investors. This is especially important in times of crisis, when correlations tend to move to extremes.

Tran concluded by asking to what extent these developments contribute to complacency and moral hazard. Although it is impossible to second-guess markets, the mispricing of risk that can result from complacency can only be recognized ex post. He cited the recent subprime mortgage collapse in the United States as a prime example, and hypothesized that the leveraged loan market could also suffer from mispricing. Finally, he cautioned that securitization might be a source of moral hazard, as financial institutions no longer have to hold the debt they originate. This may induce banks to originate more and weaker credit than they would choose to hold on their books.

General Discussion: What Has Changed Over the Last Decade?

Fabio Panetta, Banca d'Italia

Fabio Panetta thanked the discussants for their careful reading of the report. In response to comments by Panizza, Panetta commented that the report finds that the key feature in today's financial markets is that volatility is simultaneously low across geographical markets and asset classes, although in general volatility is not exceptionally low in individual markets (with money markets being an exception). This need not be a permanent feature of financial markets: volatility could increase rapidly in response to shocks (e.g., a deterioration of credit risk) or as a result of a general deterioration in economic conditions. He also argued that monetary policy does matter when combined with new financial instruments. The mixture of low policy interest rates and financial innovation contribute to low volatility. The incentives that prevail in financial markets are a key issue for policy-makers.

Panetta was unsure whether central banks are too transparent, as suggested by Ubide. He warned against trying to attach a weight to the potential determinants

of the decrease in volatility. If volatility is driven down by conjectural factors, then once the growth or inflation outlook deteriorates, volatility could increase even if conditions in financial markets remain unchanged.

Pierre Duguay, Bank of Canada

Pierre Duguay observed that the Geneva Report makes little mention of the steps that have been taken to risk-proof the financial system, such as new standards for bank supervision and clearing and settlement systems. He also noted that the report is silent on the growth of the private equity industry and the increase in leveraged investment associated with it.

He thought that the report could be a bit too negative on banking sector consolidation and overly sanguine about new credit-risk transfer instruments. Consolidation is presented as increasing operational risk and moral hazard for little gains in efficiency. One should ask whether consolidation was accompanied by a lowering of barriers to entry, increased diversity and contestability of products, and if not, what could be done to promote that. He noted that recent Bank of Canada research showed evidence that increasing returns do exist in the Canadian banking sector, which is highly concentrated compared to the United States. He also emphasized that new instruments change the way the financial system functions and the nature of systemic risks by moving risk from financial institutions with fixed liabilities to financial markets, where risk is priced continuously. The complexity and opacity of CRT instruments has introduced new operational risks, heightened principal-agent problems, and made modelling and managing these risks increasingly difficult.

Moving on to household finance, Duguay opined that the greatest risk on the household side is from a shift from defined benefit to defined contribution pension plans. These new schemes may require an increase in savings to fund an adequate retirement because the new plans (with their shorter horizon) cannot generate the yields that defined benefit plans can. Increased savings, in turn, would put further downward pressure on yields, thus aggravating the situation.

Finally, Duguay observed that global imbalances are a market solution to the world distribution of savings and investment and that the main risk to financial stability comes from a real shock that would change this inherently unsustainable global distribution of savings and investment. He outlined two potential risks that could result in a discontinuation of the current situation. First, American consumers could increase savings without a concomitant decrease of savings by Asian consumers. This would be a deflationary shock that could be exacerbated by rising protectionist sentiment and increases in credit risk premia. Alternatively, Asian domestic demand could increase without an increase in US savings. This would be an inflationary shock that would push up interest rates, increase volatility, and end the great moderation.

Luigi Buttiglione, Head of G-10 Economics, Fortress Investment Group

According to Buttiglione, the drivers of liquidity growth have been both high powered money created by central banks and higher liquidity multipliers determined in financial markets. This led him to wonder about the policy implications of endogenously created liquidity. Given that high powered money creation accounts for only a small portion of the creation of total liquidity, does this mean

a reduction of money supply by central banks would be irrelevant to curb world liquidity growth?

Mark Carney, *Ministry of Finance, Canada*

Mark Carney highlighted three areas of change and their implications for global financial stability. First, he noted that capital cushions at major institutions have increased substantially. Second, securitization might have made credit markets more fragile than they appear. Securitization offers the possibility to diversify credit risk, but this depends on the depth of the market for the BBB or equity tranche. He observed that the sponsor originator is less likely today to hold this tranche, which introduces moral hazard. Furthermore, the sub-prime mortgage collapse in the United States showed that the market can disappear for very risky tranches in time of stress, which can lead to gapping. Third, narrowing spreads have increased the power of private equity. Private equity is vulnerable to a reversal of credit conditions, which makes it essential to stress test portfolios at higher multiples. He cautioned that gapping in credit markets could threaten the viability of current private equity activity.

In response to Jean Imbs, he noted that spread compression is the other side of greater access to and use of financial markets. He cautioned that people may be overpaying because of a structural change that is not as sustainable as it appears.

Jean-Pierre Danthine, *HEC Lausanne and Swiss Finance Institute*

Jean-Pierre Danthine emphasised that it is completely consistent to have falling volatility in terms of prices and returns and increased volatility in terms of levels. This would be the case if the supply curve for assets had become flatter than previously, a change that is also consistent with increased substitutability of assets. He asked why pension claims are not traded on financial markets. This would complete pension markets and relieve the pressure to move from defined benefits to defined contributions pension schemes.

Märten Ross, *Deputy Governor, Bank of Estonia*

Märten Ross wondered if the report was too pessimistic on the effect of banking sector consolidation on financial stability. He admitted that there may be a threshold beyond which consolidation can create serious issues for financial stability on global scale. However regional and national banking consolidation may actually decrease financial instability.

Ignazio Visco, *Deputy Director General, Banca d'Italia*

Ignazio Visco wanted more focus on the risks to the global financial system and on three recent important changes: (1) the new economy, (2) the emergence of new players in the world economy, and (3) population ageing. He argued that low volatility is the flip side of the flat yield curve, both of which are hard to reconcile with the new economy. The second and third changes may have led to high investment in fixed income and a reduction of interest rates. He wondered if the impact of these three changes would be transitory, and if interest rates would increase once their impact was completely absorbed.

Visco thought that it was necessary to do stress tests on increased volatility. But, he questioned what policy changes could be undertaken if stress tests show that

there is substantial risk of financial instability. There is not much that can be done on the regulatory side, which could leave the central banks with the need to react *ex post*.

Avinash Persaud, *Chairman, Intelligence Capital*

Avinash Persaud questioned the view that volatility is a bad thing. He stated that many aspects of volatility are bad, but that volatility is good when it is caused by markets reacting to new information. He also wondered whether low volatility is structural or cyclical. He doubted that lower volatility was a structural phenomenon related to better risk management and regulation, which has been going on for a long while. Instead, increasing risk appetite seemed to be a more parsimonious explanation. Finally, Persaud observed that market participants focus excessively on new instruments and that people today are no more innovative than in the past. Behaviour, not innovation, is the key issue of concern. Market participants have greater ability to price risk, but not to hold risk. He also warned that current risk management strategies could be summarized as selling risk to someone else before times turn bad.

Hermann Remsperger, *Member of the Executive Board, Deutsche Bundesbank*

Hermann Remsperger doubted that it was possible to equate lower volatility with lower risks to financial stability. He asked whether innovation in financial instruments went hand in hand with transformation of a bank-based financial system to a market-based system, and whether this process led to an increase or a decrease in financial stability. He also noted that transparent monetary policy clearly explains the flattened yield curve and the low level of long-term interest rates. Furthermore, emerging markets' increasing ability to support domestic currency bond markets could contribute to decreased volatility, as could improvements in the financial infrastructure.

Carlo Monticelli, *Senior Director, International Financial Relations, Ministry of Economy and Finance, Italy*

Carlo Monticelli commented on the implication of decreased volatility on tail risk, i.e. of very low in probability events with disastrous consequences. He noted that the world is fraught with tail risks that cannot be diversified or insured against. However, there also exist tail risks that are important for the financial system and can be addressed *ex ante* by setting aside adequate reserves. For example, large, swift movements in asset prices can sizeably change the correlation structure between assets thereby invalidating previous diversification strategies. These changes are especially difficult to deal with since market participants and policy makers do not know the shape of the distribution in the tails. As a result, it is not possible to define precisely a strategy to insure against the occurrence of these events. Furthermore, stress tests might not capture relevant information about these sorts of risks, nor provide reliable estimates of the reserves needed to ensure resilience under extreme (but unlikely) circumstances. Given these problems, financial institutions would need to set aside a large amount of capital to insure against tail risk. But, it remains an open question as to how much is enough to remain resilient to all sort of shocks – and at the same time whether is sensible to set aside large reserves for disastrous events that, most likely, will never occur.

