

Financial Stability Report

April 2007 | Issue No. 21



BANK OF ENGLAND





BANK OF ENGLAND

Financial Stability Report

April 2007 | Issue No. 21

The Bank of England has two core purposes — monetary stability and financial stability. The two are connected because serious disruption in the financial system would affect the implementation and effectiveness of monetary policy, while macroeconomic stability helps reduce risks to financial stability.

The Bank's responsibilities for monetary stability are set out in the Bank of England Act 1998. Responsibility for financial stability in the United Kingdom is shared between the tripartite authorities — HM Treasury (HMT), the Financial Services Authority (FSA) and the Bank of England. Their roles are set out in a Memorandum of Understanding (MoU).⁽¹⁾

The Bank's responsibility for contributing to the maintenance of the stability of the financial system as a whole derives from its responsibility for setting and implementing monetary policy, its role in respect of payment systems in the United Kingdom and its operational role as banker to the banking system. The Bank aims to bring its expertise in economic analysis and its experience as a participant in financial markets to the assessment and mitigation of risks to the UK financial system including, if necessary, helping to manage and resolve financial crises.

The *Financial Stability Report* aims to identify the major downside risks to the UK financial system and thereby to help financial firms, authorities overseas and the wider public manage and prepare for these risks. The *Report* is produced half-yearly by Bank staff under the guidance of the Bank's Financial Stability Board, whose best collective judgement it represents.

The Financial Stability Board:

John Gieve, Chair
Andrew Bailey
Charles Bean
Nigel Jenkinson
Mervyn King
Rachel Lomax
Paul Tucker

This document was delivered to the printers on 23 April 2007 and, unless otherwise stated, uses data available as at 5 April 2007.

The *Financial Stability Report* is available in PDF at www.bankofengland.co.uk.

⁽¹⁾ The tripartite Memorandum of Understanding was revised in March 2006 and is available at www.bankofengland.co.uk/financialstability/mou.pdf.

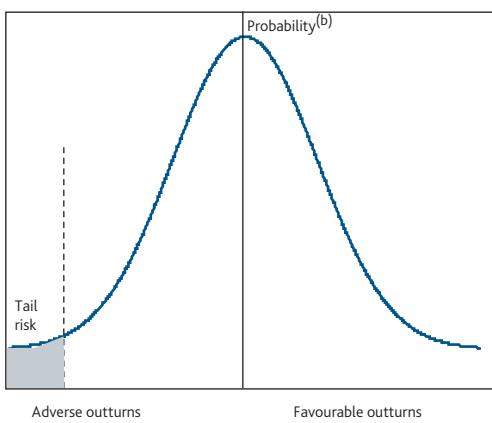
Contents

Foreword	1
Overview	5
Box A Key sources of vulnerability for the UK financial system	7
1 Shocks to the UK financial system	12
Box 1 Low economic and financial volatility and financial instruments	14
Box 2 Financial market liquidity	18
Box 3 Could problems in US sub-prime mortgage markets be replicated elsewhere?	22
2 Structure of the UK financial system	26
Box 4 Assessing the sensitivity of Value-at-Risk to measures of stress	33
Box 5 Hedge funds and financial stability	36
3 Prospects for the UK financial system	38
Box 6 Uncertainty in systemic stress testing	44
4 Mitigating risks to the UK financial system	49
Box 7 OTC derivatives clearing and settlement arrangements	54
Box 8 Bank resolution regimes	58
Other financial stability publications	59
Index of charts and tables	63
Glossary and other information	65

Overview

The UK financial system remains highly resilient. But strong and stable macroeconomic and financial conditions have encouraged financial institutions to expand further their business activities and to extend their risk-taking, including through leveraged corporate lending, and the compensation for bearing credit risk is at very low levels. That has increased the vulnerability of the system as a whole to an abrupt change in conditions. Financial innovation and the growing use of credit risk transfer markets have increased the risk-bearing capacity of the system — but also bring some risks. Recent developments in the US sub-prime mortgage market have highlighted how credit risk assessment can be impaired in these markets and how participants can be hit by sharp reductions in market liquidity. Similar problems in a more significant market, such as corporate credit, could have more serious consequences if credit quality were to deteriorate. It is important that participants in these markets are alert to these risks and that firms' stress testing takes them into account.

Chart 1 Tail risk^(a)



(a) In this simple schematic diagram, the distribution of possible events is assumed to be normal.
 (b) Probability density.

What might cause system-wide stress?

The operating environment for UK banks and global financial institutions has remained stable over much of the period since the July 2006 *Report*. Conditions are likely to remain favourable. But a key aim of the Bank's financial stability work is to assess resilience in unlikely, adverse future events in the tail of the distribution of possible outcomes (**Chart 1**). In contrast to individual firms' risk management, the Bank's focus is on assessing threats to the financial system as a whole, given the major costs to the economy of financial system failure. This *Report* provides an assessment of these risks, which is intended to inform firms' risk assessment and to identify areas that may require risk mitigation efforts.

The July 2006 *Report* identified and explored six sources of vulnerability that could cause stress to the UK financial system. These vulnerabilities, which remain important, are summarised in Box A and discussed further in Section 3.

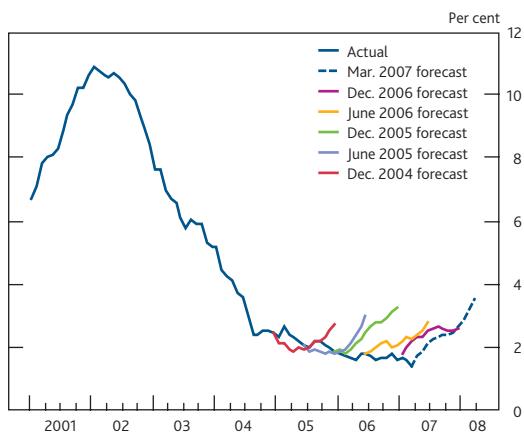
How are these vulnerabilities evolving?

Two key drivers — one conjunctural, the other structural — have shaped the development of risks to the UK financial system in recent years. Their influence has, if anything, intensified over the nine months since the July 2006 *Report*.

Macroeconomic stability is encouraging greater risk-taking...

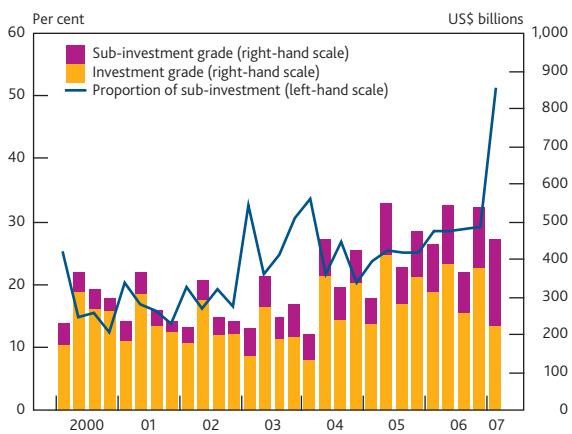
First, benign economic conditions have kept losses on major UK banks' corporate and secured household debt exposures at

Chart 2 Speculative-grade corporate bond default rate forecasts



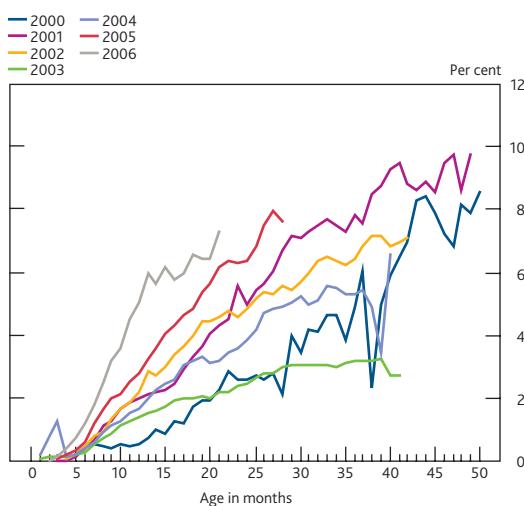
Source: Moody's Investors Service.

Chart 3 Global quarterly syndicated loan issuance



Sources: Dealogic and Bank calculations.

Chart 4 Arrears of 60+ days on US second-lien sub-prime home equity loans^(a)



Source: JPMorgan Chase & Co.

(a) Year refers to year of securitisation.

very low levels, supporting continued high profitability. And the timing of a long-anticipated turn in the corporate credit cycle has been pushed out further (**Chart 2**). Anchored expectations of macroeconomic stability and competitive pressures in the financial sector appear to have encouraged a further increase in risk-taking. That is evident in, for example, further falls in credit risk premia, an increase in sub-investment grade debt issuance (**Chart 3**) and rising trading activity at LCFIs.⁽¹⁾ While there were falls in asset prices in May and June 2006 and in February and early March 2007, these episodes do not appear to have had a lasting impact on risk-taking behaviour.

...while use of risk transfer markets is affecting the depth and quality of risk assessment...

Second, high investor risk appetite has stimulated further development by firms of techniques for unbundling and distributing risks through financial markets. Many financial institutions — including UK banks — are placing increased emphasis on an 'originate and distribute' business model, whereby they lend to borrowers but then distribute much of the underlying risk to end investors such as pension funds, insurance companies, mutual funds, hedge funds and other banks.

The trading of credit risk in financial markets enables risk to be better diversified across the system as a whole. But recent events in US sub-prime⁽²⁾ mortgage markets have illustrated that weaknesses can also emerge. Similar problems in a more significant market, such as corporate credit, could have more serious consequences if credit quality were to deteriorate. Potential weaknesses include:

- **Weakened credit risk assessment.** Those arranging loans may be less inclined to assess credit quality at origination if they bear little of the ultimate risk. While market mechanisms exist to ensure that originators distributing risk remain exposed to some of the potential credit loss, the high levels of arrears in recent vintages of US sub-prime mortgage lending (**Chart 4**) raise questions about the effectiveness of those mechanisms.
- **Impaired risk monitoring.** While credit risk transfer has led to greater dispersion of risk, new holders of risk may have less access to information on borrowers. In such cases, monitoring may be partly delegated to others, including rating agencies and managers of structured credit vehicles, such as collateralised debt obligations (CDOs). Investors

(1) LCFIs include the world's largest banks, securities houses and other financial intermediaries that carry out a diverse and complex range of activities in major financial centres across the globe. The group of LCFIs is identified currently as: ABN Amro, Bank of America, Barclays, BNP Paribas, Citi (formerly Citigroup), Credit Suisse, Deutsche Bank, Goldman Sachs, HSBC, JPMorgan Chase & Co., Lehman Brothers, Merrill Lynch, Morgan Stanley, RBS, Société Générale and UBS.

(2) In the United States, the term sub-prime generally refers to borrowers who do not qualify for prime interest rates because they have weakened credit histories, low credit scores, high debt-burden ratios or high loan to value ratios.

Box A

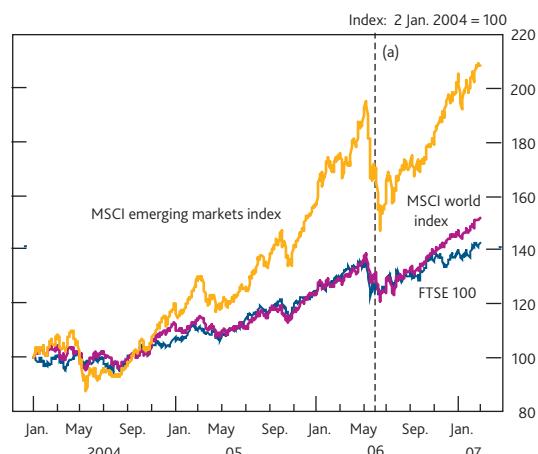
Key sources of vulnerability for the UK financial system

Six key vulnerabilities are explored in this *Report*. None of them is new and all are on the radar of financial sector participants. But if some firms have underestimated and/or underprepared for the full consequences of them unfolding, they could affect the functioning of the UK financial system, with material costs for the wider economy.

- **Unusually low premia for bearing risk**, especially in credit markets. Benign current economic conditions, the greater dispersal of credit risk and confidence that market liquidity will remain high may have weakened risk assessment standards. If risk perceptions were to adjust, unexpectedly large shifts in market liquidity might lead to sharper asset price changes than anticipated by market participants, with knock-on effects on counterparty credit risk.
- **High and rising leverage in parts of the corporate sector.** Current low financing costs and strong economic conditions may have led to some underestimation of the longer-term financial risks of higher indebtedness among non-financial companies. The impact of a downturn in corporate credit conditions could be amplified by the increased use by investors and traders of credit products with 'embedded leverage'.

- **Rising systemic importance of large complex financial institutions (LCFIs).** Given their scale and their pivotal position in most markets, distress at an LCFI could have a large, unanticipated, impact on other financial market participants. This could arise from losses on direct exposures to an LCFI that failed or from the wider market implications of actions taken by an LCFI to manage problems.
- **Dependence of UK financial institutions on market infrastructures and utilities.** Disruption to, or failure of, core parts of the infrastructure supporting financial markets could have pervasive effects on the financial system, which owners and users of these systems may not have fully prepared for or insured against.
- **Large financial imbalances among the major economies** have been associated with significant cross-border flows of capital. Financial market participants may be underestimating the potential speed and extent of asset price changes in the unlikely event of a sudden adjustment in these financial flows.
- **High UK household sector indebtedness.** Balance sheets look strong in aggregate, but there have been signs of stress among a minority of households, with personal insolvencies rising sharply recently. Lenders have tightened credit terms on unsecured lending but rising insolvencies heighten uncertainty about potential future losses.

Chart 5 Equity prices



Sources: Bloomberg, MSCI and Bank calculations.

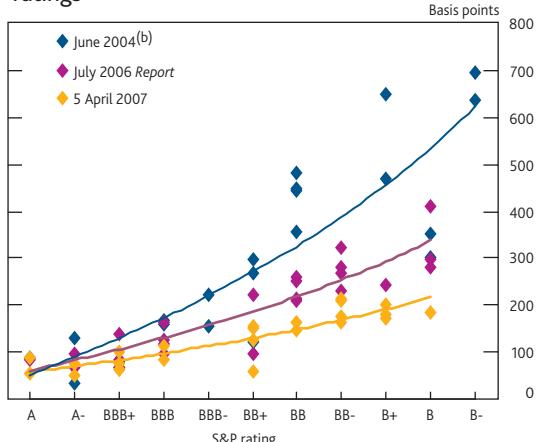
(a) July 2006 Report.

could become overly reliant on their risk assessments. Some investors may not appreciate fully that ratings provide only a summary opinion on the riskiness of a product. And those with mandates restricting their investment to certain ratings bands may be attracted by higher-yielding products within those bands, without fully appreciating the associated risks.

- **Impaired market liquidity.** Financial institutions can become more dependent on sustained market liquidity both to allow them to distribute the risks they originate or securitise and to allow them to adjust their portfolio and hedges in the face of movements in market prices. If it becomes impossible or expensive to find counterparties, financial institutions could be left holding unplanned credit risk exposures in their 'warehouses' awaiting distribution or find it difficult to close out positions, as was apparent in synthetic US sub-prime mortgage markets in February.

Over the period since the July 2006 *Report*, these drivers — an increase in risk-taking at the same time as a possible fall in the quality of risk assessment — have potentially increased the vulnerability of the financial system as a whole. They have affected, in particular, the low risk premia, corporate debt, LCFI and infrastructure vulnerabilities.