John Murray, *Advisor to the Governor, Bank of Canada*

John Murray asked if the public did not have the right to expect from policy makers more definite views on issues such as international financial stability and wondered when policy makers might have enough evidence to take a position on this issue. He suggested breaking the discussion of international financial stability down into three separate issues. First, is the financial system headed for a fall? Second, would a fall matter? Third, could policy makers do anything about a fall?

Nigel Jenkinson, *Executive Director, Financial Stability, Bank of England*

Nigel Jenkinson challenged the view that credit risk is currently underpriced. Bank of England discussions with market participants had revealed that many participants believe that credit is underpriced, and did not provide adequate compensation for the risks taken. Yet, these same participants continue to underwrite new credit rather than withdrawing from the market. Market participants consider the strategic or business risk of refusing to issue new credit greater than the financial risk of credit mispricing. But that collective action was raising systemic risk.

Jenkinson also asked whether market participants are confident that their positions are liquid. The ability to dynamically hedge positions, as well as to unwind positions in the event of an adverse shock, depends on high levels of market liquidity. Recent episodes such as the down-grading of General Motors and Ford credit, as well as the sub-prime mortgage market collapse in the United States, has highlighted that market participants are exposed to risks of evaporation of liquidity. The divergence between the cash market and the credit derivatives market for US sub-prime mortgages was a case in point.

Jenkinson next noted that if credit risks are underestimated, then it should be profitable for long-term investors to take on the other side of the trade. This, however, is not occurring. The emphasis on short-term investment performance objectives based upon mark-to-market accounting is generally a beneficial development, but it lowers the incentive to take the other side of the trade. This unwillingness of investors to take long-term contrarian positions to provide effective arbitrage may constitute a form of market failure. An underpricing of credit risk could support a build up of excess debt and increase the vulnerability of the system to a rise in defaults.

The bottom line is that policy makers must encourage market participants to do more severe stress tests, especially in rapidly changing liquidity situations. He noted that firms tend to underestimate the impact and probability of severe events. The current failure to conduct these tests is a result of the short-term focus of many fund managers, who place an emphasis on diversifying their portfolios against higher-likelihood events that have a smaller global impact. On the whole, Jenkinson concluded that there have been many positive developments in the realm of international financial stability in the last ten years, but a number of disquieting trends and practices still rest below the surface.

Benoît Coeuré, *Chief Executive, Agence France Trésor*

Benoît Coeuré commented on risk transfer to households and its importance for policy makers. He noted that any event that has a severe impact on households would be more likely to trigger a change in laws and regulations than anything that happens to investment banks or other financial institutions. Furthermore, he

feared that mark-to-market accounting and more frequent reporting might decrease the ability of some market actors to hoard risks. This may have led to a system where risks are eventually transferred to agents who cannot or do not want to hold them, such as governments or households. Finally, Coeuré emphasized that policy makers need to explore the welfare consequences of these kinds of transfers. It is desirable, he argued, to explore the political economy of risk transfer to households, which may undermine the political acceptance of the financial system.

Hans Genberg, *Executive Director, Research, Hong Kong Monetary Authority*

Hans Genberg asked about the implications of low volatility on economic activity, and through what channel it might operate. The report concludes that volatility is pro-cyclical, and may be an exogenous variable. As economic activity is ultimately what policy makers are interested in, it is important to know how this exogenous variable would affect economic outcomes. He also asked if the issue of real concern is volatility or spillovers or tail risk among banks. The international dimension of spillovers needs to be explored. Tail risks can spread across countries as well as banks, and can have severe implications for emerging market countries, which are the most vulnerable members of the international financial system.

Adrian Van Rixtel, *Senior Economist, Banco de España*

Adrian Van Rixtel stated that it was not clear that banking sector consolidation leads to a decrease in competition. He cited the example of Japan, which has seen much consolidation in recent years and where competitive conditions in the banking market have improved substantially.

Edwin Truman, *Senior Fellow, Peterson Institute for International Economics*

Edwin Truman noted that the decrease in macroeconomic volatility and increase in microeconomic volatility, commented upon by Imbs, is important if policy makers and market actors take a short-term perspective. However, the increase in microeconomic volatility could be positive in a market with high entry and exit costs.

Bernhard Winkler, *Senior Adviser, Monetary Policy Stance Division, ECB*

Bernhard Winkler considered the role that money and credit has played in recent years. He referred to Mervyn King's comments that interest rates may have been too low for too long. Central banks should begin looking at money in the context of the build-up of financial risks. Some small country inflation-targeting central banks seemed to go further by looking at asset prices directly in addition to the CPI in monetary policy decision-making. In particular, he argued that central banks should look more closely at money, not less. The ECB's attention to the monetary pillar helps to prevent the lowering interest rates too much and to raise interest rates earlier than otherwise might have been done. He asked Mr. Ferguson if – with the benefit of hindsight – the US housing market bubble and the related risks would make him consider looking more closely at monetary and credit data.

Stefan Gerlach, *Head of Secretariat, CGFS, Bank for International Settlements*

Gerlach cautioned against overemphasizing asset price volatility as a source of risk

to the global financial system. For instance, hedge funds that had run into problems had in many cases done so without a previous increase in volatility. Volatility is thus not the only risk that policy makers must focus on.

Jacques Delpla, *Senior Advisor, Fixed Income, BNP Paribas*

Jacques Delpla took the perspective of the trading floor, noting that market participants may have a problem with measuring risk. Banks are very good at selling products that optimize rating agency models, but that the buyers and sellers may not completely understand. He also pointed out that investment banks make money selling structured products, many of which front-load gains while the risk falls upon investors as they near maturity.

Pierre Duguay, *Deputy Governor, Financial Stability and Currency, Bank of Canada*

Pierre Duguay thought that the big question facing policy makers was whether low long-term interest rates are the result of liquidity generated by central banks or excess savings. He tended to favour the latter explanation. He also pointed out a paradox, the simultaneous occurrence of low interest rates with high returns on equities. He wondered whether the higher return on bank equity may not be a sign of increased risk taking. From a risk–return trade-off perspective, it is paradoxical that financial innovation, which has allowed banks to focus on fee-income generating activities, has resulted in higher returns from less volatile revenues.

Roger W. Ferguson, JR., *Swiss Re*

Roger Ferguson agreed that, with financial markets benefiting from a long period of benign occurrences, this has been a lucky time to be a policy maker. Responding to Winkler, he stated that monetary aggregates were not very helpful in the United States. He also asserted that central banks do not have the power to deflate asset price bubbles. Thus he would not revise the position of the Federal Reserve concerning the use of monetary data.

In response to Imbs, Ferguson said that policy makers must worry about microeconomic volatility and risk taking on a macroeconomic dimension. Policy makers should not be too anxious if individual households or businesses lose money, as it is the nature of capitalism for some companies and households to fail. They should only worry when individual problems become a macroeconomic concern. However, policy makers must educate the population that there will be volatility on the microeconomic level, and that policy will only become involved if microeconomic fluctuations become a macroeconomic problem.

Finally, Ferguson worried that market participants might be too optimistic about getting out of positions in time of crisis. He argued that it must be emphasized that markets can disappear in times of crisis, resulting in the gapping referred to by Carney. He also commented that the failure of markets to provide opportunities to make big contrarian bets on long-term positions that could lose money in the short term is proof that markets are not always complete.

Philipp Hartmann, *Head, Financial Research Division, ECB*

Philipp Hartmann stressed the importance of Murray's comments that many recent developments in financial markets have had benign effects, while many

issues under the surface must be looked at more carefully. He also agreed that the link between tail risk and financial stability is the more important issue of concern for policy makers. In response to Mr. Tran, he cited evidence that multivariate tail risk has increased among financial institutions on both sides of the Atlantic. Finally, he emphasized that market actors have created products to take advantage of both increased and decreased volatility environments. However, the writers of these instruments must have a dynamic hedging strategy in place to be on the opposite side of these trades.

Session 2: Major Developments and their Implications for Financial Stability

Karen Johnson, *Director, International Finance Division, Federal Reserve System*

Karen Johnson stated that her comments are her personal opinion and should not be interpreted as speaking on behalf of the Fed. She first argued that principal-agent issues are an important element in financial development and are likely to become even more important. She emphasized the need for good governance of Large Complex Financial Institutions (LCFIs), whose management has become increasingly removed from shareholders. She also stated that supervisors must understand the incentives created by structured financial instruments, whose originator and holder may have widely differing incentives. Considering supranational supervision, she cautioned market participants to avoid off-shore solutions, which are a loophole to supervision.

Looking at the impact of LCFIs on systemic risk, she noted that the effect of mega-banks on financial stability is ambiguous. Good risk management is crucial for the day-to-day operations of LCFIs and must be used at the highest levels of the organization. However, she warned that LCFIs might be powerful enough to impede regulatory action in small countries, which does not bode well for effective supervision.

Johnson took the view that supervision should focus on the process of risk management for the most complex institutions. Although it is impossible to ensure that risk management practices will keep up with financial sector innovation, this should not be used as justification to block innovation. It is impossible to be sure that officials are prepared for a large crisis and the cooperation that would be needed to address it; at least, they should think hard about the issues involved.

Moving on to the subject of household finance, Johnson challenged the assertion that the transition from defined benefit to defined contribution pension plans increases household risk exposure. She argued that defined contribution plans are not riskless for households, as they are structured in terms of nominal payments and, thus, provide imperfect protection against inflation. They also can tie workers to specific firms or industries, which makes labour markets less flexible. Finally, defined benefit plans rest on a guarantee of the union or firm sponsoring the programme, and ultimately, the tax payers of the specific country. On the other hand, defined contribution pension schemes are fully funded, which Johnson argued is especially important given demographic trends in industrialized countries.

Although household exposure to financial markets poses a potential problem, this is balanced by increased household net worth, she argued. She then asked whether lower household wealth would be preferable to households holding portfolios that include new financial market products or whether households would be helped by holding only low-risk, low-return assets. This led her to challenge the assertion that households might not be capable of managing risk efficiently. If accepted, this assertion eliminates the idea of consumer sovereignty, which is the basis for markets in the capitalist system. She argued that this is a very risky path for economist to take, but conceded that information is not distributed uniformly to all actors in markets. These information asymmetries create the need for financial education for households and individuals.

Commenting on the recent episode in the US sub-prime mortgage market, Johnson stated that mortgage markets present little risk to financial stability unless the problems are very widespread. She called for increased market discipline to prevent excessive risk taking. Moreover, she noted that more nonsense than sense has been written about the US current account deficit. She stated that quite a lot is known about the US net international investment position. The rate of return puzzle arises mostly from the difference in US FDI payments and receipts, which in turn stems from the age of investments, the types of industries invested in, and the capital structure of investment targets. Careful attention to detail in these data resolves much of the puzzle. Johnson was optimistic about US current account adjustment and noted that global imbalances are a market solution, not a result of policy. She concluded by stating that the policy response to demand shifts towards US goods in the event of a dollar depreciation might not be enough to maintain aggregate demand in the rest of the world.

Edwin Truman, Peterson Institute for International Economics

Edwin Truman worried that the report could fail to pass the 'Bundesbank Test': does it recognize the risk to global financial stability from a rise in global inflation, which might be appropriate since inflation has been picking up in a number of countries of late?

Dealing with the hedge funds issue, he put forth three major issues that should be addressed: consumer protection, market integrity or dynamics, and systemic stability. He noted that consumer protection and market integrity issues were neglected by the report, which focused only on the risk of hedge funds to global financial stability. However, he agreed that hedge funds are unlikely to be a source of systemic risk. He also expressed concern about hedge funds' incentives to locate off-shore, and made a case for additional systemic disclosure of information on gross liabilities or a set of risk metrics to either counterparties as a group, to regulators, or the general public. He noted that the lack of convergence of official views about hedge funds is worrisome and could potentially lead to problems in the future in the context of a systemic threat.

Dealing next with the emergence of China and India in the global financial system, and global imbalances, Truman thought a financial crisis in these countries would remain within their borders, with no systemic consequences. He also expressed the need to China to be more transparent about the management of its official reserve holdings. China currently fails to recognize the risk of financial protectionism linked to where and how it invests its reserves and other official

cross-border assets.

He also stated his dissatisfaction with the idea that the threats to the financial system from a depreciation of the US dollar are the result of changing expectations about its potential course, even though it is important to flag the risk of protectionism in this regard. He cautioned that a reversal of global imbalances, which are not limited to the United States, will have an economic and financial impact on the rest of the world, and that it would be wrong to assume that they can be immaculately eliminated by actions by the United States alone. He concluded by noting that it is incorrect to say that the majority of foreign inflows to the United States in recent years are from official sources; the recorded figure is about 20% and an upper-end estimate is no more than one-third.

Charles Goodhart, *London School of Economics*

Charles Goodhart called for a clearer specification of the risks and threats to financial stability. He agreed that the financial system today may be more resilient to small and medium shocks, but more vulnerable to a total collapse in the face of large shocks. While policy makers today live in a golden age of low inflation and steady growth, he warned that there have been other 'golden ages' that have collapsed as a result of subsequent financial crises, the United States in the 1920s, for example, and Japan in the 1980s. What distinguishes today from these previous episodes is the near certainty that any shock will have cross-border consequences.

The likelihood of international ramifications raises a whole series of regulatory issues that have not been adequately addressed yet; an oversight which Goodhart characterized as 'sleepwalking to Armageddon' on the part of policy-makers. He emphasized that the report made no mention of the lack of progress on cross-border supervisory or regulatory issues, nor of the steps that have been taken to date, such as Basel II and IAS 39. In principle, these measures should both lead to an increase in good behaviour and better risk management by banks. He concluded on a pessimistic note, positing that the Geneva Report's failure to discuss regulatory progress might be because there is nothing good to be said on the issue.

Claudio Borio, *Head of Research and Policy Analysis, Monetary and Economic Department, Bank for International Settlements*

Claudio Borio highlighted three major changes in the financial landscape: increased complexity, financial sector consolidation, and increased cross-border activity. Borio stressed that the evaporation of market liquidity, and its interaction with counterparty risk and funding liquidity, was likely to be more important than in the past; that new players were more likely to be at the origin of specific episodes of distress or act as amplifying mechanisms (e.g., hedge funds); and that the international ramifications of distress would be harder to contain.

Borio argued that despite the major changes in the financial system that had taken place, some fundamental factors had not changed. And it was precisely the factors that had not changed that held the key to the dynamics of financial instability, and hence to appropriate policy responses. Among the factors that had not changed, Borio highlighted three. First, enduring limitations in risk perceptions meant that it was much harder to measure the time dimension than the cross-sectional dimension of risk, especially how risk for the financial system as a whole

evolved over time. This was one reason why market indicators of risk (e.g., risk premia) tended to be comparatively low precisely before the peak of the financial cycle, when, in retrospect at least, it turned out that risk had been highest. Second, actions that were individually rational did not necessarily result in desirable aggregate outcomes; notions such as herding, coordination failures, and prisoner's dilemmas were examples of the genre. In both cases – risk perceptions and incentives – short horizons played a key role, and these in turn could reflect contract terms aimed at addressing principal-agent issues that were endemic in finance. Finally, powerful positive feed-back mechanisms resulted in self-reinforcing processes within the financial system and between the financial system and the real economy. Examples included the processes linking the availability and terms on external financing, asset prices and output or those linking profitability, risk appetite, short-term volatility and market liquidity. From this perspective, the specificity of financial sector was that, in contrast to other sectors, there was a sense in which supply created its own demand, given the wide scope of finance and the mechanisms at work. In particular, easier terms on funding liquidity (lower interest rates, risk premia, etc.) ultimately generated additional demand for it.

Borio argued that these factors had important implications for financial distress. In particular, financial instability invariably reflected an overextension in risk-taking and balance sheets in good times, associated with the build-up of financial imbalances that at some point unwound, with potentially serious costs for the economy. This could be termed the potentially 'excessive pro-cyclicality' of the financial system.