Chart 6 EME sovereign US\$ bond spreads and credit ratings^(a)

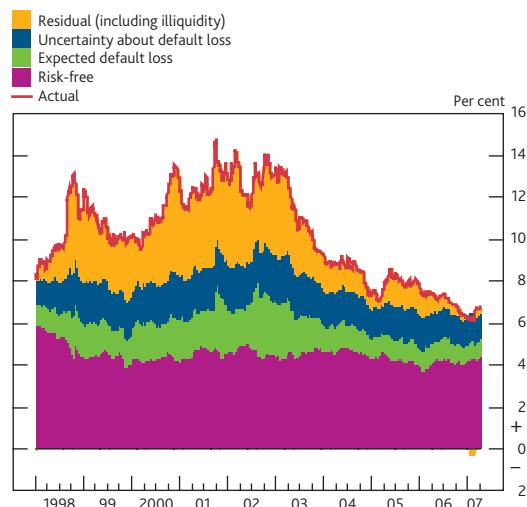


Sources: Bloomberg, JPMorgan Chase & Co. and Standard & Poor's.

(a) Lines represent logarithmic best-fit lines. Ratings are plotted linearly. Outliers with ratings below CCC in June 2004 (Argentina and Dominican Republic) are not shown.

(b) Through US interest rate cycle.

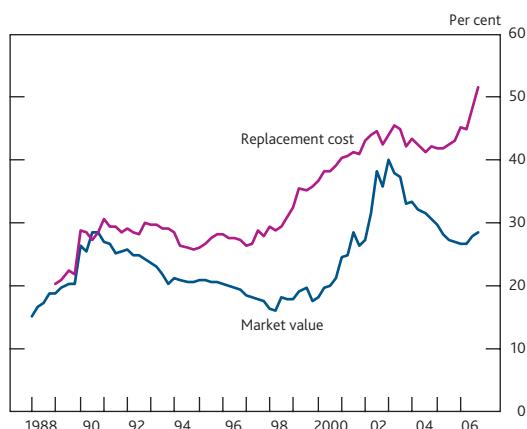
Chart 7 Decomposition of borrowing costs for UK high-yield corporates^(a)



Sources: Bloomberg, Merrill Lynch, Thomson Datastream and Bank calculations.

(a) The decomposition assumes a debt maturity of 20 years. For details, see Churm, R and Panigirtzoglou, N (2005), 'Decomposing credit spreads', *Bank of England Working Paper no. 253*.

Chart 8 UK PNFCs^(a) capital gearing^(b)



Sources: ONS and Bank calculations.

(a) Private non-financial corporations.

(b) Gearing is calculated as the ratio of debt, net of liquid assets, to the market value or replacement cost of capital.

...leading to further rises in asset prices...

Strong and stable economic conditions over the period since the July 2006 Report have been reflected in a continuation of the rise in equity prices seen over the past several years (Chart 5) and further falls in credit risk premia. The 'search for yield' is continuing. This is evident in signs of lower discrimination between instruments of differing credit quality, for example, in emerging market sovereign bond markets (Chart 6). With credit spreads at low levels, market intelligence has indicated strong demand for instruments employing leverage, such as junior tranches of CDOs, and the pursuit of strategies dependent on stability continuing, such as the selling of protection against higher volatility.

Falls in credit risk premia might be expected as new instruments better match investors' demand for risk. Even so, levels of risk premia have led to concerns among market contacts that assets are being 'priced for perfection'. Asset market liquidity remains high (as discussed in Box 2, page 18) and a decomposition of corporate bond yields suggests that at present investors require little compensation for liquidity risk (Chart 7). Some market participants appear to be extrapolating the stable past environment and high asset market liquidity into the future. Greater use of risk transfer markets may have encouraged this process.

...higher leverage at some non-financial firms...

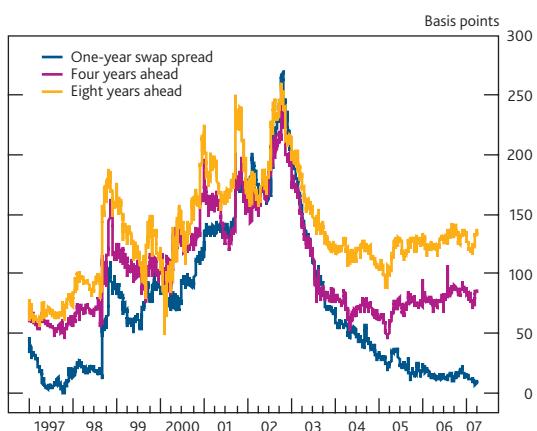
Narrow credit spreads and low risk-free rates mean nominal corporate bond rates in the United Kingdom are near their lowest levels in 50 years. This has contributed to continued strong growth in lending to non-financial firms, particularly to the UK commercial property sector. Lending to finance leveraged buyouts (LBOs) has risen rapidly in both Europe and the United States. And there are reports that the threat of buyout has led potential targets to take on higher debt as a defensive measure. Overall, after a number of years of balance sheet consolidation, UK corporate debt gearing has begun to rise (Chart 8), as has been the case in the United States.

UK banks have been active in corporate credit markets.

Although global corporate credit quality appears high, with defaults at historically low levels, markets are already anticipating some increase in credit spreads in the next few years (Chart 9). If corporate credit quality weakened sharply, a growing tail of risky corporate debt could be exposed. In such an event, the experience of sharply rising delinquencies in US sub-prime mortgage markets could be illuminating, as there are some structural similarities between US sub-prime mortgage markets and leveraged corporate markets, as Box 3 on pages 22–23 discusses.

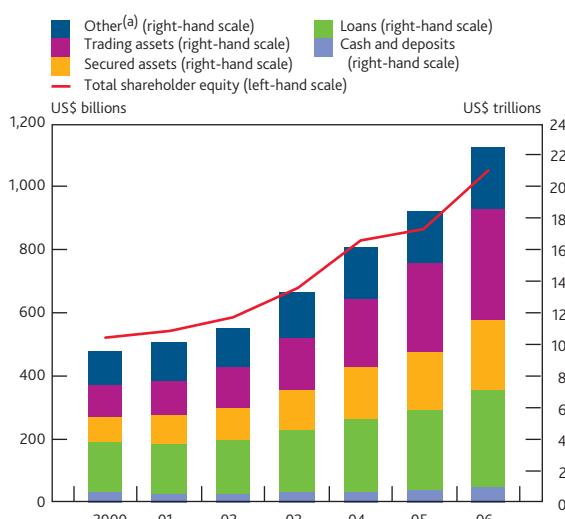
...greater financial risk-taking by some LCFIs...

LCFIs are important to the UK financial system as key intermediaries of risk and, through their market-making

Chart 9 US implied forward corporate credit spreads^(a)

Sources: Merrill Lynch and Bank calculations.

(a) One-year forward spread over swaps for BBB US corporate bonds.

Chart 10 LCFIs' total assets

Sources: Bloomberg, SEC filings, published accounts and Bank calculations.

(a) Other includes (among other items) receivables, investments, goodwill and property.

Table A Change in assessment since the July 2006 Report

A significant increase in risk	Broadly unchanged
A slight increase in risk	A slight decrease in risk
	A significant decrease in risk
Vulnerability	Probability^(a)
Low risk premia	
Global corporate debt	
LCFI distress	
Infrastructure disruption	
Global imbalances	
UK household debt	

Source: Bank calculations.

(a) Assessed change in the probability of a vulnerability being triggered over the next three years.

(b) Assessed change in the expected impact on the UK financial system if a vulnerability is triggered.

activities and principal risk-taking, as liquidity providers to capital markets. As Section 2 discusses, their activities have mirrored developments in global capital markets. Seemingly low financial risk and strong incentives to match performance by competitors have encouraged LCFIs to expand their business. That has led to further growth in their balance sheets, which have more than doubled since the turn of the century (**Chart 10**). A large part of this growth stems from increased holdings of trading assets, due in part to greater principal risk-taking, but also resulting from 'warehousing' of assets as part of 'originate and distribute' activity. Increased trading activity exposes LCFIs to a sharp rise in the volatility of asset prices and/or the correlations between them. While reported Value-at-Risk measures suggest that LCFIs' exposure to market risk is limited, that may reflect the influence of current low volatility in markets (as discussed in Box 4, page 33).

...and increasing dependencies on supporting market infrastructures.

As the use of markets for distributing credit risk grows, the smooth functioning of the infrastructure supporting these markets, some of which is provided by LCFIs, becomes increasingly important. Since the July 2006 Report, several incidents have reminded participants of the risks from infrastructure dependencies. High trading volumes during the market turbulence in late February and early March led to some temporary disruption to the New York Stock Exchange. And, while key UK infrastructure systems remain highly resilient,⁽¹⁾ there have been some short-lived operational problems with CREST, CHAPS, BACS and SWIFT in recent months. That has underlined the importance of these systems and their users having effective contingency plans for operational disruption.

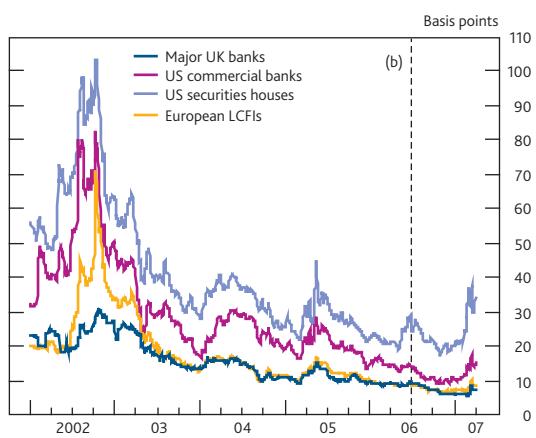
Several key vulnerabilities have edged up.

Table A summarises how the Bank's judgement on the six sources of vulnerability has evolved since the July 2006 Report. It is broken down into changes in the assessed likelihood of significant stress occurring as a result of each vulnerability (probability) and the possible consequence for the UK financial system if that vulnerability was exposed (impact).

The changes are relatively modest, though several are judged to have edged up. Perhaps the most notable news is an increase in the interrelated low risk premia and corporate debt vulnerabilities, with signs of a further expansion of risk-taking in global capital markets. As conduits for much of this activity, the potential impacts of LCFI distress and infrastructure disruption are also assessed to be slightly higher. The likelihood of a disorderly unwinding of persistent global imbalances is judged to have fallen slightly since the July 2006

(1) As discussed in the Bank's annual *Payment Systems Oversight Report* available at www.bankofengland.co.uk/publications/psor/psor2006.pdf.

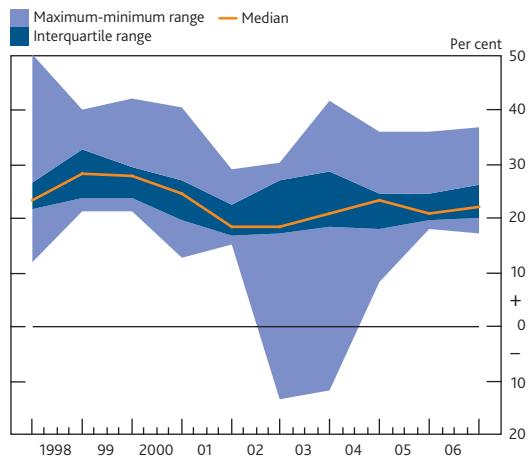
Chart 11 Major UK banks' and LCFIs' credit default swap premia^(a)



Sources: Bloomberg, Markit Group Limited, published accounts and Bank calculations.

- (a) Asset-weighted average five-year premia.
(b) July 2006 Report.

Chart 12 Major UK banks' pre-tax return on equity^{(a)(b)}



Sources: Published accounts and Bank calculations.

- (a) Data for major UK banks, excluding building societies.
(b) Pre-tax return on equity calculated as pre-tax profit as a proportion of shareholders' funds and minority interests.

Report, as US domestic demand growth has eased and growth in the euro area has increased. And, as discussed in Section 3, the likelihood of distress in the UK household sector contributing to system-wide pressures has risen slightly given the sharp rise in personal insolvencies, although the prospect of problems arising from secured debt exposures remains low and unchanged.

Prospects for UK financial stability

Many of these risks originate in international capital markets. They could affect UK financial stability either through their impact on those UK banks that are active in these markets, or through their effects on non-UK LCFIs. The key in assessing prospects for financial stability is to consider how the resilience of financial institutions measures up to these threats.

Non-UK LCFIs and major UK banks remain highly resilient...

The performance of non-UK LCFIs has remained strong and markets remain confident about their future resilience (**Chart 11**). Market indicators of the risk of default of US securities dealers remain at low levels, but have risen slightly, reflecting their role in the US sub-prime mortgage market. The major UK banks remain highly profitable, with a median return on equity of 22% in 2006 (**Chart 12**). Published capital ratios are well above regulatory minima. Banks' reliance on wholesale funding sources has risen in recent years, making the cost and availability of funding more sensitive to market conditions, though dependence on higher-risk short-term funding sources is more modest. Taken together, this provides strong support for the continuing high resilience of the UK financial system, which is also reflected in continued low market estimates of default probabilities for the major UK banks (**Chart 11**).

...vulnerabilities individually appear manageable...

How severely would this resilience be tested if shocks exposed the vulnerabilities discussed above? It is much harder to judge the level of threats than to assess how they are evolving. As a contribution towards that assessment, Bank staff have updated the stress-testing exercises that were used in the July 2006 Report to map and scale the potential impact on the UK banking system if these vulnerabilities were exposed severely. The results, described in Section 3, suggest that if these vulnerabilities were to crystallise individually, they would be unlikely to erode to any significant extent the capital base of the UK banking system.

...but vulnerabilities in combination could have a more material impact.

In practice, the vulnerabilities are unlikely to be exposed in isolation, since several are interdependent and a number could be triggered by common shocks. An increasingly likely stress scenario would be a sharp unwinding of low risk premia, which then triggered a pickup in corporate defaults as credit

conditions tightened. The unwinding of leveraged positions in corporate credit markets could lower market liquidity, amplifying falls in asset prices. The sharp movements in some markets in late February and early March highlight the potential for a more marked adjustment in asset prices if underlying conditions were to change more fundamentally. If price falls led to a generalised retreat from risk-taking, and a rise in correlation across asset markets, the scope for diversification against such shocks would be reduced. In such a scenario, the sustainability of high revenues generated by 'originate and distribute' business models could be called into question.

Actions to help ensure stability

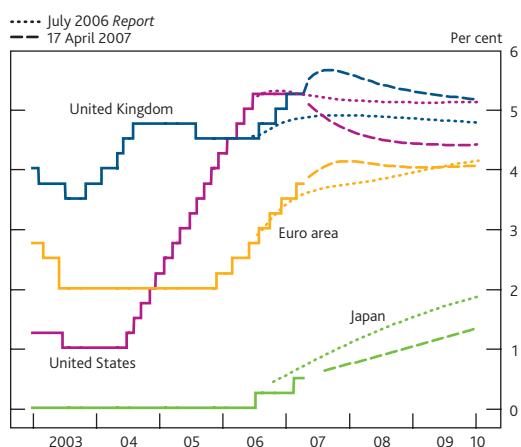
While there are significant buffers in the UK financial system for absorbing even large shocks, the potential high costs of financial instability support ongoing efforts, by both the private sector and the authorities, to close identified gaps in the management of these risks. The priorities, discussed in Section 4, would include:

- **Enhancing stress-testing capabilities.** In benign conditions, it is important that risk management systems continue to examine the robustness of capital and liquidity buffers to severe, but plausible, adverse future stress scenarios. These scenarios need to take adequate account of potential amplification and feedback effects that might occur in highly connected markets in times of stress, including those arising as a result of a fall in market liquidity. Because these effects are the collective result of the behaviour of many firms, they are hard for individual firms to calibrate and manage. The Bank and the FSA are working with firms to improve understanding of these effects. More generally, the Bank and FSA are currently examining, alongside other authorities, the liquidity standards required of banks in different countries.
- **Greater operational resilience.** Growth in the use of risk transfer markets increases the systemic significance of the infrastructure supporting these markets. It is important that providers and users of core infrastructure systems have strong arrangements for managing operational disturbances. Work is ongoing to test and strengthen these arrangements.
- **Improving crisis management capabilities.** There is considerable work under way to improve and test procedures and information flows for dealing with severe stress events. Further work is needed to strengthen arrangements for managing cross-border problems, which could emerge in the event of severe difficulties at a global financial institution.

1 Shocks to the UK financial system

Macroeconomic conditions have remained benign over the period since the July 2006 *Report* and asset market volatility is historically low. This has encouraged increased risk-taking: credit spreads have narrowed; leveraged and sub-investment grade lending have risen strongly; covenant protection has slipped further; and the international 'carry trade' has risen in popularity. Corporate leverage ratios have begun to rise reflecting the falling cost of credit, although default rates have remained low. But sharp falls in the prices of some assets in late February and early March show that markets are sensitive to signs of increased economic uncertainty. And the recent distress in the US sub-prime mortgage market provides a warning of how quickly credit quality can deteriorate following a period of lax credit standards.

Chart 1.1 Official and forward interest rates^(a)



Sources: Bloomberg and Bank calculations.

(a) Solid lines are official, dotted lines are one-week forward rates.

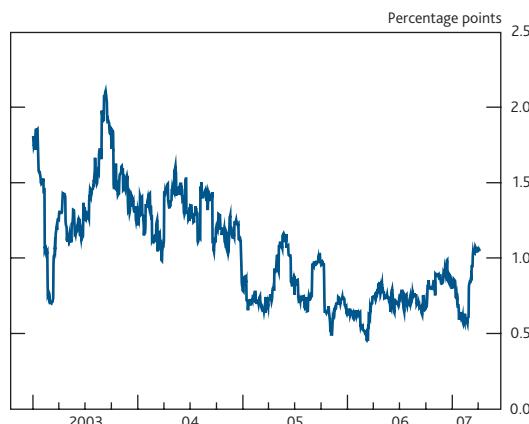
This section discusses developments in the global economy and financial markets since the July 2006 *Report* affecting risks to the UK financial system.

Global macroeconomic prospects remain benign...

Since the July 2006 *Report*, growth in the United Kingdom has remained robust, has accelerated in the euro area and has been solid in Japan. Growth has slowed in the United States and conflicting economic news in the early months of 2007 increased uncertainty about the near-term outlook. Overall, global output is expected to grow at a strong and steady pace in 2007. Although inflation remains low in Japan, it rose in other industrialised countries during 2006, for example, peaking at 2.5% in the euro area and 4.3% in the United States. The annual rate of UK inflation rose to 3.1% in March 2007.⁽¹⁾

Official interest rates have increased in the United Kingdom, the euro area and Japan (ending the zero interest rate policy in place since March 2001) since the July 2006 *Report*, but the US Fed Funds rate has remained unchanged. Relative to July, markets now anticipate a higher path for short-term interest rates in the United Kingdom and the euro area over the remainder of 2007, a significantly lower path for the United States and a slower pace of increases in Japan (Chart 1.1). Expectations about the most likely path of US interest rates over the coming year became more volatile during February and March (Chart 1.2). This may have contributed to the volatility observed in financial markets at that time (discussed later in this section).

Chart 1.2 US nominal interest rate volatility^(a)

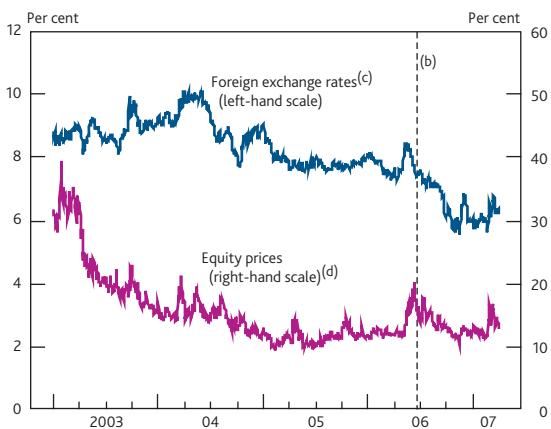


Sources: Bloomberg and Bank calculations.

(a) Annualised one-month volatility of daily changes in the one year ahead US nominal overnight forward rate.

(1) The Bank's latest forecasts are set out in the February 2007 *Inflation Report*, available at www.bankofengland.co.uk/publications/inflationreport/ir07feb.pdf.

Chart 1.3 Average implied volatilities of equity prices and exchange rates^(a)



Sources: BBA, Chicago Mercantile Exchange, Eurex, Euronext.liffe and Bank calculations.

(a) Standard deviation of distribution of returns based on three-month options.

(b) July 2006 Report.

(c) Simple average of €/£, \$/¥, €/\$ and £/\$.

(d) Simple average of S&P 500, Euro Stoxx 50 and FTSE 100.

...supported by low economic and financial market volatility.

Macroeconomic uncertainty and financial market volatility are currently low by historical standards. Episodes of market turbulence, such as in May and June last year and in early 2007, stand out against a background of stability and generally falling forecasts of future volatility (Chart 1.3). As Box 1 explains, greater economic and financial asset price stability and low implied volatility can be mutually reinforcing. They can also encourage increased risk-taking predicated on this stability continuing.⁽¹⁾ A risk looking forward is that this process could go into reverse. For example, an adverse macroeconomic shock and a downturn in the credit cycle could raise uncertainty about future growth prospects, increase financial market volatility and reduce risk appetite.

Global adjustment is occurring...

Macroeconomic conditions in advanced economies have been moving gradually to reduce global imbalances. Domestic demand growth has picked up in the euro area and Japan and slowed in the United States. Rising investment rates in Japan and the euro area may in time reduce the global excess of planned savings over investment.⁽²⁾ Brent crude oil prices also fell from \$70 per barrel at the time of the July 2006 Report to \$60 at the end of December, contributing to a narrowing of the US current account deficit to 5.8% of GDP in 2006 Q4. Oil prices have now risen back to just below \$70 per barrel. Global adjustment may also be facilitated by the depreciation of the US dollar against the euro over the period since the July 2006 Report. Overall, there seems to be a slightly lower risk of a sharp adjustment in global imbalances in the near future.

...but the 'carry trade' has grown in popularity...

But gradual global adjustment and perceived reduced risks of sharp exchange rate movements can encourage currency speculation, including via the so-called 'carry trade'. In the case of the yen, low expected foreign exchange volatility and slower-than-expected convergence of Japanese interest rates with other economies have encouraged speculators to borrow in yen to invest in higher-yielding currencies such as the US, New Zealand and Australian dollars, the South African rand, Turkish lira and sterling. Carry trades also appear to be developing from other low interest rate currencies. For example, in many emerging European countries, there has been a marked increase in household borrowing in the euro and Swiss franc to finance house purchases.

Chart 1.4 Yen carry trade 'attractiveness'



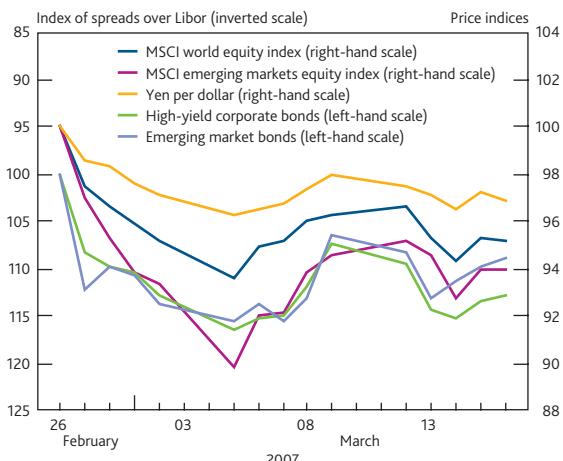
Sources: Bloomberg, Chicago Mercantile Exchange, Commodity Futures Trading Commission, UBS and Bank calculations.

(a) Spread between US and Japanese three-month interest rates per unit of implied volatility of the US\$/¥ exchange rate. Dashed line based on implied forward rates.

(b) July 2006 Report.

(c) Six-month average of number of non-commercial short yen contracts as a proportion of total number of yen contracts.

Chart 1.5 Asset prices during recent market turbulence^(a)



Sources: Bloomberg, Merrill Lynch, MSCI, Thomson Datastream and Bank calculations.

(a) Rebased to 100 on 26 February 2007.

(1) This was discussed by John Gieve in a speech at the Bank of England, 'Pricing for perfection', on 14 December 2006, available at www.bankofengland.co.uk/publications/speeches/2006/speech295.pdf.

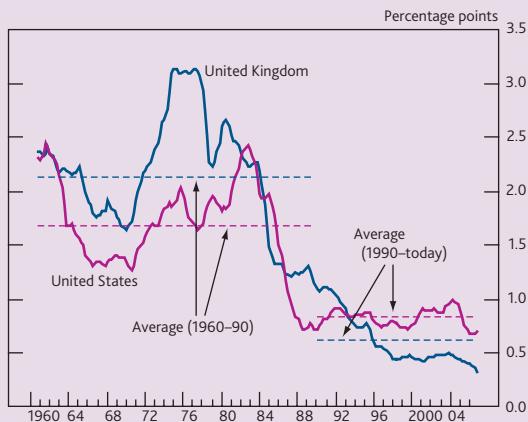
(2) Bernanke, B (2005), 'The global saving glut and the US current account deficit', remarks at the Sandridge Lecture, Virginia Association of Economics, Richmond, March.

Box 1

Low economic and financial volatility and financial instruments

The volatility of economic growth in the United Kingdom and United States in recent years has been very low by historical standards (**Chart A**). And the volatility of inflation and other economic indicators, both in these countries and others, has also generally fallen in what has been called the 'great stability'.⁽¹⁾

Chart A Volatility of real GDP growth^(a)



Sources: ONS, Thomson Datastream and Bank calculations.

(a) Five-year rolling average of annualised volatility of quarter-on-quarter growth rate.

The volatility of asset returns has also been low in recent years, especially compared with the 1970s and 1980s (**Table 1**).⁽²⁾ This may partly be a response to greater economic stability, with the payment streams on assets becoming more certain and the discount rate used to value them more stable. Indeed, there may have been feedback effects to economic stability, with less volatile collateral values promoting steady credit, investment and growth rates.

Table 1 Equity and bond volatility^(a)

Period	Equity returns ^(b) (percentage points)		Bond yield changes ^(c) (basis points)	
	United Kingdom	United States	United Kingdom	United States
Jan. 1946 – Aug. 1971	14	13	60 ^(d)	59
Sep. 1971 – Dec. 1989	25	16	187	153
Jan. 1990 – Mar. 2007	14	14	102	94
July 2006 Report – Apr. 2007	11	10	49	59

Sources: Global Financial Data, Inc. and Bank calculations.

(a) Based on monthly data, except for final row, which is based on daily data.

(b) FTSE All-Share and S&P 500.

(c) Ten-year government bonds.

(d) Beginning January 1958.

These developments appear to have influenced on the structure of corporate and household borrowing. For example,

the stability of the economic environment may have encouraged the provision of more long-dated and subordinated finance because lenders are more confident that firms will not default as the result of sharp shocks. Loan payments are also being backloaded. US households have recently been able to arrange mortgages where the debt outstanding rises in the early years of the loan, as initial payments are not required to cover the interest fully. In the corporate sector, some firms are paying coupons with more debt through payment-in-kind notes or not paying coupons at all with 'bullet' loans (which repay debt in a single instalment at maturity). Even lowly rated firms are able to raise subordinated finance, with issuance of second-lien loans and mezzanine notes (which fall between debt and equity in a firm's capital structure) increasing over the past year.

Economic and financial stability is also affecting financial market behaviour. To maintain returns amidst lower financial market volatility, some investors are reportedly selling insurance against large movements in asset prices, for example by writing deep out-of-the-money options or variance swaps.⁽³⁾ Such positions generate regular premia and only have to pay out if prices move sharply. In periods when there are no such moves, returns appear to be in excess of those warranted by inherent risks. It is possible that the popularity of such strategies could have driven down implied volatilities. This is partly because taking an opposing position would be unlikely to appeal to any investor with either a short horizon or limited funding. Low implied volatilities may help to explain increased speculative activity in risky strategies such as carry trades (**Chart 1.4**).

Investors may also be increasing their risk exposures via derivatives or by other holding instruments with 'embedded leverage'. Derivatives such as swaps and options provide exposures to risky assets, but only require funding for relatively small margin payments rather than for the full amount of the underlying asset. Financial instruments with significant embedded leverage are those in which profits and losses are highly sensitive to the performance of underlying assets given the amount invested. Junior tranches of collateralised debt obligations fall into this category,⁽⁴⁾ as do Constant Proportion Debt Obligations. The latter generate 'leverage' by insuring around \$15 of credit against default for every dollar invested. This ratio is increased when the credit position generates losses and vice versa.

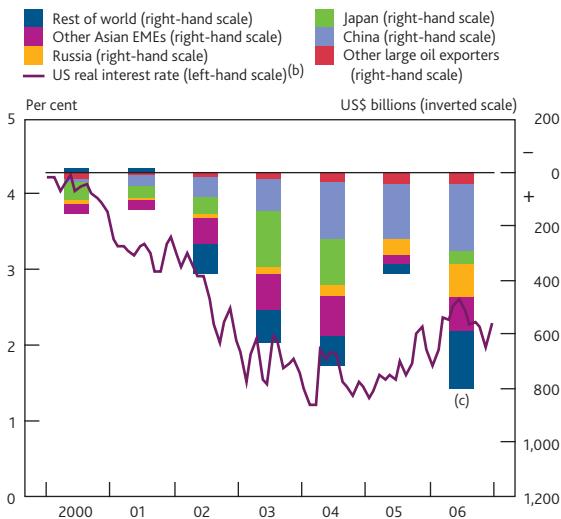
(1) See Bank of England (2007), 'The Monetary Policy Committee of the Bank of England: ten years on', *Bank of England Quarterly Bulletin*, Vol. 47, No. 1, pages 24–38.

(2) See the speeches by John Gieve and Paul Tucker footnoted in the main text and Rogoff, K (2006), 'Impact of globalization on monetary policy', Jackson Hole symposium.

(3) See Bank of England (2006), 'Markets and operations', *Bank of England Quarterly Bulletin*, Summer, page 127.

(4) See Bank of England (2005), 'Credit correlation: interpretation and risks', *Financial Stability Review*, Issue 19, pages 103–15.