Turning to the policy response, Borio noted that if the problem was one of overextension in good times, one obvious objective for policy was to find ways of keeping that overextension in check. By analogy with policy towards road safety, Borio noted that this was not just a matter of ensuring that the state of the roads was fine (e.g., filling in holes) and that there were sufficient buffers to limit the damage of any accidents that did occur (e.g., guard rails, car bumpers and safety belts), but also, and importantly, of ensuring that the speed was not excessive given the design of the system, the characteristics of the cars that travelled on it and traffic conditions.

In his view, policy initiatives had so far very effectively focused on improving the state of the roads (e.g., the financial infrastructure, such as the strengthening of payment and settlement systems) and in putting in place buffers (Basel II and similar efforts in the insurance sector). However, more thought could usefully be given to speed limits. Admittedly, from this perspective the very good work done to encourage improvements in risk management and disclosure was a step in the right direction, and could act as a brake. Even so, the effectiveness of these steps could fall short of expectations because of limitations in risk perceptions and incentives. For example, at worst, improvements in risk management could act more like a speedometer than a speed limit per se.

Borio acknowledged that designing effective speed limits was a very difficult task. An ideal speed limit would slow down the build-up of overextension/financial imbalances, by increasing the resistance to them as they developed (a kind of 'dragging anchor') and, by the same token, it would allow the speed to pick up faster following any strains that did materialise (by 'releasing the drag'). It would,

therefore, act as a stabiliser in both upward and downward phases.

Despite these difficulties, Borio did venture to put forward several general principles that might guide the design of such speed limits. First, built-in stabilisers were to be preferred to discretionary measures. Discretionary measures required the identification of the build-up of risk in real time, which was very difficult, and might be hard to implement owing to political economy pressures. Examples of built-in stabilisers included greater reliance on through-the-cycle or stress measures in the calibration of prudential regulatory tools (statistical provisions, conservative LTV ratios (coefficients and valuations), minimum capital requirements that used as inputs long-period averages or stress parameters, such as the downturn LGDs emphasised by Basel II), and encouraging similar practices among market participants (through-the-cycle margining practices to address counterparty risk). Second, built-in stabilizers could be complemented occasionally by discretionary measures, by tightening the regulatory requirements or the intensity of the supervisory review process if the authorities suspected that imbalances were building up. Borio noted that prudential authorities in several countries had been increasingly resorting to such steps in recent years. A prerequisite for effective adjustments was to strengthen the authorities' ability to measure system-wide risk in real time, including through quantitative tools such as macro-stress tests and early warning systems. Third, prudential authorities should closely coordinate such efforts with other authorities. Borio elaborated on the need to coordinate steps with accounting and tax authorities and stressed, in particular, the importance of coordination with monetary authorities. The availability of, and terms on, funding liquidity were key in influencing the 'speed' of the system. Funding liquidity was partly endogenous, and that part naturally behaved pro-cyclically. But central banks retained the ultimate influence on it, through their setting of monetary policy.

Borio concluded by re-emphasizing that a lot had changed in the financial system. But what had not changed was as, if not more, important. Likewise, a lot had been done to strengthen the financial system. At the same time, he harboured a certain sense of incompleteness about current policy initiatives. While policy had devoted a lot of attention to improving the state of the roads and to introducing buffers, it has devoted less to putting in place speed limits.

General Discussion

Richard Portes, *London Business School*

Richard Portes thanked the discussants for their very helpful suggestions and responded to the call by Truman for increased disclosure of information by hedge funds. He wondered if increased disclosure would pass the 'so what' test. That is, even if supervisors and regulators knew more about hedge funds' risk profiles, would it help to avert undesired outcomes? He noted this information may be of little use because it would be inherently short-term information that would be useful only immediately after it was obtained.

He responded to Imbs's comments by questioning how increased microeconomic volatility could affect global financial stability, the focus of the report. Volatility at the firm level is of little interest to policy makers in the international arena unless it might affect global economic conditions.

Angel Ubide, *Tudor Investment Corporation*

Angel Ubide asked why global imbalances have been sustained for the past several years even when many economists agree that they are unsustainable. Estimates of the size of a dollar depreciation fail to consider the implications of the rest of the world reaction to the dollar's fall, as well as the fact that all currencies are not freely floating. He asked whether markets, rather than banks, had become too big to fail because of their ascending importance in the global financial system. This situation would complicate policy making, as it would be far more difficult for central bankers and other officials to determine who to bail out in the case of crisis.

Hung Tran, *IMF*

Hung Tran noted that the major problem today in many countries is the deteriorating quality of credit originated in domestic markets. He questioned if policy makers should not do anything about so-called Ninja loans, which are extended to borrowers with no verification of income, job or assets.

Satoshi Kawazoe, *Deputy Director General, Financial Markets Department, Bank of Japan*

Satoshi Kawazoe observed that there exist two different types of mispricing of risk. First, there is real mispricing, which results from the fact that actors cannot see the true distribution of returns on any security. This type of mispricing can be addressed to some extent by capital cushions and diversification, but there will always be some degree of mispricing on financial markets. The second mispricing can result from complacency about risk, which occurs when people forget about important practices or assumptions as a result of incentives. He noted that policy needs to focus on incentive structures in financial markets so as to prevent mispricing resulting from complacency.

Ulrich Kohli, *Chief Economist and Alternate Member of Governing Board, Swiss National Bank*

Ulrich Kohli indicated that he was not very concerned about global imbalances, likening them to intertemporal trade between 'consenting adults.' However, he wondered if the US current account deficit might not be underestimated as a result of overestimates of the United States' net income from abroad.

Jean-Pierre Landau, *Banque de France*

According to Jean-Pierre Landau, the financial system is evolving towards increased securitization, with market dynamics increasingly taking place outside of bank balance sheets. This is problematic, as supervisory and regulatory systems are designed for a bank-centric financial system. He noted that supervisors do not currently have the means to solve problems that occur outside of bank balance sheets and asked what kind of regulatory infrastructure would be needed to deal with these kinds of problems. Given these challenges, he concluded that supervisors must think hard about what kinds of information would be needed to manage this new system.

Hendrik Jan Brouwer, *Executive Director, De Nederlandsche Bank*

Hendrik Jan Brouwer agreed with the need for speed limits and increased risk management, but wondered if either of these would be powerful enough to convince the management of LCFIs to take less risk.

David Laster, *Senior Economist, Swiss Re*

David Laster responded to Brouwer by noting that the position of chief risk officer has evolved tremendously in the past two decades and is a C-suite officer in many institutions.

John Murray, *Bank of Canada*

Responding to Ubide, John Murray noted that the problem of where to inject liquidity might be far simpler than previously thought. In the event of a crisis, he noted that it may be sufficient for central banks to inject liquidity into the affected market and let the market mechanism sort out who gets it. Effectively, the central bank would bail out the market, not any specific actor in that market.

José Antonio Ocampo, *Under Secretary-General for Economic and Social Affairs, UN Economic and Social Council*

José Antonio Ocampo brought up the issue of the effects of financial market development on emerging markets. He noted that financial deepening has had different effects on different agents, both within and among nations. Industrialized nations have benefited, while many EMs have not.

The pro-cyclicality seen today in industrial countries credit markets is similar to the experience of EMs over the last 30 years. Many nations (and agents within countries) experience easy access to finance in good times, which dries up when the economy slows. However, many emerging countries have learned from previous experience, and are saving more than during previous capital account and commodity booms. This has also been reflected, in particular, in the demand for self-insurance against a sudden stop, as witnessed by the massive build-up of reserves by many countries.

Ocampo noted that these two issues – reserve accumulation and increased savings – are too often ignored. While these actions are rational from an individual country's point of view, they are not necessarily optimal for the world as a whole, as these processes may be contributing to the build-up of the massive liquidity that has characterized world finance in recent years, as well as to global imbalances. Policy makers must think hard to determine what to do to manage these processes.