Chart 1.6 Foreign exchange reserve accumulation^(a) and real interest rates



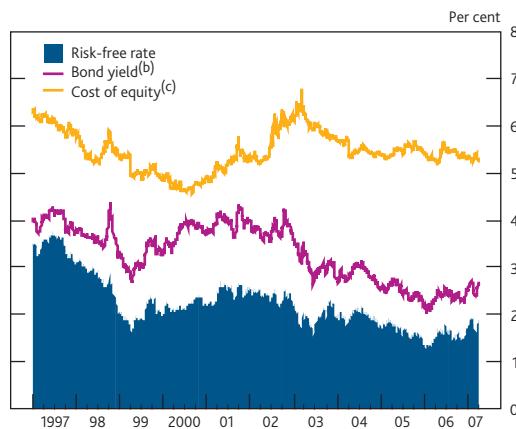
Sources: Bloomberg, IMF *International Financial Statistics* and Bank calculations.

(a) IMF definition (total reserves minus gold).

(b) Seven and a half year spot real interest rate

(c) Latest data end-November for 'other large oil exporters' and 'rest of world'.

Chart 1.7 Real cost of capital for UK PNFCs^(a)



Sources: Bloomberg, Merrill Lynch, Thomson Datastream and Bank calculations.

(a) Private non-financial corporations.

(b) Risk-free rate plus an investment-grade bond spread.

(c) Risk-free rate plus an equity risk premium, estimated using a Gordon growth model for a sample of FTSE All-Share companies.

In theory, carry trades should not make money on average because the difference in nominal yields between the low and the high-yielding currencies should be offset by expected exchange rate moves. Carry trades are essentially exchange rate speculation and the market price of this exchange rate risk can be derived from options prices. The attractiveness of carry trades is highest when the difference in interest rates is large and the implied volatility of exchange rates is low. **Chart 1.4** shows a measure which combines these two elements to illustrate the attractiveness of borrowing in yen to invest in the United States. It was as high in the second half of 2006 as it was in early 1997 and 2000, when speculative positions in the yen also reached a peak.

It is difficult to quantify the scale of the carry trade because positions can be created synthetically in forward markets without any underlying financial flows. Periods of weakness in the yen, though, appear to have corresponded with heightened risk-taking, suggesting that the ability to borrow cheaply in yen underpins some risky speculative positions in international markets. And the yen closely tracked moves in risky asset prices in late February and early March (**Chart 1.5**). This suggests that an unwinding of carry trades could amplify any adjustment in asset prices resulting from a disturbance to interest rate or exchange rate expectations.

...and the stock of reserves is still rising strongly.

The major oil-exporting countries and non-Japan Asia have not reduced their net savings rates. Global foreign exchange reserves grew significantly faster in 2006 than 2005, increasing by around \$800 billion to reach \$5.1 trillion. Strong net savings by these countries have contributed to the global imbalance between savings and investment intentions which, in turn, will have tended to push down on real interest rates (**Chart 1.6**).⁽¹⁾

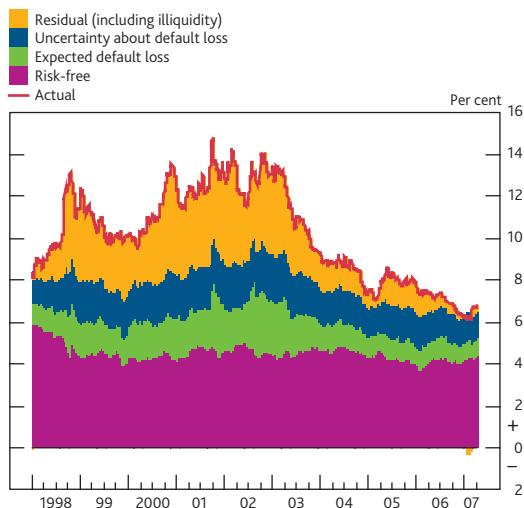
A global preference shift to fixed income and deposits...

Asian central banks and major oil exporters have historically invested in US government and agency debt and foreign currency deposits. The recent creation of asset management companies in Korea and China suggest these countries may diversify their portfolios, although the pace of change is expected to be gradual. The scale of the reserve accumulation by central banks, and their preference for fixed-income products and banking deposits, has likely increased the demand for debt relative to equity in recent years.⁽²⁾ A similar trend has occurred in the United Kingdom and elsewhere, as pension funds have purchased fixed-income products for asset and liability matching purposes.

(1) Official capital flows to the United States in the twelve months to May 2005 are estimated to have reduced the US ten-year Treasury yield by around 60 basis points. See Warnock, F and Warnock, V (2005), 'International capital flows and US interest rates', *International Finance Discussion Papers*, No. 840, United States Federal Reserve Board, September.

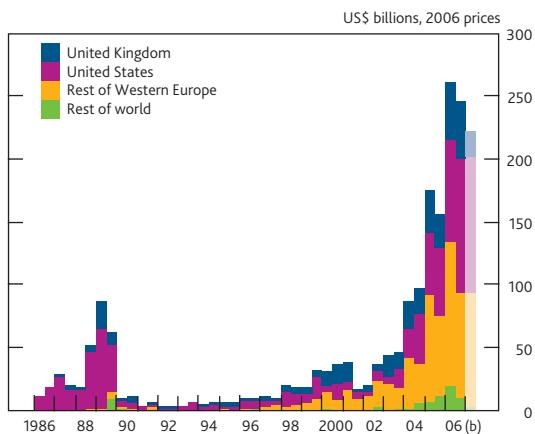
(2) As discussed by Paul Tucker in his Roy Bridge Memorial Lecture, 'Macro, asset price, and financial system uncertainties' on 11 December 2006, available at www.bankofengland.co.uk/publications/speeches/2006/speech294.pdf.

Chart 1.8 Decomposition of borrowing costs for UK sub-investment grade corporates



Sources: Bloomberg, Merrill Lynch, Thomson Datastream and Bank calculations.

Chart 1.9 Real LBO loan issuance^(a)

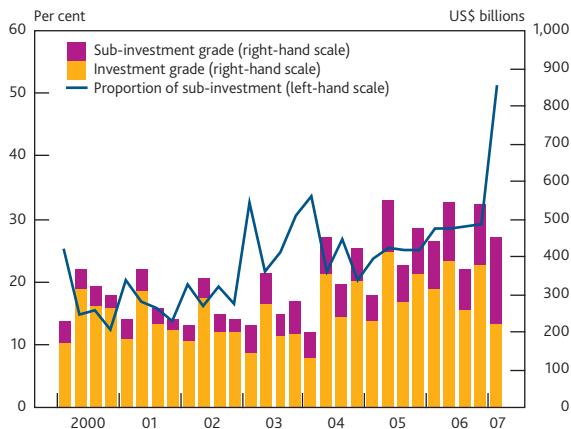


Sources: Dealogic, US Bureau of Economic Analysis and Bank calculations.

(a) Bi-annual syndicated lending deflated by US GDP deflator.

(b) Shaded area is total up to 5 April 2007.

Chart 1.10 Global quarterly syndicated loan issuance



Sources: Dealogic and Bank calculations.

...may help explain low credit risk premia...

This portfolio preference shift may have contributed to the compression of credit risk premia relative to equity risk premia over the past four years. This compression is illustrated for the United Kingdom in **Chart 1.7**. Some of the decline in credit risk premia can be explained by lower expected default rates, as shown by the decomposition of long-term sub-investment grade UK corporate bond yields in **Chart 1.8**.⁽¹⁾ The greatest fall, though, has been in the residual component of yields which includes compensation for liquidity risk. With falling compensation for default and liquidity risk and low risk-free rates, nominal corporate bond rates in the United Kingdom in the past two years have been at their lowest levels for 50 years. These borrowing costs could rise, and defaults increase, if the liquidity premium rises from its unusually low level.

...and strong growth in loan securitisation.

Strong demand for fixed-income securities has also encouraged banks to repackage large volumes of loans into collateralised loan obligations (CLOs). Around \$95 billion of these instruments were issued globally in 2006 H2, an increase of 35% over 2006 H1. Satisfying this demand has led to the origination of increasing numbers of higher-risk loans. Growth in loans to finance leveraged buyouts (LBOs) has been particularly strong (**Chart 1.9**) and the proportion of sub-investment grade debt in global syndicated loan issuance exceeded 50% in 2007 Q1 (**Chart 1.10**). Credit standards have also slipped, exemplified by the falling incidence of covenants on these instruments. Indeed, issuance of so-called 'covenant-lite' loans, which do not contain any maintenance covenants, is growing strongly in the United States and they have recently appeared in Europe for the first time. The absence of maintenance covenants may allow companies to survive longer before defaulting but could reduce the recovery rate for investors if they do default.

Issuance of residential mortgage-backed securities (RMBS) also continued at pace. In the United Kingdom, RMBS issuance almost doubled in 2006 to £95 billion. In the United States, RMBS issuance slowed in line with the housing market, but remains high. More generally, global issuance of cash collateralised debt obligations (CDOs) in 2006 was around \$490 billion, more than twice the level in 2005. Issuance of synthetic CDOs (which have the same exposure as cash CDOs but with no exchange of principal) also doubled to \$450 billion in 2006.

The search for yield continues...

Even though debt and loan issuance has grown strongly, credit spreads have continued to narrow across the risk spectrum

(1) Decomposition assumes a debt maturity of 20 years, see Churm, R and Panigirtzoglou, N (2005), 'Decomposing credit spreads', *Bank of England Working Paper no. 253*.

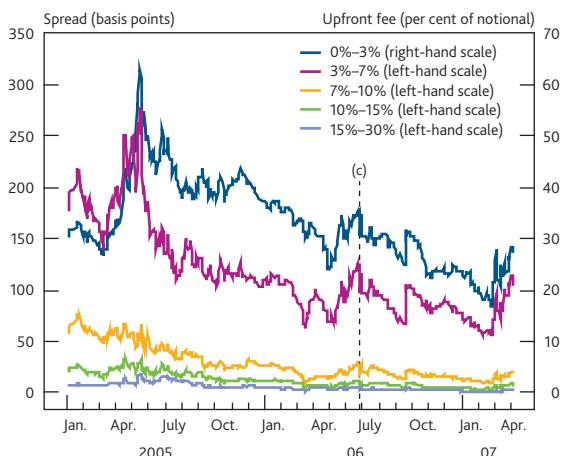
Table 1.A Price changes of risky assets

	Oct. 2002 to 26 Feb. 2007	Changes between: 26 Feb. 2007 and 5 Mar. 2007	5 Mar. 2007 and 5 Apr. 2007	Changes since: July 2006 Report
World equity index ^(a)	+101	-6	+7	+21
MSCI emerging markets equity index ^(a)	+237	-10	+13	+36
Industrial metals price index ^(a)	+234	-7	+16	+24
Investment-grade bond spreads ^(b)	-112	+2	+2	0
Sub-investment grade bond spreads ^(b)	-561	+33	-12	-37
Emerging market bond spreads ^(b)	-643	+19	-26	-58

Sources: Bloomberg, Goldman Sachs, JPMorgan Chase & Co., Merrill Lynch and Bank calculations.

(a) Per cent.

(b) Basis points.

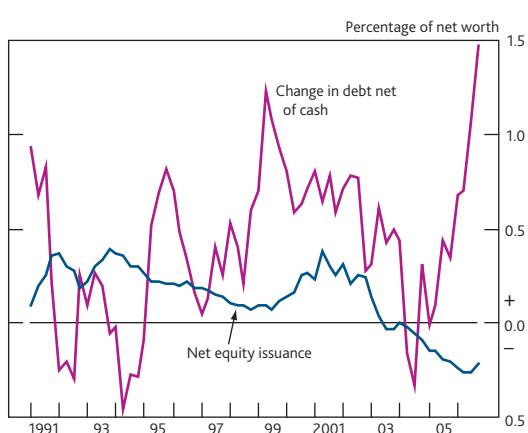
Chart 1.11 On-the-run CDO tranche spreads and fees^{(a)(b)}

Source: JPMorgan Chase & Co.

(a) Losses on x%-y% tranche accumulate as losses on notional principal of underlying North American investment-grade CDS index rise from x% to y%.

(b) 0%-3% tranche often referred to as 'equity', 3%-7% as 'mezzanine' (both of which are considered junior tranches) and others as grades of senior tranches.

(c) July 2006 Report.

Chart 1.12 UK PNFCs' net equity issuance and change in net debt^(a)

Sources: ONS and Bank calculations.

(a) Four-quarter moving average.

over most of the period since the July 2006 Report (**Table 1.A**). This is consistent with an intensification of the search for yield. Spreads on CDO tranches have continued to fall and had reached record low levels by early 2007 (**Chart 1.11**). With credit spreads falling, investors have been using more risky strategies to maintain nominal returns. For example, as sovereign bond spreads have fallen, emerging market investors have been buying increasing amounts of corporate bonds. Private equity firms raised \$430 billion in 2006, up 38% from 2005 and flows into hedge funds have remained high. There has also been increased investment in commodities, with exchange-traded funds for gold and silver growing from \$6 billion at the start of 2006 to \$12 billion in March 2007.

...liquidity remains high...

High primary issuance and strong speculative activity has been supported by, as well as contributing to, high secondary market liquidity. Across equity and foreign exchange markets, bid-ask spreads are narrow and high volumes of financial assets have been traded in a number of key markets, for example during February and March this year, with limited impact on prices. A summary measure of financial market liquidity conditions is presented in Box 2 and supports this impression of continuing high liquidity.

...and financial leverage is increasing...

Market intelligence suggests that some investors have increased their risk exposures to sustain portfolio returns as the yields on risky assets have fallen. This has been achieved by taking on greater leverage, investing in derivatives and holding more instruments with 'embedded leverage'. One instrument with embedded leverage that was launched recently, Constant Proportion Debt Obligations, attracted particular interest by offering the prospect of significantly higher returns than on other comparably rated securities (see Box 1 for more details).

...but combining leverage and concentration can be risky.

The experience of the multi-strategy hedge fund Amaranth during 2006 is a good example of how leveraged and concentrated positions in highly volatile markets can lead to large profits or losses. Amaranth made large profits trading natural gas derivatives in 2005, but during 2006 its monthly trading profits were subject to wide swings. In late August and early September, prices moved sharply against the fund and in mid-September it was forced to sell its positions at a large loss. It ultimately lost investors around \$6 billion.

Corporate leverage is rising again...

These developments in financial markets have had an effect on the rest of the economy. For example, the low cost of debt (especially high-risk debt) relative to equity is affecting the structure of corporate balance sheets. Net borrowing has risen quickly since 2005 and equity has been withdrawn (**Chart 1.12**). But equity prices have risen, so the average net

Box 2

Financial market liquidity

There are two types of liquidity risk.⁽¹⁾ Funding liquidity risk occurs if a firm is not able to meet its cash-flow needs; it is discussed further in Section 2. Market liquidity risk materialises if a firm cannot easily offset or eliminate a position without significantly affecting the market price.

These two concepts can be linked. A firm facing funding liquidity risk may need to sell assets to meet cash-flow needs. But if asset markets are relatively illiquid, then the firm may be forced to sell them at a low price. In extreme events, feedback loops between the two may be generated. An initial fall in asset prices might trigger further asset sales, for example, to meet margin calls or because risk limits have been breached. Prices could then be driven down further and so on.

Some measures of market liquidity

This box focuses on deriving an indicator of market liquidity using measures which can be calculated for markets in which major UK banks are likely to be particularly active (**Table 1**).