Avinash Persaud, *Intelligence Capital*

Avinash Persaud was concerned by an excessive focus on the well-known banking industry's notion that the spreading of risk is always better. This calls for deepening our understanding of the macroeconomic implications of microeconomic volatility. In particular, two important micro-macro issues should be focused upon: first, whether the risk we are observing is systemic. A way of defining systemic and non-systemic risk would be necessary and useful. Second, whether risk is being spread to agents who are better able, or more willing to hold it or not, which is the supposed benefit of more complete markets. He noted that one of the

unintended consequences of the move from defined benefit to defined contribution pension plans is that risk is being spread to those least able to manage it.

Märten Ross, *Deputy Governor, Bank of Estonia*

Returning to the view that the fact that households are taking risks that they do not understand is the major threat to financial stability, Märten Ross wondered why we are so pessimistic about households when they are expected to make many other even more difficult decisions in their private life every day. Furthermore, if this message is sent to policy makers, then it is incumbent upon them to be serious about making changes to existing regulation. He suggested that this is not a message to be thrown around lightly.

Charles Wyplosz, *HEI and ICMB*

Charles Wyplosz argued that it must be made clear why central banks may have to be the lender of last resort, as it is not necessary to bail out financial markets just because they are risky. The case is more obvious for banks: since they are the heart of the payment system, any crisis in the banking sector could have much larger economic costs than a stock market collapse. He also commented that risk transfer to households has important distributional issues. Previously, tax payers bore the burden of central banks fulfilling their lender of last resort function. Today, investors bear the risk in the event of a market collapse. Wyplosz questioned if this may not actually be an improvement over the previous system.

Bernhard Winkler, *ECB*

Bernhard Winkler commented that European financial account data shows that investment choices by households have been rather conservative over recent years, with the share of equity and mutual fund investments remaining limited compared to deposits, debt securities, and insurance and pension fund products. This was in contrast with the United States and the UK. However, households may have taken on extra risk connected to rising house prices. He also noted that some of the debt security instruments may be more risky than households think, in particular with respect to asset-backed securities and financial derivatives in the portfolios of households and institutional investors. In any case, Winkler concluded that it is necessary for the authors of the report to distinguish more clearly between different kinds of risky assets.

Philipp Hartmann, *ECB*

Philipp Hartmann wanted to keep a clear focus on systemic risk, not on distributional issues. This requires a better understanding of how the household sector would react to a crisis or liquidity crunch. In addition, he noted that the move of risk away from the banking system creates difficulties for regulators, since the securities and insurance regulators tend to be less sophisticated than central banks. Responding to Johnson's comments, he noted that several recent studies have shown that households are not completely able to manage risk effectively. He argued that this finding is not incompatible with the belief in markets. Finally, he wondered how regulators might coordinate to get the incentives for excessive risk taking out of the financial system.

Jean-Jacques Rey, *Honorary Executive Director, National Bank of Belgium*

Speaking on global imbalances, Jean-Jacques Rey noted that the gold standard was recognized unsustainable eight years before it collapsed. Thus, he concluded, global imbalances could stick around for a long time before any correction occurs. He also stressed that any adjustment of global imbalances will likely mean a large appreciation of currencies other than the dollar, such as the euro. He hoped that this adjustment would occur in the midst of a strongly growing Euro area economy.

Derek Queisser, *Partner, Queisser & Cie.*

Derek Queisser thought that private equity is a source of productivity increases at the operational level and could decrease default risk among private equity-owned companies. Lower default risk would, in turn, change investors' portfolio allocation decisions, especially concerning debt versus equity.

Nigel Jenkinson, *Bank of England*

Nigel Jenkinson commented that it is too early to begin discussing the demise of the banking system, as LCFIs remain crucial to the financial system. He noted that the balance sheets of the world's 16 largest international banks (sometimes referred to as Large Complex Financial Institutions) have grown from 10 trillion dollars in assets in 2000 to 22 trillion in 2006, underpinned by strong growth in trading assets. Given this growth, the response of public authorities to a crisis in one of these mega-banks with a global footprint is a major issue.

Hendrik Jan Brouwer, *De Nederlandsche Bank*

Hendrik Jan Brouwer concluded the conference by remarking central bankers pay substantially more attention to financial stability issues. He wondered aloud whether central bankers may have nothing else to worry about, since monetary policy seems to be no major problem anymore. Alternatively, he suggested, central bankers recognize that externalities are being created by financial markets and they need to be addressed. He offered to summarize the concerns expressed during the conference with the view that the devil is in the detail.

Endnotes

- 1 The share in total production gives a similar picture.
- 2 See Hartmann et al. (2005).
- 3 There is a range of market-oriented views: 'Some argue that financial instability occurs when imperfections or externalities in the financial system are substantial enough to create significant risks for real aggregate economic performance. Others argue that financial stability is potentially absent, or that financial instability is on the horizon, when they perceive that some important set of financial asset prices seem to have diverged sharply from fundamentals. Finally, many observers have used the term 'financial instability' to describe their perception that market functioning seems to have been significantly distorted or impaired.' (Ferguson, 2006). Wyplosz (1999) discusses public good aspects of international financial stability.
- 4 See, for example, the account below of Kindleberger's (1978) vision of the dynamics of financial crises (or Schinasi, 2004).
- 5 E.g., Group of Ten (2001).
- 6 See De Bandt and Hartmann (2000).
- 7 Gorton (1988) and Demirgüç-Kunt and Detragiache (1998) have estimated the importance of aggregate shocks for banking crises in various historical episodes. Hellwig (1994) argues that banks are vulnerable to macroeconomic shocks because these shocks affect the value of bank assets far more than the value of bank liabilities.
- 8 See Allen and Gale (2000) or Kyle and Xiong (2001).
- 9 E.g., Flannery (1996) or Kodres and Prittsker (2002).
- 10 See Smith (1991) or Temzelides (1997).
- 11 See Merton (1976), Guttentag and Herring (1984), Hellwig (1994).
- 12 See Clarke (2007), Anspachs et al. (2007), IMF (2007).
- 13 Cited by Allen and Gale (2004).
- 14 See for example Bernanke (1983) or Dell'Arriccia et al. (2004).
- 15 Caprio and Klingebiel (1996) and Hoggarth, Reis and Saporta (2001), for example, have provided estimates of the adverse real effects of financial crises.
- 16 Perhaps the most readable, succinct version is in Minsky (1992).
- 17 The *ex ante* cost of some far-reaching measures to prevent crises may be unacceptably high. For example, extensive capital controls could limit contagion, 'sudden stop' capital flow reversals, etc.; prohibition of financial institution consolidation could avoid the creation of institutions that are too big to control risks effectively or indeed 'too big to fail' (and hence a source of moral hazard). But in either case, the efficiency, investment and growth losses could be substantial.
- 18 Shin (2005) and Acharya and Schaefer (2006) have pointed out the difficulty of defining liquidity and the lack of consensus about the different notions of liquidity used in the literature.
- 19 See Rajan (2005).
- 20 See Loretan and English (2000), Forbes and Rigobon (2002).
- 21 See for example de Fontnouvelle et al. (2006) for an analysis in the relatively new field of operational risk.

- 22 More precisely, it is the square root of the average squared deviation of returns from its mean.
- 23 Standard statistical analyses are performed under the assumption that financial returns follow a lognormal distribution.
- 24 Of course, some of the reserve accumulation of the past several years is deliberate 'precautionary saving', motivated in particular by the intention to avoid any repetition of the Asian crisis of 1997-98. This has been widely discussed (e.g., Aizenmann and Lee, 2007; Jeanne, 2007; Rodrik, 2006; Wyplosz, 2007). We are concerned only with the effects on international liquidity and on domestic financial stability of systemically important countries.
- 25 See for example IMF Global Financial Stability Reports (2005, 2007) and World Economic Outlook, BIS Annual Reports (2006, 2007), ECB (2006, 2007), and the Bank of England (2007) *Financial Stability Report*
- 26 See Rajan (2007) on the global effects of Japanese monetary policy.
- 27 See Plantin and Shin, 2006, for an analysis of the speculative dynamics of the carry trade.
- 28 Acharya and Schaefer (2006) specify the causes of a sudden drop in liquidity: an increase in the default risk of institutions, a fall in the market-value of collateral, an increase in hair-cuts on collateral. All reduce the ability of trading institutions to borrow, the provision of liquidity in capital markets, and trading profits. This creates a downward spiral. But what causes funding liquidity risk for financial institutions, falls in the market value of collateral, and market liquidity risk? In all cases : large, negative asset-return shocks - and this is the major tail risk, partly too because it changes the correlation structure of asset returns.
- 29 For example, the separation between originators and final investors in credit markets might reduce the incentives to monitor credit risk.
- 30 Allen and Gale (1994, 2000). Rajan (2005) makes a similar point: '...Linkages between markets, and between markets and institutions, are now more pronounced. While this helps the system diversify across small shocks, it also exposes the system to large systemic shocks - large shifts in asset prices or changes in aggregate liquidity.' (p. 346)
- 31 In the case of Spain, primarily the intra-EMU capital market.
- 32 A recent example is Ahearne et al. (2007).
- 33 See Backus et al., 2006. But Ohanian and Wright (2007) find that 'for much of the last half century, capital has not flowed from low return to high return countries.'
- 34 According to Rajan (2006), investment in fixed assets has not kept pace with the increase in savings, so that real collateral is globally scarce.
- 35 See Portes (2007).
- 36 As the name suggests, the implied volatility of an option is the level of volatility implied by its market price. In other words, it is the volatility that, given a particular pricing model, yields a theoretical value for the option equal to its current market price.
- 37 This chapter and Chapter 5 draw on Panetta et al. (2006).
- 38 For Germany the current volatility of long term rates is around the 43th percentile of its distribution in the 1986-2004 period. Statistical tests do not support the hypothesis of a decline in the volatility of long term rates.
- 39 An exception is represented by the increase in the volatility of the Japanese equity market in mid-2006 (see Table 1).
- 40 The empirical evidence on the tendency of different markets to co-move is not unanimous. For example, in a recent paper Bekaert et al. (2006b) argue that in the period 1980-2003 the degree of co-movement among the stock markets of a large cross section of developed countries has not increased, except for the European markets.
- 41 The characteristics of these volatility indicators are described in Figure 4.7.
- 42 See Schwert (1989) and Campbell (2003) for evidence on the stock market; and Bansal and Zhou (2002) and Andreou et al. (2000) for short and long term interest rates. For an overview see Engle and Rangel (2006).
- 43 In the finance literature, risk premia are often obtained as the product of the quantity of risk (for example, the β in a CAPM framework) with the price of risk (see, for example, Cochrane, 2005). In textbook models, the latter is directly related to investor risk aversion.

- 44 Campbell et al. (2001) find that, in the US stock market, industry- and firm-level volatility have become more important relative to market volatility in 1962–97.
- 45 See Schwert (1989) and Figlewski and Wang (2000) for US firms; Bekaert and Wu (2000) for Japanese firms; and David and Veronesi (2004) and Wei and Zhang (2006) regarding the level and uncertainty of profits.
- 46 The great moderation has been documented by Kim and Nelson (1999), McConnell and Perez-Quiros (2000), Stock and Watson (2002), Cecchetti et al. (2006) and Summers (2005).
- 47 According to Stock and Watson (2002), in the post-1984 period the standard deviation of production fell in 21 of 22 sectors. The decline was larger for non-durables consumption than for services or durables consumption.
- 48 The evidence for this is not as clear-cut as for the great moderation (see Helbling and Bayoumi, 2003).
- 49 The average cross-country correlation was 0.41 in the pre-1984 period and 0.36 in the following period. Excluding Japan, the correlation was about 0.44 in both periods. McAdam (2003) finds that the business cycles in the US, the Euro area and Japan are quite distinct. Heathcote and Perri (2003, 2004) argue that financial integration has been a key determinant of the reduction in the synchronization between the business cycle of the US and the rest of the world.
- 50 See Clarida et al. (2000), Stock and Watson (2002), and Summers (2005). Cecchetti et al. (2006) find that improvements in the conduct of monetary policy account for the decline in output volatility in 10 of the 24 countries they analyse.
- 51 Blanchard and Simon (2001) find a positive correlation between output volatility and inflation volatility.
- 52 For example, from 1980 to 2002, the service sector's cyclically-adjusted share of total employment and value-added increased by about 16 and 13 percentage points, respectively, in the euro area, to about 70.
- 53 See McConnell et al. (1999), McConnell and Perez Quiros (2000), Kahn et al. (2002), and McConnell and Kahn (2002).
- 54 Morgan et al. (2004) find that state employment volatility fell sharply after interstate banking was permitted.
- 55 See Dynan et al. (2005); Aghion et al. (2005); and Justiniano and Primiceri (2006). Cecchetti et al. (2006) find that output volatility falls as a country's financial system becomes more developed (and its central bank becomes more independent) and the availability of credit improves.
- 56 Cecchetti et al. (2006) find that improved inventory management policies contribute to the fall in volatility in all 12 countries for which they have data. Stock and Watson (2002) find limited support for the 'sectoral shift' hypothesis: in some countries this factor contributed to the moderation but has a quantitatively very small effect; in other countries the sectoral evolution goes in the direction of increasing GDP volatility.
- 57 Campbell (2005) shows, for US equities, that although the volatility of investors' forecasts of future corporate earnings or dividends has declined substantially since the mid-1980s, which would tend to lower the volatility of stock prices, the volatility of the discount rate applied by equity investors has not declined.
- 58 Calculations based on data from the World Federation of Exchanges, at <http://www.world-exchanges.org>
- 59 Estimates are based on BIS Triennial Central Bank Survey for April 2004 (table E.17) and the semi-annual Survey of North American Foreign Exchange Volume for the October 2004 and October 2006 reporting periods.
- 60 Fitch Ratings global derivative surveys, for example, clearly indicate that active traders of credit derivatives include a broad range of banks, insurance companies, hedge funds and, to a lesser extent, pension funds.
- 61 Data are from Hedge Fund Research.
- 62 Avramov et al. (2006) show that better informed, rational traders (either individual or institutional investors) help stabilize financial asset prices.
- 63 However, Bekaert and Harvey (1997) find that market liberalization increases the correlation between the local market and the world market but has no effect on market volatility.

- 64 See Perli and Sack (2003) and Panetta et al. (2006).
- 65 As mortgage rates decrease, households' incentive to prepay increases, the expected life of outstanding mortgages declines, and the duration of MBS shortens. Conversely, if rates increase, households have less incentive to prepay, the expected life of existing mortgages increases, and duration lengthens. Thus, unhedged portfolios of US-type MBS represent large positions in options whose values are influenced by the level and volatility of interest rates and can incur large losses when rates change.
- 66 Dynamic hedging causes investors to sell debt securities precisely when their prices are falling (i.e., when interest rates are rising) and to buy them when their prices are rising (i.e., when interest rates are falling).
- 67 Examples of static hedging include the issuance of callable debt and the purchase of interest-rate options.
- 68 See, for example, Clarida et al. (2000), DeLong (1997), Mayer (1998) and Romer and Romer (2002).
- 69 Carpenter (2004) provides a comprehensive review of the literature.
- 70 However, those forward-looking words were initially part of the FOMC's set of alternative policies at a time when policy rates were close to the zero bound (Bernanke and Reinhart, 2004). The Fed's policy communication in the last 20 years is reviewed in Rudebusch and Williams (2006).
- 71 This practice has sparked an intense debate on the merits and possible risks of this choice - related in particular to the markets' ability to interpret correctly the conditional nature of the optimal interest rate path.
- 72 For example, if the central bank successfully stabilizes money market rates on maturities up to two months, the effect on 10-year rates' volatility is likely to be of the order of a few basis points.
- 73 According to Gordon's formula, the price of equities is equal to the value of future earnings discounted at the appropriate risk-adjusted interest rate (that is, the sum of the risk-free rate and an equity premium).
- 74 The low level of yields has been associated with several other factors, including the 'savings glut', greater inflation credibility of central banks, changes in the regulation of pension funds, demographic trends.
- 75 For example, imports from China are estimated to have contributed to lower import price inflation by 2 percentage points in the euro area (see ECB, 2006) and by 1 percentage point in the US (see Kamin et al., 2004).
- 76 Tucker (2005) analyses this mechanism. A strategy of this sort was put in place by Berkshire Hathaway. In April 2006 Warren Buffett announced that his firm, in order to improve returns, had sold large amounts of insurance (equivalent to a sale of put options) against a fall of major stock market indices over a long time horizon (20 years) (see the International Herald Tribune, April 4, 2006).
- 77 For example, open interest in the S&P500 options rose from end-2003 to end-2006 by 95%, while that on Euro STOXX rose by 150% over the same period.
- 78 Complex portfolio credit products could exacerbate price volatility for a number of reasons. First, the more structured the products, and hence the narrower the potential investor universe, the less liquid the market will be in times of stress. Moreover, the risk that leveraged investors are in 'crowded trades' is likely higher for complex credit products. Hence, a firm-specific or adverse market event could trigger the simultaneous unwinding of crowded positions. On these issues, see Laganà et al (2006).
- 79 For example, when interest rates are low insurance companies with fixed rate commitments may find difficult to meet their obligations. They may thus choose to take high-risk/high-return investments, focusing their attention on the upside (the only situation in which they survive) and ignoring downside risks. The compensation contracts of hedge fund managers may also cause 'risk shifting' behaviour, inducing the manager to take more risk (i.e. increase leverage) when interest rates are low (Rajan, 2005).
- 80 The most common example of this trade involves uncovered arbitrage across currencies, such as borrowing on the yen market and investing in higher yielding assets, such as dollar-denominat-

ed securities issues in the US or by emerging sovereigns. Chapter 6 discusses the carry trade in greater detail.