Table 1 Liquidity measures

Bid-ask spreads	Gilt repo Exchange rates (dollar with yen, euro and sterling) FTSE 100 (average of individual stocks)
Return to volume ratio	Gilt market FTSE 100 (average of individual stocks) Equity options (S&P 500 options as a proxy)
Liquidity premia	Corporate bonds (investment grade and high yield) Libor spread (three-month dollar, euro and sterling)

Bid-ask spreads

Kyle (1985) discusses three dimensions of market liquidity.⁽²⁾ The first is 'tightness', which can be measured by the bid-ask spread — the difference between the prices at which a financial instrument can be bought and sold. In normal conditions, the bid-ask spread is determined largely by structural features in a market. But in illiquid conditions, market-makers will increase bid-ask spreads as compensation for the possibility that they might be unable to sell readily assets that they are holding.

Return to volume ratio

Two other dimensions to market liquidity are 'depth' — the volume of trades possible without affecting prevailing market prices — and 'resiliency' — the speed at which price fluctuations resulting from trades are dissipated. One proxy measure for these dimensions is the ratio of absolute returns on an asset to its trading volume.⁽³⁾ In illiquid conditions, the price will move more for a given trading volume, so the ratio will be higher.

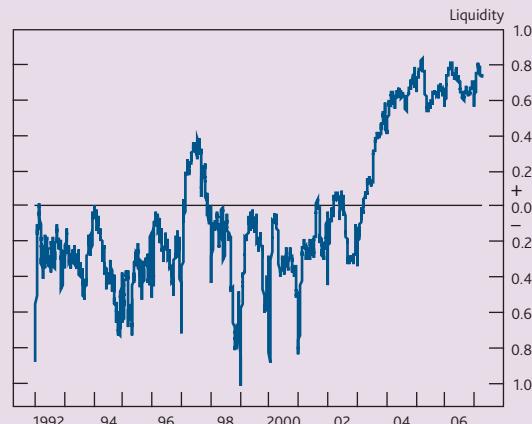
Liquidity premia

The academic literature suggests that investors will require higher liquidity premia for assets with greater market liquidity risk.⁽⁴⁾ For corporate bonds, a possible indicator of the liquidity premium is the difference between the observed bond spread and an estimated credit spread.⁽⁵⁾ For interest rate swaps, changes in the spread of Libor over a government bond yield are largely due to liquidity.

A summary indicator for market liquidity

All of these measures can be summarised into a single composite indicator (**Chart A**). According to this simple, preliminary indicator, markets are currently very liquid and have been so over the past few years. This may partly reflect structural features, including the increasing role of new investors, such as hedge funds, and innovation in financial instruments. But **Chart A** also shows that market liquidity can turn sharply during episodes of stress, highlighting the importance of managing this source of risk in the financial system.

Chart A Financial market liquidity^(a)



Sources: Bank of England, Bloomberg, Chicago Board Options Exchange, Debt Management Office, London Stock Exchange, Merrill Lynch, Moody's Investors Service, Thomson Datastream and Bank calculations.

(a) Simple, unweighted mean of the liquidity measures, normalised on the period 1999–2004. Data shown are an exponentially weighted moving average. The indicator is more reliable after 1997 as it is based on a greater number of underlying measures.

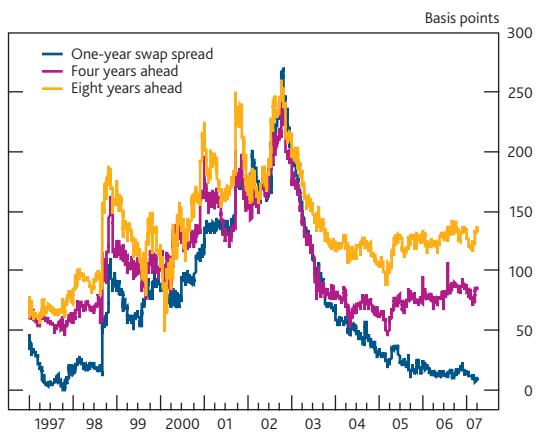
(1) Basel Committee on Banking Supervision (2006), 'The Joint Forum: the management of liquidity risk in financial groups', May. Available at www.bis.org/publ/joint16.htm.

(2) Kyle, A (1985), 'Continuous auctions and insider trading', *Econometrica*, Vol. 53, pages 1,315–35.

(3) Amihud, Y (2002), 'Illiquidity and stock returns: cross-section and time series effects', *Journal of Financial Markets*, Vol. 5, pages 31–56.

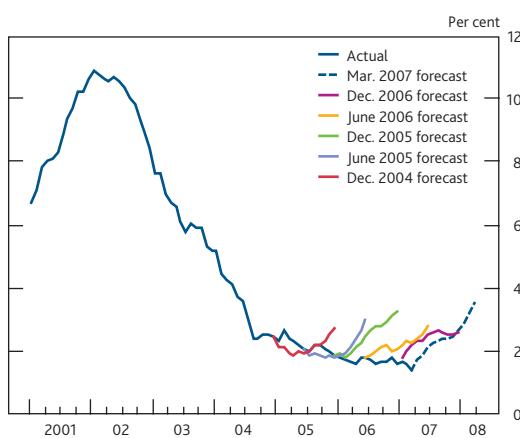
(4) Amihud, Y, Medelson, H and Pedersen, H (2005), 'Liquidity and asset prices', *Foundations and Trends in Finance*, Vol. 1, pages 269–364.

(5) See, for example, De Jong, F and Driessens, J (2005), 'Liquidity risk premia in corporate bond markets', mimeo, University of Amsterdam. The credit spread has been estimated in two different ways. The first uses the structural model in Leland, H and Toft, K (1996), 'Optimal capital structure, endogenous bankruptcy, and the term structure of credit spreads', *The Journal of Finance*, Vol. 51, pages 987–1,019. The second uses historical default and recovery rates published by Moody's Investors Service.

Chart 1.13 US implied forward corporate credit spreads^(a)

Sources: Merrill Lynch and Bank calculations.

(a) One-year forward spread over swaps for BBB US corporate bonds.

Chart 1.14 Speculative-grade corporate bond default rate forecasts

Source: Moody's Investors Service.

debt to equity ratio at market prices in the UK corporate sector only started rising in the second quarter of 2006; it has been rising for the past year in the United States. Higher corporate borrowing has partly been the result of private equity buyouts. Global LBO loan issuance increased by 60% in 2006 and the stock of, as yet, undrawn commitments in private equity firms has grown to around \$600 billion. Maximum debt levels for European LBOs are now consistently above seven or eight times earnings, whereas the maximum was around six times earnings a year ago.

This LBO activity is affecting the behaviour of other companies, with reports of public companies re-leveraging as a defensive measure against private equity takeovers. Some companies report that any associated falls in their credit rating would not significantly raise their average cost of debt. Based on recent leveraged buyouts and the potential additional corporate leverage if the undrawn commitments of private equity firms are used, Bank staff estimate that the UK corporate default rate could be up to 0.8 percentage points higher on average over an economic cycle.⁽¹⁾

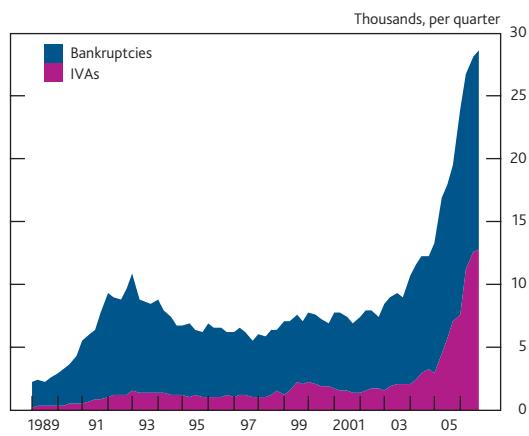
...but strong corporate liquidity is keeping defaults down...

The high availability of credit is supporting corporate performance. Benign macroeconomic conditions, strong profit growth and high cash balances in recent years have contributed to historically very low global corporate default rates. But the high availability and low cost of lowly rated debt may have kept some high-risk companies from otherwise defaulting. According to Moody's, US CCC-rated bonds have an average annual default rate of 25%. The actual default rate in 2006 was 7%.

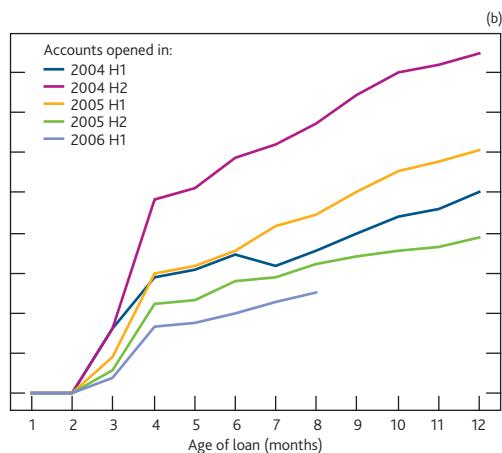
...although this is not expected to last.

But this unusually low level of corporate defaults is not expected to continue indefinitely. **Chart 1.13** shows the one-year cost of borrowing currently and that implied in four and eight years' time. This suggests that markets expect corporate default rates to remain low in the near term, before rising back towards historical levels over the next few years. Predictions of an imminent rise in default rates have been confounded for some years (**Chart 1.14**). And corporate conditions remain very favourable for most companies, with investment-grade firms appearing particularly robust. Nevertheless, the highly leveraged balance sheets of a small, but rising, segment of companies have made their viability dependent on continued benign macroeconomic conditions and the ongoing availability of cheap credit. Recent experience in the UK and US personal lending markets

(1) There are two steps in this calculation: first, the increase in default probability of companies subject to an LBO is based on a representative firm being downgraded from BBB to B and the historical corporate default probabilities of these two ratings; second, the potential proportion of LBO debt in total UK corporate debt is calculated by assuming that 20% of the \$600 billion equity capital raised globally by private equity firms and not yet spent is used in the United Kingdom (the recent average) and that the debt/equity ratio of these deals is four. The debt of other UK companies is assumed to grow at the average rate of the past five years.

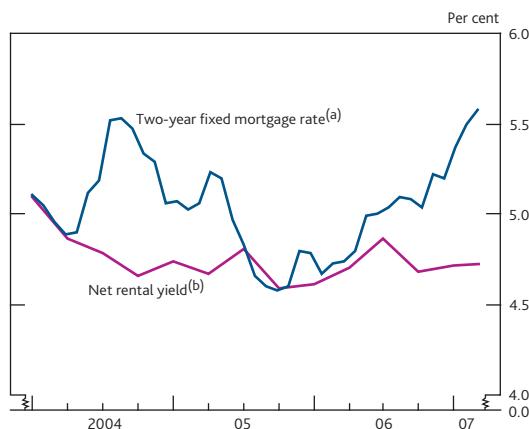
Chart 1.15 Personal insolvencies in England and Wales

Source: Insolvency Service.

Chart 1.16 Profile of arrears performance of UK credit card lending vintages^(a)

(a) Data provided by a major UK bank, showing the proportion of credit cards in arrears in each month after the account was opened.

(b) The axis is blank because of data confidentiality.

Chart 1.17 Residential rental yields and mortgage rates

Sources: Association of Residential Letting Agents and Bank of England.

(a) Weighted average two-year fixed mortgage rate on owner-occupied mortgage with 75% loan to value ratio.

(b) Gross rental yield adjusted for average vacancy rate per year.

demonstrates how quickly vulnerabilities created by a relaxation of credit standards can be exposed and the ways in which stress may propagate.

UK insolvencies have risen sharply...

Financial distress in a subset of UK households has been rising for several years, despite benign economic conditions. But it picked up sharply in 2006 with over 100,000 people becoming bankrupt or entering an individual voluntary arrangement (IVA), up nearly 60% on 2005 (Chart 1.15). Part of the explanation for this significant rise in personal insolvencies lies in the earlier behaviour of lenders. Banks loosened lending standards in 2003 and 2004, partly to maintain market share in the face of strong competition. Arrears rates on loans extended during this period have performed relatively poorly (Chart 1.16). As explained in Section 2, lenders responded over the following year by curtailing unsecured lending and tightening credit standards, which may have further contributed to the recent bunching of defaults by making it more difficult for households to roll over loans.

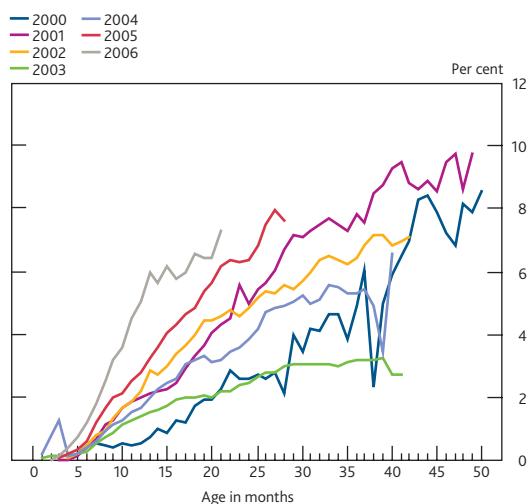
The outlook for personal bankruptcies is clouded by two uncertainties. First, there appears to have been some substitution away from debt management plans and bilateral agreements towards IVAs. This would imply that household financial distress is growing less quickly than official insolvency statistics may suggest. This may partly be because of a greater awareness of the IVA option, which appears to carry less stigma than bankruptcy. Second, there may have been a cultural shift in attitudes to debt and insolvency by some households. Bank contacts report that IVAs have been clustered along geographical lines and among certain occupations, suggesting that their take-up may have spread by word-of-mouth. A behavioural shift of this type makes predicting the future path of insolvencies particularly problematic, but suggests there is further potential upside risk to personal insolvencies.

Distress among UK unsecured debtors has contrasted with the robustness of the secured mortgage market. House prices rose by 10% during 2006, increasing the equity buffer for most UK mortgagees and offering a source of refinancing for homeowners with unsecured debts. Rising house prices have contrasted with weaker growth in rental rates. Defaults among buy-to-let investors are currently low. But rental yields remain below mortgage rates (Chart 1.17), and low by historical standards, suggesting that recent investors are relying on ongoing house price increases for their returns.

...as have delinquencies on US sub-prime mortgages.

Arrears on US sub-prime mortgages rose from around 10% in June 2005 to over 13% in 2006 Q4. Here too, lender behaviour has been an important factor (see Box 3). As mortgage refinancing volumes fell in 2003, lenders sought to maintain volumes for securitisation by offering riskier products

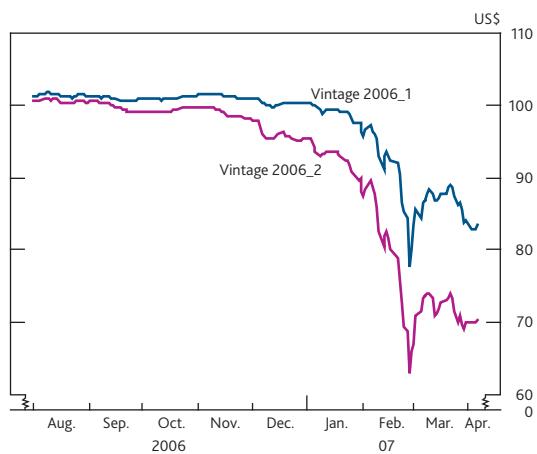
Chart 1.18 Arrears of 60+ days on US second-lien sub-prime home equity loans^(a)



Source: JPMorgan Chase & Co.

(a) Year refers to year of securitisation.

Chart 1.19 Prices of US sub-prime mortgage credit default swaps^(a)



Source: JPMorgan Chase & Co.