- 81 See also the discussion in Section 2.2, which characterises financial integration as one aspect of greater 'connectivity' in financial systems.
- 82 See Bekaert et al. (2005a) or Kose et al. (2006).
- 83 Roughly speaking, the law of one price for financial assets implies that assets with the same risk-return characteristics should be traded at the same price irrespective of the location of trading.
- 84 For a discussion of different types of financial integration indicators and their use to assess European financial integration, see Baele et al. (2002) and ECB (2007).
- 85 These results are, for example, summarized in the comprehensive surveys by Henry (2006) and Kose et al. (2006). Eichengreen et al. (1998) pointed out that information problems and domestic political distortions may not allow the full benefits of financial liberalization to be reaped, in particular in developing countries where they can be expected to be more important. Bekaert et al. (2001, 2005b, 2006, 2007) find more generally valid positive effects of equity market liberalizations.
- 86 When the sample is split according to the World Bank's definitions of systemic and non-systemic banking crises, the latter are more frequent for financially integrated countries and the former less frequent. Demirguc-Kunt and Detragiache (2001) find that financial liberalizations increase the likelihood of banking crises, but they consider only domestic interest rate liberalizations and they do not look at the removal of restrictions on foreign capital.
- 87 The analysis does not control for a host of potentially relevant factors (such as domestic business cycles and the quality of economic institutions and banking supervision etc) and econometric issues.
- 88 Also Prasad et al. (2007, p. 7) point out that there "is little systematic evidence ... that capital mobility by itself can precipitate financial crises...". Similarly, IMF Research Department (2007, p. 27) states that "...existing empirical studies ... do not support the view that greater financial integration increases the likelihood of crisis. On the contrary, a majority of studies find that crises are, if anything, less frequent in financially open countries than in financially closed ones."
- 89 For a discussion featuring the main arguments in the context of the 1997–8 debate on whether to incorporate capital account convertibility in the IMF Articles of Agreements, see Fischer et al. (1998)
- 90 See, for example, Caprio et al. (2006) for an excellent volume discussing the regulatory and financial stability implications of cross-border banking.
- 91 The coefficient of variation is a measure of dispersion that is defined as the standard deviation divided by the mean of a random variable. The more overall non-performing loans fluctuate over time in a given country the more risk there is in the banking system. If then two banking systems integrate and the risk of non-performing loans is not fully aligned, the overall fluctuations of non-performing loans can be reduced making the joint banking system safer than each separate one.
- 92 See for instance, Hansen and Hodrick (1980), Fama (1984), Engel (1996), Boudoukh et al. (2006), Burnside et al. (2006) and Lustig and Verdelhan (2007).
- 93 Carry trades may also unwind when market sentiment changes. We do not address this issue in this report.
- 94 Ex post Sharpe ratios on currencies are computed as ex post excess returns on exchange rates normalized by their standard deviations, while the ex post Sharpe ratio on the S&P500 is computed as the ex post excess returns on the S&P500 normalized by its standard deviation. We use a three month rolling window.
- 95 This indicator has both upward and downward biases. It could overestimate the value of carry trades due to double counting of the contracts; and it is based on the notional value of the contract, while the actual transaction at the closing dates would be equal to net gains/losses (which are significantly smaller than notional values). It also underestimates overall trades, as it is only based on exchange-traded derivatives and therefore excludes over-the-counter carry trades. Moreover, futures data are unavailable for some major emerging market target currencies. And net non-commercial currency futures positions do not show a clear relationship with ex post Sharpe ratio differentials. Therefore, when assessing the size of carry trades, the net future positions reported in Figure 6.8 should be interpreted with caution.

- 96 Thresholds are computed with realised Sharpe ratios over the period 22 February-22 May 2007. Additional calculations, not reported here, show that the levels of interest rates necessary to make carry trades unattractive are implausibly high or low.
- 97 Another important factor was news about greater risks for a US recession. See Chapter 3 for a discussion of medium-term market volatility developments.
- 98 Chapter 3 addresses this debate and draws financial stability implications.
- 99 India ranked only at number 28 by exports and even lower by imports. China is expected to overtake the US in exports in 2007. Most of the numbers quoted above are taken from the excellent overview by Bussiere and Mehl (2007).
- 100 The recent restructuring of the three largest (state-owned) commercial banks has reduced the share of non-performing loans in the total banking system from 17% to 8%, but asset quality remains low, especially among smaller banks (Cappiello and Ferrucci, 2007). This compares to only 2% of non-performing loans in India.
- 101 For example, the large investments channelled into India via Mauritius can be explained with tax advantages. Lane and Schmukler (2006, Table 3b) report that Hong Kong and Mauritius account for between one quarter and one third of portfolio investments in China and India.
- 102 As discussed in Chapter 2, the most important source of banking crises tend to be aggregate downturns, related either to GDP or to the bursting of asset bubbles.
- 103 We also considered the cumulative loss of output relative to pre-crisis trend growth as a fourth measure of banking crisis severity, but since the World Bank dataset we use sets this number to zero when output actually increased during a crisis, we dismissed the variable as suffering from censorship bias.
- 104 Longevity risk is defined as the risk that a cohort's average age at death is higher than its life expectancy, in which case many people might run out of resources in their last years and would have to face an unexpected drop in consumption.
- 105 For example, the preference for home ownership varies across countries. Moreover, in countries where households cover a larger part of their pension needs with private savings, the share of financial wealth is larger.
- 106 The accounting identity is: total savings = investment in real assets + investment in financial assets - new debt
- 107 A PAYGO, or 'pay as you go', system is one in which young people pay taxes today and are promised benefits in the future that will be funded by the next generation's taxes.
- 108 This figure is calculated by taking the population aged 50 and older (assuming that younger individuals would bear most of the cost of pension reforms aimed at correcting the effects of longer life expectancy) and computing the extra pension payments that they would receive if they lived longer than expected by applying from 2005 forward the same percentage improvements observed in life expectancy between 1990 and 2002 (the year of the latest official mortality table).
- 109 For example, in the US, financial institutions in recent years have been offering 'alternative' mortgage products with features such as 'negative amortization' (where initially payments are low and the overall debt rises) or adjustable rate products (where rates are initially low but increase substantially afterwards). These products are generally offered to households with low credit ratings, which would otherwise encounter difficulties obtaining traditional credit.
- 110 'Evidence abounds that people consistently make certain mistakes because of lack of knowledge, faulty logic, cognitive dissonance, and biased statistics [...] From a social-welfare perspective, this development [from defined-benefit to defined-contribution pension plans] might actually be a step backward. Risk is being transferred to those who are least qualified to manage it.' (Bodie 2003)
- 111 Longevity risk is currently undiversifiable and unhedgeable. The ongoing debate regards the choice for public intervention to endorse directly this risk, or at least its tail, or to contribute to the creation of a market for this type of risk, letting market forces allocate it efficiently.
- 112 A risk that is often mentioned in relation to aging is the so-called asset meltdown, i.e. the risk that as the baby boomer generation retires it will finance its consumption by selling its assets – thereby triggering a sharp decrease in asset prices and potentially causing turbulence on finan-

cial markets. This risk seems to be small, however, if only because it rests on the assumption that there will be a shortage of savings at global level (the only one that matters since financial markets are increasingly integrated), which is not the case now.

- 113 The report was coordinated by Ron Sandler ('The Sandler Review') on invitation by the UK Treasury and is available at http://www.hm-treasury.gov.uk/documents/financial_services/savings/fin_sav_sand.cfm
- 114 'In view of the limited ability of the general public to handle the complex task of investing for retirement, financial firms will have to design safer products with a small number of choices that are easily understood'. (Bodie, 2003).
- 115 See for example Angelini and Cetorelli (2003). Demutualization, a parallel trend, has facilitated consolidation among insurers.
- 116 See Angelini and Cetorelli (2003) for Italy, Shaffer (1993) for Canada and Jayaratne and Strahan (1997) for the United States.
- 117 On the other hand, mergers could also be associated with a redistribution of resources from the employees to the bank through lower wages (see Shleifer and Summers (1988)) or from consumers to banks, owing to an increase in market power (see Prager and Hannan (1998) for the United States and Focarelli and Panetta (2003) for Italy). In this case, profit ratios of merged banks could improve even when efficiency is unchanged.
- 118 See Focarelli and Panetta (2003), Berger et al. (1998), Calomiris and Karceski (2000), Rhoades (1998) and Houston et al. (2001).
- 119 See Group of Ten (2001).
- 120 See Bliss and Rosen (2001), Gorton and Rosen (1995), Ryan (1999), and Pilloff and Santomero (1998).
- 121 For a discussion of entry barriers in equity underwriting, see Chen and Ritter (2000).
- 122 The failure of a small German bank, Bankhaus Herstatt, illustrates the challenges of international coordination. On 26 June 1974, the firm's banking license was withdrawn, and it was ordered into liquidation during the banking day, after the close of the German interbank payments system (3:30PM local time). Some of Herstatt Bank's counterparties had irrevocably paid DM to the bank before the banking licence was withdrawn, believing they would receive US dollars later the same day in New York. But when Herstatt's banking business was terminated, it was only 10:30AM in New York. Herstatt's New York correspondent bank suspended all outgoing US dollar payments from Herstatt's account, leaving its counterparties fully exposed to the value of the DM they had paid the bank earlier that day. The risk of such a future mishap has come to be known as 'Herstatt risk' and is a point of concern for regulators. For further discussion, see: <http://riskinstitute.ch/134710.htm>
- 123 See De Figueiredo and Edwards (2004) for the impact of political contributions by US telecom companies on regulatory decisions.
- 124 Futures Industry Association.
- 125 There is no single ideal measure of derivatives risk exposure. While the notional amount outstanding in mid-2006 was USD 370 trillion, the gross market value of these contracts was USD 10.1 trillion, or 2.7% of notional value.
- 126 US Census Bureau.
- 127 An anecdote from the 1990s illustrates the value of this option. A colleague phoning his counterparts in the research department of a regional Federal Reserve bank was told that they would be away for the afternoon because it was their annual 'refinancing day'. There was a tradition among several staffers that each year on that day they would refinance their mortgages, reaping the fruits of a declining interest environment. Thankfully for lenders and investors, most borrowers are not as interest-rate sensitive as this group.
- 128 For an excellent report discussing CRT instruments, see BIS, Committee on the Global Financial System, *Credit Risk Transfer*, January 2003.
- 129 International Monetary Fund, Global Financial Stability Report, 2006, Figure 2.5.
- 130 Testimony of US Federal Reserve Bank Chairman Alan Greenspan on Over-the-Counter Derivatives before the Committee on Agriculture, Nutrition and Forestry, United States Senate, 10 February 2000.

- 131 Berkshire Hathaway, 2002 Annual Report, released 4 March 2003.
- 132 Calculations based on data from: FDIC, Statistics on Banking, 1934-2001, pp. 10 and 40; and FDIC Quarterly Banking Profile, 2001-2006.
- 133 The IMF's 2006 *Global Financial Stability Report* suggests that the backlog phenomenon may reflect 'growing pains', which may dissipate as the market matures. Underinvestment in back-office capacity may also reflect a collective action problem.
- 134 Data are from *Inside Mortgage Finance*, an industry newsletter, quoted in James Hagerty et al, 'At a Mortgage Lender, Rapid Rise, Faster Fall', *Wall Street Journal*, 12 March 2007, p. A1. Box 7.1 discusses the US subprime market.
- 135 A previous version of this chapter appeared in the April 2007 issue of the Banque de France's *Financial Stability Review*.
- 136 HedgeFund Intelligence estimates that total assets at year-end 2006 were US\$ 2.06 trillion; a survey by *Institutional Investor* and Hedgefund.net puts the total at US\$ 1.89 trillion. Data on assets by region are from HedgeFund Intelligence.
- 137 Britt Erica Tunick, 'The Hedge Fund 100', *Institutional Investor's Alpha*, June 2007.
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- 140 Speech by Dan Waters, Director, Asset Management Sector Leader and Director of Retail Policy, FSA, October 19, 2006.
- 141 Definitions based on US Securities and Exchange Commission (SEC), 'Implications of the Growth of Hedge Funds', staff report, September 2003, pp. 35-6.
- 142 The standard deviation of monthly returns was 2.1% for the HFR Composite and 4.2% for the MSCI-W.
- 143 Regarding survivorship bias, backfill bias and self selection bias, see, for example, Burton Malkiel and Atanu Saha, 'Hedge Funds: Risk and Return', *Financial Analysts Journal*, November/December 2005, pp. 80-88. For evidence that reported hedge fund returns understate the correlation of funds with equity markets, see Clifford Asness, Robert Krail, and John Liew, 'Do Hedge Funds Hedge?' *The Journal of Portfolio Management*, Fall 2001, pp. 6-19.
- 144 OECD Steering Group on Corporate Governance, 'The Implications of Alternative Investment Vehicles for Corporate Governance', July 2007.
- 145 Nicholas Chan et al., 'Systemic risk and hedge funds', in M. Carey and R. Stulz, eds., *The Risks of Financial Institutions and the Financial Sector*, 2006.
- 146 Jean-Pierre Petit, Exane Economics Research, 23 June 2004, p. 9. LTCM had total trading assets of US\$ 125 billion, and notional off-balance sheet positions of over US\$ 1 trillion. US commercial banks only had loans outstanding to LTCM of US\$ 170 million and equity investments of US\$ 900 million, according to Laurence Meyer, Testimony before the US House of Representatives, 24 March 1999.
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- 149 Hilary Till, 'EDHEC Comments on the Amaranth Case: Early Lessons from the Debacle', working paper, EDHEC Business School, October 2006.
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- 160 Anthony Richards, 'Idiosyncratic Risk: An Empirical Analysis, with Implications for the Risk of Relative-Value Trading Strategies,' IMF working paper, No. 99/148, November 1999. Research suggests that hedge funds avoided the worst of the recent stock market downturn because they were able to time their investments by selling tech stocks before, during, and after the stock market started to collapse. Source: Markus Brunnermeier and Stefan Nagel, 'Arbitrage at its Limits: Hedge Funds and the Technology Bubble,' Working Paper, August 2002.
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- 162 Kara Scannell et al, 'No Consensus on Regulating Hedge Funds', *Wall Street Journal*, 5 January 2007, p. C1.
- 163 Empirically, there is a strong correlation between being a poor credit and having low levels of general and financial education.
- 164 Typical sources of model risk are represented by lack of historical data to compute the rating of structured products or the analytical difficulties of estimating the credit risk of each tranche of the portfolio (think for example of the treatment of spread correlations or recovery rates, the probability of prepayments).
- 165 While it is true that ratings evaluate long term solvency - in contrast to daily prices, which reflect also other concerns - a major mistake would still be spotted immediately.
- 166 Moody's, for example, posted a 24% increase in SF revenue during 2006, and SF ratings now contribute 44% of its total revenues.
- 167 For example, according to the financial press, ratings firms generally had no access to the due-diligence reports commissioned by the arrangers of SF products on the books of the originators of subprime loans (*International Herald Tribune*, 2 August 2007).
- 168 Think for example to Constant Proportion Debt Obligations, whose payoff derives from leverage on credit indices.
- 169 For example, Moody's downgraded more than 400 securities backed by subprime loans on 10 July.
- 170 See Flannery (1996).

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