(a) Price of ABX.HE BBB-.

and pursuing riskier borrowers with low ‘teaser’ rates. Lending to sub-prime households remained strong even after a slowdown in the US housing market was clearly under way in early 2006. These recent loans have subsequently been the worst performing vintages (**Chart 1.18**). Delinquencies on US Alt-A mortgages, the risk category above sub-prime, have also risen, but less dramatically. Foreclosures and forced sales could increase the stock of unsold houses, putting further pressure on house prices and thereby affecting the ability of homeowners to refinance.

Portfolios of sub-prime mortgage loans are typically packaged into asset-backed securities (ABS) of varying degrees of subordination. These structured securities have junior notes (equity and mezzanine) which protect the senior, highly rated notes by absorbing the first losses. The first mezzanine tranches are usually rated at BBB and BBB-, just sufficient to be considered investment grade. The tranches are rated by agencies on the basis of an expected proportion of defaults in the underlying sub-prime mortgages. There is an actively traded credit default swap market, particularly for the mezzanine tranches. The prices in this market are summarised by a tradable index (the ABX.HE) which is referenced to specific ratings and sub-prime loan vintages.

As the extent of potential delinquencies on sub-prime mortgages increased in early 2007, the ABX.HE indices of BBB- tranches fell sharply (**Chart 1.19**) and spreads increased. The index of the second vintage of 2006 fell by more than the first vintage of 2006, consistent with the pattern of deterioration in underlying credit quality. These sharp movements in the indices primarily reflected the highly non-linear pay-offs for these intermediate tranches as the underlying sub-prime mortgage sector deteriorated.⁽¹⁾ But liquidity in these instruments is also limited and contacts suggest bid-ask spreads widened sharply as prices fell, contributing to the fall in prices. Ratings of ABS of sub-prime mortgages are expected to be lowered as delinquencies rise further through this year as interest rates on sub-prime loans are reset and losses on mortgages accumulate. Price falls could be exacerbated if downgrades push ratings below investment grade, forcing institutional investors that can only hold investment-grade assets to sell.

These episodes could provide a warning of corporate stress to come...

At this stage, the shocks to UK unsecured lending and the US sub-prime market have been concentrated in a small minority of households and neither is large enough to have a systemic effect on its own. What both episodes do reveal, however, is that pressures to sustain lending volumes can potentially undermine the quality of credit assessments.

(1) These intermediate tranches provide protection against narrow ranges of losses and therefore lose value quickly as expected losses rise through this interval.

Box 3

Could problems in US sub-prime mortgage markets be replicated elsewhere?

Section 1 discusses how the rapid deterioration in the US sub-prime mortgage market has so far remained relatively self-contained from other credit markets. The impact on the sub-prime market in the United Kingdom appears similarly limited. However, as Section 2 discusses, these events have raised concerns about the future profitability of banks and LCFIs, given their reliance on securitisation markets both as a generator of revenue and funding mechanism. And Section 3 considers some of the factors underlying the US sub-prime market that may have contributed to its current fragility.

The rapid growth of structured credit markets over the recent past has largely taken place in benign conditions. The recent problems in the US sub-prime market are an important test of the structure of this market and its performance in response to stress.⁽¹⁾ As such, the sub-prime market may provide a useful case study from which lessons can be drawn about other credit markets, such as the commercial real estate (CRE) and corporate credit markets.

Sub-prime market structure and dynamics

The US sub-prime market has a number of characteristics which have contributed to the recent problems:

- During 2005 and 2006, heightened competition between sub-prime originators to maintain volumes and/or increase market share led to product innovations, such as 'affordable lending' products, often incorporating low initial 'teaser' rates that are reset after two or so years.
- At the same time, there was an apparent weakening of lending standards — loans were made with increasingly high loan to value ratios and often without full documentation.
- Most originators sold on the loans to larger banks and LCFIs, who in turn securitised them and sold them to end-investors. As such, the banks and LCFIs had significant 'warehouses' of sub-prime assets. The distribution of assets from warehouses relies on continued market liquidity.
- Dealers purchasing mortgages from originators bid on the basis of a sample. If the whole pool of mortgages does not conform to this sample the dealer can 'put back' the loan pool to the originator. If the borrower makes no payments at all, or defaults in the first few months, this is classified as an 'early payment default' (EPD) and again the dealer can return the specific loan to the originator. The ability to return such loans helps to align the incentives between the

originators who underwrite the risk and the dealers who securitise the mortgages. However, having to take back the mortgages pushed some originators into bankruptcy, and the risk then flowed back to the banks and LCFIs that held their direct credit lines.

- Some hedge funds had positioned themselves to benefit from any fall in the price of the related sub-prime derivatives market — the ABX.HE — arising from a perceived deterioration in the US housing market. Due to their role as market-makers, dealers typically took the opposite position. Market contacts suggest that some dealers had partially hedged their resulting mezzanine exposures either in other vintages of ABX, other parts of the capital structure (senior or equity tranches) or in underlying cash or single-name CDS of ABS. As the price of the ABX.HE fell alongside the deterioration in the sub-prime mortgage market in February, many dealers faced unexpected losses on their derivatives positions as so-called 'basis risk' from the incompleteness of their hedges crystallised.

Wider issues highlighted by problems in the US sub-prime sector

These problems may give insights into potential problems in other markets, such as corporate credit and CRE, which share structural features with the US sub-prime market. Some similarities include:

- Strong investor demand for securitised assets, combined with benign market conditions, has sustained a heavy issuance of both residential (RMBS) and commercial mortgage-backed securities (CMBS).⁽²⁾ In turn, this seems to have led to an easing in underwriting standards, such as increasing 'covenant-lite' deals in the leveraged lending arena⁽³⁾ and weaker documentation requirements for CRE lending.
- The banks and LCFIs sponsoring securitisations face the same types of warehouse risk in securitising corporate and CRE loans as for residential mortgages. Indeed, some of these collateral pools will be subject to longer warehouse accumulation periods than retail mortgages as it takes time to accumulate a stock of comparable loans.
- As discussed in Section 3, given that risk is transferred to other market participants, there are concerns that the 'originate and distribute' model might dilute incentives for the effective screening and monitoring of loans in the corporate market, as appears to have occurred in the sub-prime market.
- The structured corporate credit market is characterised by new types of investor and a concentration of credit risk in lower-rated tranches. CDO managers are typically the

main distribution channels for mezzanine tranches of both sub-prime ABS and corporate credit deals. There are also some hedge funds who purchase the higher risk equity tranches of both. Any fall in demand from these investors could cause a sharp rise in the cost of debt to firms.

- The embedded leverage in CDOs is common across sub-prime, CRE and corporate credit markets and could magnify the market response if there was a particularly sharp deterioration in the performance of underlying assets.
- The tightening in sub-prime mortgage lending standards now under way is likely to exacerbate problems for new and existing borrowers who may find it more difficult to refinance. This dynamic may provide an indication of what could happen in CRE and corporate credit markets — particularly LBOs — if and when underwriting standards are significantly tightened.

Although the sub-prime and other structured credit markets share a number of similarities, there are also some important differences. These include:

- Corporate loan prices do not appear to have been driven by demand to the same extent as MBS. And corporate credit securitisations tend to be more diversified than sub-prime MBS, with greater differentiation across the risk factors that corporates are exposed to.
- 'Put backs' and EPDs appear to be a feature of the sub-prime mortgage market. Although there is evidence that CDO managers sometimes replace loans which default early, the prevalence of 'put backs' or EPDs does not appear as common in the corporate credit market.

- Credit analysis may be more extensive in corporate credit and CRE lending than sub-prime lending, due both to the size of the individual deals (which are often rated) and the fact that the arranging institution usually retains at least some exposure.
- In the case of sub-prime mortgages, although tranches of the subsequent securitisations are rated, the underlying loans are not. As such, they cannot be individually downgraded and early warning signs arise only from delinquencies. Due to their size, some CRE loans are not individually rated, although larger single-name deals tend to be. The speed of transmission from the cash market to the securitisation and structured credit markets may be faster in corporate credit, since the underlying assets are rated and so any downgrades can quickly affect the ratings of tranches.

As discussed in Section 3, structured credit markets have expanded rapidly in benign conditions and their resilience in less favourable conditions has not been severely tested. Although both the sub-prime and corporate credit markets do exhibit significant differences, the common factors suggest there is merit in risk managers examining carefully lessons arising from the recent sub-prime episode.

(1) Credit markets were also tested to some extent during 2001 and 2002 as a result of the US corporate accountancy scandals and by the Ford/GM downgrades in May 2005.

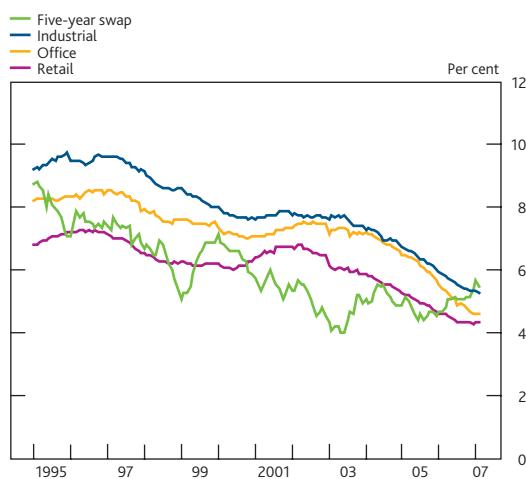
(2) The CMBS market has grown substantially over recent years, by over 270% between 2002 and 2006. But despite global CMBS issuance of around \$300 billion in 2006, of which the United Kingdom accounted for about \$20 billion, the CMBS market remains considerably smaller than the RMBS market.

(3) Declining credit quality is reflected in ratings, to some extent. The rating agencies are rating a greater share of new issuance at lower levels (ie with higher assumed levels of default). The extent to which qualitative factors, such as weakening covenants, are taken into account by rating agencies is unclear.

Strong lending and associated asset price growth support returns, increasing pressures to originate new loans. While this process continues in an apparent virtuous spiral, confidence is sustained and default rates stay low. Indeed, the absence of credit events itself makes modelling default probabilities difficult. But as default rates rise, confidence in credit quality can quickly be undermined as models break down. There is a risk that this dynamic could occur in other markets. For example, there are some similarities between the structure and incentives of the US sub-prime mortgage market and the structured credit market for corporate debt and commercial property mortgages. These similarities (and important differences) are discussed in more detail in Box 3.

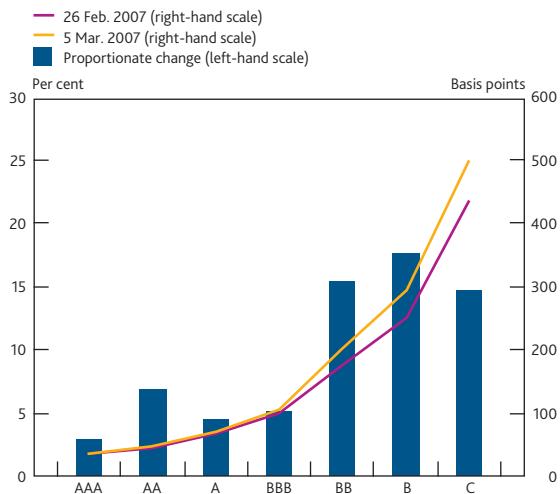
Against this background, one area that appears potentially vulnerable in the United Kingdom is commercial property. It has experienced low default rates recently and strong price and lending growth. Prices have been boosted by both low

Chart 1.20 Initial rental yield on commercial property and the swap rate



Sources: Bloomberg and Thomson Datastream.

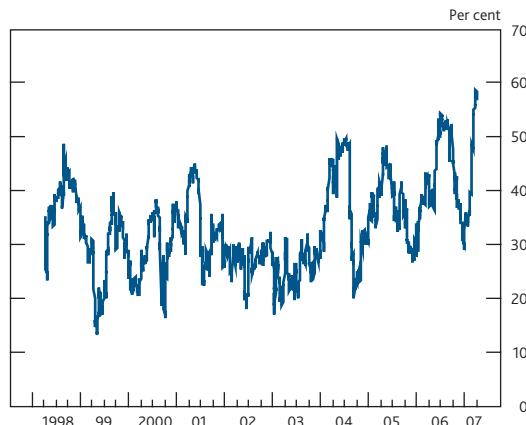
Chart 1.21 Global corporate bond spreads by rating^(a)



Source: Merrill Lynch.

(a) Option-adjusted spreads over government bonds.

Chart 1.22 Common component in asset prices^(a)



Sources: Goldman Sachs, Merrill Lynch, MSCI and Bank calculations.

(a) Proportion of variation in global equities, emerging market equities, high-yield spreads and commodities explained by a common component over a three-month rolling window.

interest rates and increased demand from retail and wholesale investors, based both in the United Kingdom and overseas.

Prices rose by 11% in the year to February 2007, although the rate of increase has moderated slightly in recent months, having peaked at over 15% in July 2006. Rental growth has lagged behind and rental yields are now below the cost of finance, as proxied by the five-year swap rate (**Chart 1.20**).⁽¹⁾ At the same time, competition among banks to provide finance to commercial property companies has led to an easing in lending terms and conditions, including falls in the minimum interest margin and interest cover, and a rise in the maximum loan to value ratio.

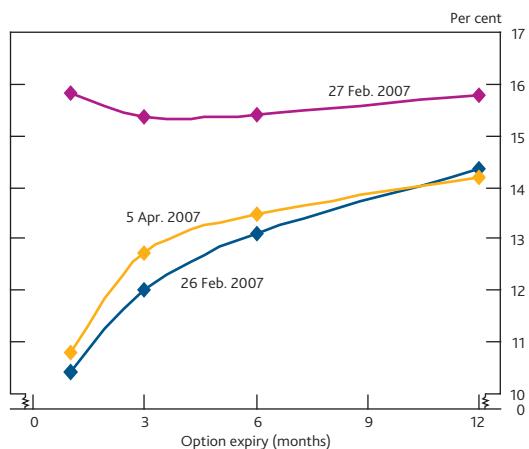
...and recent market turbulence also illustrates some of these developments.

Many of the themes discussed above — low risk premia, rising leverage and spillovers between macroeconomic and financial conditions — came together at the end of February and the beginning of March. Data releases suggesting a softening in the US economic outlook and the collapse of several US mortgage originators triggered a global re-pricing of risky assets. The prices of high-risk assets fell more than low-risk assets, suggesting that risk aversion rose somewhat. For example, lower-rated corporate bond spreads rose by more (in absolute and relative terms) than for higher-rated bonds (**Chart 1.21**). But the price falls and spread increases over this period were modest compared with changes since the July 2006 *Report* and in a longer-run context (**Table 1.A**).

These falls in asset prices across a range of markets were mirrored in a sharp pickup in asset price correlations. To illustrate this across a range of risky assets, **Chart 1.22** shows a measure of a common driving factor. During March, this common component rose to its highest level since the series began in 1998. Implied volatility measures also jumped higher towards the end of February, although by more at short maturities than long (**Chart 1.23**). Highly leveraged positions are particularly vulnerable to falling prices, high correlations between asset price movements and rising volatility and contacts report that prices movements were amplified by investors trying to scale down risk positions. These events underscore that as financial markets have become increasingly internationally integrated, shocks originating in one country can be rapidly transmitted elsewhere. As a result, prices are likely to move together in periods of distress, reducing the scope for diversification against large shocks (see Box 4 in Section 2). As such, investors may be less hedged than they think against such large shocks.

Many economic and financial activities over the past few years appear to have been predicated on continued benign

(1) See speech by Nigel Jenkinson, 'Risks to the commercial property market and financial stability', at the IPD/IPF Property Investment Conference, 30 November 2006, available at www.bankofengland.co.uk/publications/speeches/2006/speech293.pdf.

Chart 1.23 S&P 500 implied volatility

Source: Bloomberg.

macroeconomic conditions, strong credit availability and high liquidity. The volatility in financial markets in late February and early March demonstrates that markets may be unusually sensitive at present to potential disturbances to this environment. But that adjustment proved to be short-lived and asset price falls over this period look small in an historical context. It will be interesting to see whether this recent episode will follow the same pattern as in May and June 2006. Then, risk appetite returned quickly following the period of volatility, reinforcing market participants' views about ongoing stability and encouraging a further round of risk-taking. With asset prices having already largely recovered their losses from earlier in the year, this pattern shows signs of being replicated.

2 Structure of the UK financial system

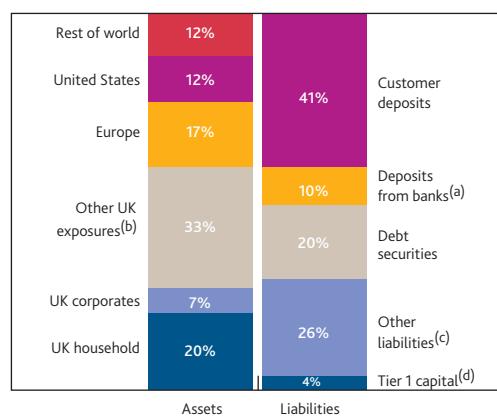
The major UK banks have been increasing their trading and investment banking activities, including through greater participation in the syndicated leveraged loan market. Growth in secured lending to UK households and UK corporate sector lending remains strong, in particular to commercial property companies. Losses to UK banks arising from UK household sector insolvencies have been material, but so far are confined to unsecured lending. The major UK banks are financing more lending through securitisation, which exposes them to funding liquidity risk if market conditions deteriorate. Large complex financial institutions (LCFIs) continue to grow their balance sheets, leading to some concentrations in risk. Their activities in the US sub-prime mortgage market have led to some questions about the sustainability of the high revenues generated by an 'originate and distribute' business model, as well as wider concerns about their emphasis on market share rather than financial risk.

This section discusses recent developments in the structural characteristics of the UK financial system and how they relate to the macroeconomic and capital market developments discussed in Section 1.

Overview of risks to the UK banking sector.

The structure of the UK financial system has been changing in recent years as the major UK banks⁽¹⁾ have made greater use of financial markets to generate revenues, obtain funding for lending and manage credit risk. UK banks are syndicating more loans, securitising more of their on balance sheet assets and are engaging in more credit derivatives activity. There has been a gradual shift towards an 'originate and distribute' business model. This may point to more effective management by the major UK banks of their funding liquidity and credit risks, as on balance sheet exposures are increasingly likely to be hedged or held in the form of liquid, tradable assets. But it also exposes the major UK banks to the risk that liquidity is withdrawn from credit markets, where this is supported by LCFIs⁽²⁾ and other financial institutions, including hedge funds. The major UK banks are further exposed to market and liquidity risks through their trading activities, which have grown rapidly in recent years.

Chart 2.1 Major UK banks' aggregate balance sheet at end-2006



Sources: Bank of England, FSA regulatory returns, published accounts and Bank calculations.

(a) Includes borrowing from major UK banks.

(b) Includes (among other items) loans to UK-resident banks and other financial corporations and holdings of UK government debt.

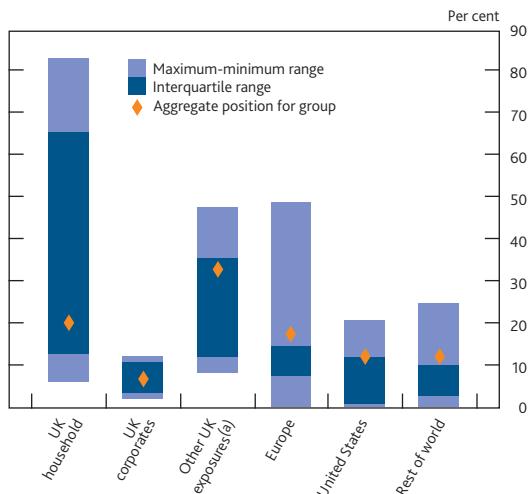
(c) Includes Tier 2 capital, short positions, insurance liabilities and derivative contracts with negative marked-to-market value.

(d) Assets are not risk weighted. As a percentage of risk-weighted assets, Tier 1 capital is 8%.

(1) Membership of the major UK banks group is based on the provision of customer services in the United Kingdom, regardless of the country of ownership. The following financial groups, in alphabetical order, are currently members: Alliance & Leicester, Banco Santander, Barclays, Bradford & Bingley, HBOS, HSBC, Lloyds TSB, Nationwide, Northern Rock and RBS.

(2) LCFIs include the world's largest banks, securities houses and other financial intermediaries that carry out a diverse and complex range of activities in major financial centres. The group of LCFIs is identified currently as: ABN Amro, Bank of America, Barclays, BNP Paribas, Citi (formerly Citigroup), Credit Suisse, Deutsche Bank, Goldman Sachs, HSBC, JPMorgan Chase & Co., Lehman Brothers, Merrill Lynch, Morgan Stanley, RBS, Société Générale and UBS.

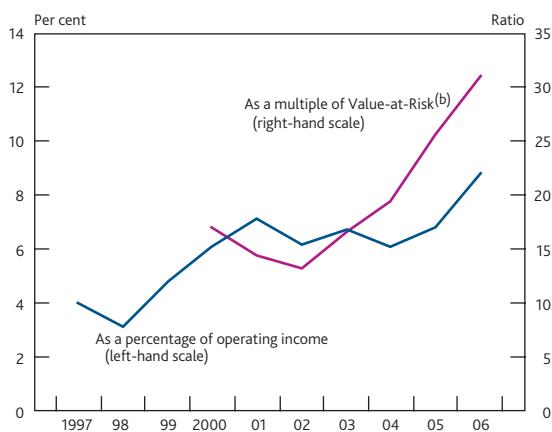
Chart 2.2 Major UK banks' exposures as a share of total assets at end-2006



Sources: Bank of England, FSA regulatory returns, published accounts and Bank calculations.

(a) Includes (among other items) loans to UK-resident banks and other financial corporations and holdings of UK government debt.

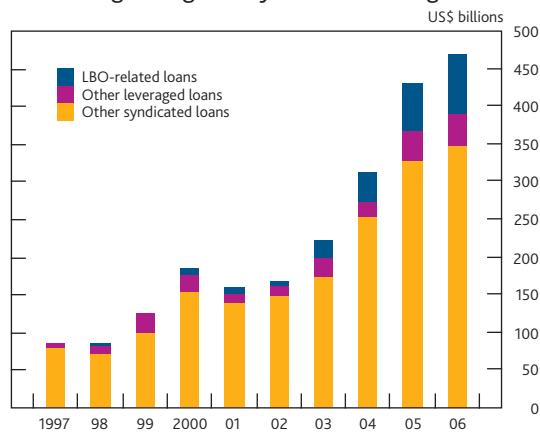
Chart 2.3 Major UK banks' aggregate trading income^(a)



Sources: Bank of England, published accounts and Bank calculations.

(a) Data included only for those major banks that report trading income and Value-at-Risk.
(b) Aggregate Value-at-Risk standardised to sterling, 99% confidence interval and a ten-day holding period.

Chart 2.4 Major UK banks' participation as lead arrangers in global syndicated lending^{(a)(b)}



Sources: Dealogic and Bank calculations.

(a) Excludes amendments and unsigned loans.

(b) When the proportions provided by each syndicate member are unknown, loan amounts have been split equally among participating banks.

Chart 2.1 shows a stylised representation of the major UK banks' aggregate balance sheet at end-2006. UK banks are exposed to counterparty credit and interest rate risk through their lending to each other and to other financial institutions, most notably non-UK LCFIs. Claims on overseas borrowers represented just over two fifths of the major UK banks' total balance sheet assets at end-2006. All the major UK banks are exposed to domestic credit and interest rate risk through their lending to the UK household and corporate sectors, although this exhibits significant variation across the group (Chart 2.2).

UK banks' exposures to market and corporate credit risks are growing...

The major UK banks' trading activities remain concentrated among the internationally active banks. For those institutions, the aggregate share of trading income in total operating income has risen sharply during the past two years to just under 9% at end-2006 (Chart 2.3). As a multiple of disclosed Value-at-Risk (VaR), the rise in trading income is even more marked. This could mean that UK banks are diversifying their portfolios more efficiently. But it is more likely to reflect the fact that, among other things, VaR may not adequately capture liquidity and model risks arising from the UK banks' increasing activities in credit markets.

The participation of the major UK banks as lead arrangers⁽¹⁾ of global syndicated loans has continued to rise, albeit at a slower rate than in recent years (Chart 2.4). The share accounted for by leveraged (typically sub-investment grade) borrowers rose slightly, from 24% in 2005 to 26% in 2006, driven mainly by an increase in leveraged buyout (LBO) transactions. As discussed in Section 1, this reflects higher LBO loan issuance globally in 2006. The major UK banks participating in these transactions typically appear to distribute around 70% of their exposures within 120 days of the deal being finalised.⁽²⁾ As with other types of syndicated lending, banks are exposed to 'warehousing' risk during this period — the possibility that losses materialise prior to distribution or that market liquidity deteriorates leaving banks with larger exposures than they may have anticipated. But based on the major UK banks' participation as lead arrangers of LBO-related loans, the eventual credit risk retained on balance sheet would appear to be relatively modest. The maximum value of deals arranged by one or more of the major UK banks during any 120-day period in 2006 was just over 1% of the participating banks' total assets.

Growth in major UK banks' lending to domestic non-financial companies has remained strong, particularly to UK commercial

(1) Lead arrangers are the set of banks that manage the syndication process, including selling the deal to the market and offering bridging finance, a facility that may or may not be called.

(2) FSA (2006), 'Private equity: a discussion of risk and regulatory engagement', Discussion Paper 06/06, November, available at www.fsa.gov.uk/pubs/discussion/dp06_06.pdf.

Chart 2.5 Annual growth rate of major UK banks' lending to UK non-financial companies^(a)

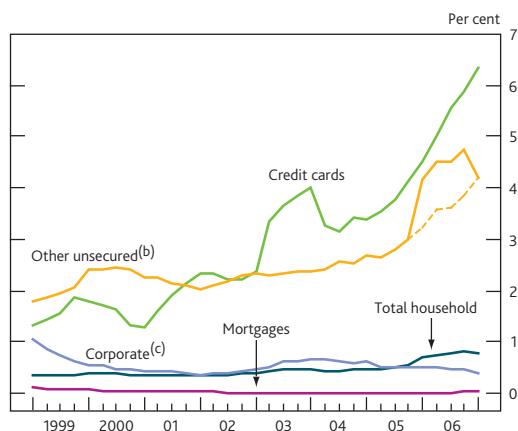


Source: Bank of England.

(a) Data exclude Nationwide.

(b) Includes lending to real estate companies.

Chart 2.6 Major UK banks' annual write-off rates^(a)



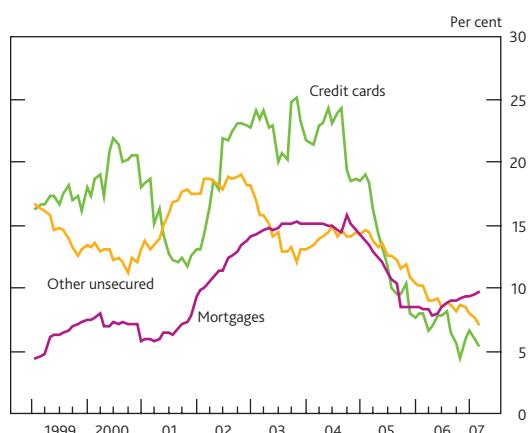
Sources: Bank of England, FSA regulatory returns and Bank calculations.

(a) Calculated quarterly as write-offs over previous year divided by average stock of lending.

(b) Dashed line shows the rate excluding a one-off write-off of £0.7 billion in 2005 Q4, which distorted the series.

(c) Data exclude Nationwide.

Chart 2.7 Annual growth in major UK banks' lending to UK households



Sources: Bank of England and FSA regulatory returns.

property companies (**Chart 2.5**),⁽¹⁾ while annual write-off rates on this lending have remained low. According to market contacts, however, credit conditions have been tightened in recent months reflecting concerns about the sustainability of commercial property price growth. The commercial property sector has been a source of substantial credit losses to UK banks in the past, with write-offs typically more cyclical than on other corporate exposures. At end-2006, 37% of the major UK banks' stock of lending to the UK corporate sector was accounted for by commercial property companies, with lending concentrated among a few banks.

...while the performance of unsecured and secured UK household lending has diverged...

The sharp rise in UK personal insolvencies highlighted in Section 1 has been reflected in losses on UK banks' unsecured lending to UK households. The annual write-off rates on credit cards and other unsecured lending reached 6.3% and 4.2% respectively in 2006 Q4 (**Chart 2.6**). Unsecured lending growth has continued to slow, consistent with a tightening of credit conditions by the major UK banks over the past two years (**Chart 2.7**). Banks have tightened acceptance criteria and have cut credit limits to heavily indebted borrowers, a process aided by improvements in the amount and quality of data sharing between banks. In particular, UK banks have been building 'positive' data⁽²⁾ into their credit risk models. Reflecting these developments, several of the major UK banks have expressed optimism that losses on UK unsecured lending may be stabilising. But, given difficulties in predicting the future path of personal insolvencies, the outlook for unsecured write-offs remains uncertain.

The annual write-off rate on secured lending, which accounted for 88% of the major UK banks' aggregate exposure to the UK household sector at end-2006, remained extremely low at 0.03% in 2006 Q4 (**Chart 2.6**). To date, there are no signs of spillover from the problems in the unsecured market. Growth in UK banks' lending secured by residential property has strengthened since the July 2006 Report (**Chart 2.7**), reaching 9.4% at the end of February 2007.

Growth in specialist mortgage lending (including sub-prime⁽³⁾ and buy-to-let) has recently outpaced mainstream mortgage lending in the United Kingdom. Recent problems in the US sub-prime mortgage market have highlighted the risks associated with this type of lending. However, UK sub-prime

(1) This includes companies involved in the development, buying, selling and renting of real estate. Exposures do not include banks' holdings of commercial mortgage-backed securities or loans to other companies collateralised by UK real estate.

(2) Negative credit data refer to information on individuals who have failed to meet their financial obligations, such as data on late payments or bankruptcies. Positive data refer to information on the financial circumstances of all individuals, such as an individual's overall credit exposure and repayment patterns.

(3) In the United Kingdom, there is no standard definition for sub-prime mortgage lending. The term is used here to refer to 'adverse credit' mortgages, which includes lending to borrowers who have experienced material and recent credit difficulties.

lending flows have accounted for a lower proportion of total mortgage lending than in the United States and underwriting standards appear to have remained tighter. Contacts report that the major UK banks' exposure to the UK sub-prime mortgage market is currently small, with activity dominated by specialist lenders. The major UK banks are more active in the buy-to-let market, which accounted for just under 9% of the total stock of UK mortgage lending at end-2006. Competition has reduced buy-to-let lending rates to levels only marginally above those on mainstream mortgage lending and average minimum rental cover levels have fallen.⁽¹⁾ Arrears rates on buy-to-let lending are currently low. However, the relatively short history of the market raises concerns that its resilience and the credit risk models used by banks to manage this risk have not been challenged by a severe downturn in the housing market.⁽²⁾

...and wholesale funding is increasingly sourced through securitisation...

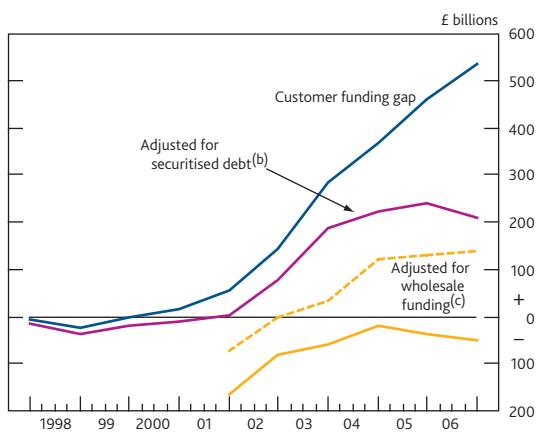
Over the past five years, the customer funding gap,⁽³⁾ which measures the amount of customer lending not financed through customer deposits, has widened significantly. It stood at around £530 billion at end-2006 (**Chart 2.8**), or 23% of customer lending. This indicates an increased reliance on wholesale funding, which is typically more expensive than customer deposits and is more sensitive to changes in investor sentiment and market conditions.

In recent years, the customer funding gap has been met increasingly with funding from securitisations, which reduces the maturity mismatch between assets and liabilities.⁽⁴⁾ Adjusting for securitisation, the gap has stabilised over the past two years and is now around £210 billion. **Chart 2.8** shows that, in aggregate, the wholesale funding used to meet this remaining gap has an outstanding maturity of greater than three months, thereby limiting the major UK banks' need to roll over very short-term funding to finance customer lending. However, there remains a significant pool of customer lending being financed by wholesale funding that needs to be renewed within a year. Problems could also arise if market conditions deteriorated so that UK banks found themselves unable to securitise existing assets and thereby free up funds for new business.

...while direct 'large exposures' to each other and to LCFIs are falling...

Regulatory 'large exposures' capture major exposures of the UK banks to each other and to other financial institutions (as

Chart 2.8 Major UK banks' customer funding gap^(a)

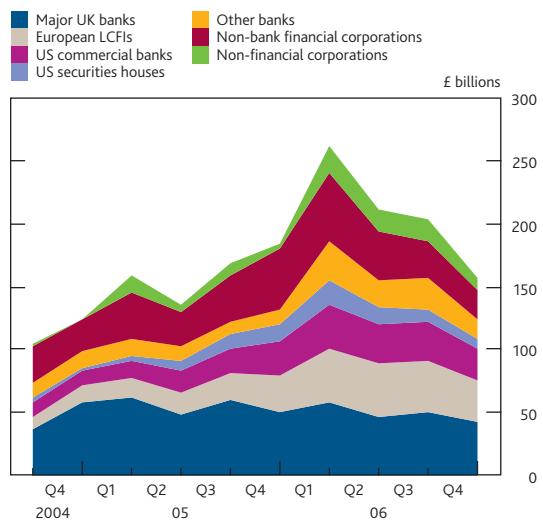


Sources: Dealogic, published accounts and Bank calculations.

- (a) Data exclude Nationwide.
- (b) Customer funding gap less securitised debt. Where not available, stocks of securitisations are estimated from data on flows of issuance.
- (c) Customer funding gap less wholesale funding with an outstanding maturity of more than three months (solid line) or with an outstanding maturity of more than one year (dashed line).

- (1) Minimum rental cover refers to the proportion of the monthly repayment on a buy-to-let mortgage that the lender requires the rent on a property to cover.
- (2) Prior to the 1996 launch of the buy-to-let scheme, banks treated borrowers like any other business start-up and typically required deposits of at least 50% of the property's value. See Thomas, R (2006), 'The growth of buy-to-let', Council of Mortgage Lenders Housing Finance, Issue 09.
- (3) The customer funding gap is customer lending less customer funding, where customer refers to all non-bank borrowers and depositors.
- (4) Mortgage-backed securities provide matched funding for mortgage lending.

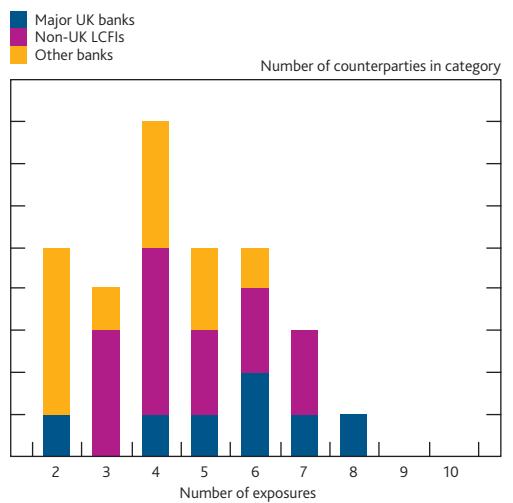
Chart 2.9 Major UK banks' 'large exposures' by type of counterparty^(a)



Sources: FSA regulatory returns and Bank calculations.

(a) Based on exposures that exceed 10% of eligible capital at the end of the reporting period.

Chart 2.10 Incidence of common 'large exposure' counterparties during 2006 Q4^(a)



Sources: FSA regulatory returns and Bank calculations.

(a) Based on exposures that exceed 10% of eligible capital during the reporting period.

well as non-financial institutions), through both on and off balance sheet transactions.⁽¹⁾ In aggregate, these exposures have been falling over the past three quarters (Chart 2.9), perhaps suggesting a slight fall in concentration risk. There has been some unwinding of large exposures to other financial firms, while a number of other exposures have fallen below the regulatory reporting threshold. Nonetheless, these exposures are still significant. At the end of 2006, large exposures to non-UK LCFIs, which accounted for just over two fifths of the total, amounted to £67 billion, or 39% of the major UK banks' Tier 1 capital.

From a systemic viewpoint, the incidence of common large exposure counterparties to the major UK banks is also important — the higher the incidence, the greater the potential loss to UK banks were that counterparty to fail. The pattern of large exposures exhibits some variation from quarter to quarter. During 2006 Q4, there were fourteen financial institutions that five or more of the major UK banks shared as large exposure counterparties (Chart 2.10), up from twelve during 2006 Q1. The data also illustrate the strong interlinkages between the major UK banks, with four banks appearing as large exposure counterparties to six or more of the peer group during 2006 Q4.

...although other interlinkages are significant.

These large exposures data do not cover intraday exposures and hence provide only a partial picture of counterparty credit exposures between the major UK banks and other financial institutions. Some institutions act as correspondent banks, which may involve extending large, uncollateralised, intraday loans to customer banks. For example, around half of all average daily CHAPS⁽²⁾ sterling payments (around £230 billion) are carried out on behalf of customer banks, with another £60 billion⁽³⁾ relating to payments between customers of the same correspondent bank. Similarly, institutions providing custody services may grant their customers intraday credit to facilitate timely settlement of securities transactions, some of which may be unsecured. The global custody business is a highly concentrated market, with just four institutions (two of which are LCFIs) acting as custodian for around three quarters of all assets, in value terms.

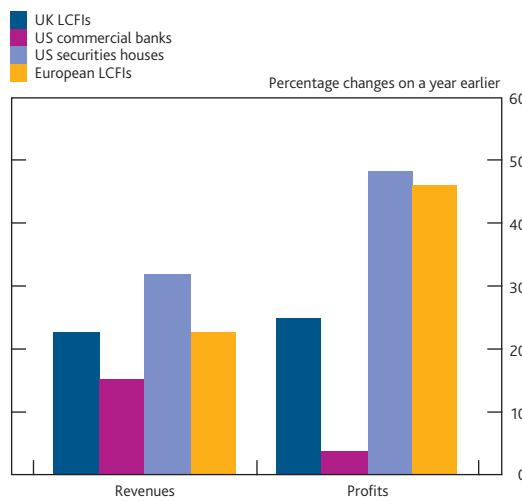
Another source of interbank exposures not reflected in the large exposures data arises from the settlement of foreign exchange trades, where banks are exposed to their counterparty from the time when they send the sold currency until they receive their bought currency. The risk of these exposures is limited by Continuous Linked Settlement (CLS), through which the four UK CLS members reported in 2005 Q3

(1) For regulatory purposes, 'large exposures' are defined as any exposures that exceed 10% of eligible capital (Tier 1 plus Tier 2 capital, less any regulatory deductions).

(2) CHAPS is the United Kingdom's high-value payments system.

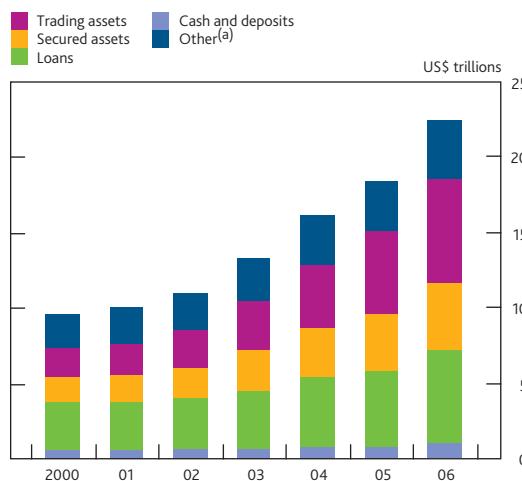
(3) See Harrison, S, Lasaosa, A and Tudela, M (2005), 'Tiering in UK payment systems: credit risk implications', *Financial Stability Review*, December, pages 63–72.

Chart 2.11 Revenue and profit growth at LCFIs' corporate and investment banking units at end-2006



Sources: Published accounts and Bank calculations.

Chart 2.12 LCFIs' total assets



Sources: SEC filings, published accounts and Bank calculations.

(a) Other includes (among other items) receivables, investments, goodwill and property.

that they were settling on average between 40% and 65% of the total value of their foreign exchange trades. But even after reductions in risk offered by other payment-versus-payment methods and bilateral netting agreements, the remaining exposures can be substantial.

LCFI revenues and balance sheets are growing strongly...

LCFIs, which include a subset of the major UK banks, are important to the UK financial system not only as counterparties to UK banks, but also as key risk intermediaries and liquidity providers in capital markets. As a group, the LCFIs continued to perform strongly throughout 2006, with revenue growth particularly robust for the US securities houses and, consistent with that, for the corporate and investment banking (CIB) units of the US commercial banks and European and UK LCFIs (**Chart 2.11**). At group level, revenue growth was led by income from fees and commissions and trading activities. Net interest income grew only slightly during 2006, by 5%, compared with 35% growth in trading revenue and 20% in fees and commissions.

These activities are reflected in the changing composition of the LCFIs' balance sheets. Balance sheets continued to grow rapidly in 2006, with total assets now having more than doubled since 2000 (**Chart 2.12**). A large component of this growth has come from increased holdings of trading assets. This is due in part to greater principal risk-taking, but also reflects increased warehousing of assets supporting 'originate and distribute' activity. Among the US LCFIs, for example, the category of trading assets that has experienced the strongest growth since 2003 includes mortgages that have been originated or purchased for distribution via securitisation. Secured assets, associated with prime brokerage activity as well as more traditional repo transactions,⁽¹⁾ have also grown substantially.

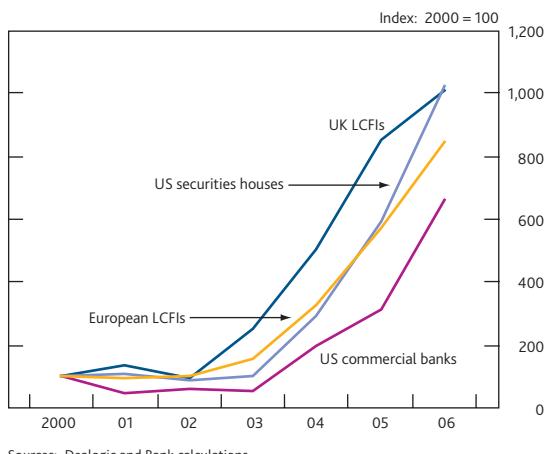
...reflecting diversification at the institutional level...

At the institutional level, LCFIs are becoming more diversified. For example, the US commercial banks continue to grow their CIB arms. This was reflected in a significant increase in compensation costs during 2006. There is evidence to suggest that the US commercial banks have increased their exposure to the commodities market in recent years, with the commodities VaR measures of those US commercial banks that publish a breakdown having doubled since 2003 Q4.⁽²⁾

Activities traditionally dominated by the US commercial banks have seen increased participation by the UK and European

(1) Banks can earn a spread and trading income through engaging in repurchase agreements (repos) and reverse repo transactions, as well as using these for funding their own holdings of securities.

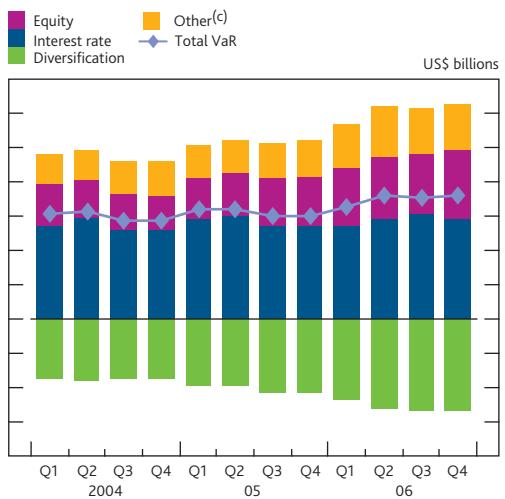
(2) For more information on recent developments in commodity markets, see FSA (2007), 'Growth in commodity investment: risks and challenges for commodity market participants', *Occasional Paper*, March, available at www.fsa.gov.uk/pubs/other/commodity_invest.pdf.

Chart 2.13 LBO lending by LCFIs^{(a)(b)}

Sources: Dealogic and Bank calculations.

(a) Excludes amended and unsigned loans.

(b) Where the actual proportions provided by each syndicate member are unknown, loan amounts have been split equally among participating banks.

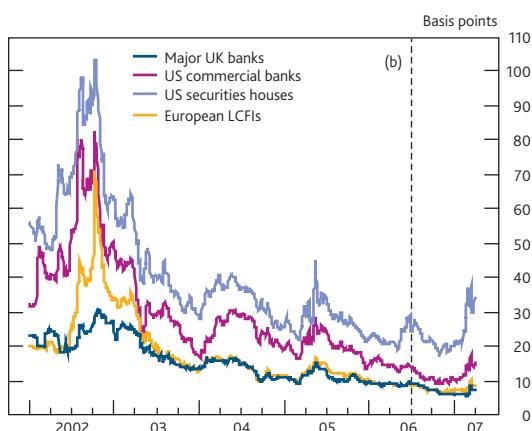
Chart 2.14 LCFIs' Value-at-Risk^{(a)(b)}

Sources: Bank of England, published accounts and Bank calculations.

(a) Standardised to US dollar 99% confidence interval and a ten-day holding period.

(b) Data for selected LCFIs. Where unavailable, quarterly data are inferred from annual or semi-annual data.

(c) Includes (among other items) commodities and foreign exchange.

Chart 2.15 Major UK banks' and LCFIs' credit default swap premia^(a)

Sources: Bloomberg, Markit Group Limited, published accounts and Bank calculations.

(a) Asset-weighted average five-year premia.

(b) July 2006 Report.

LCFIs and the US securities houses. Since 2000, the value of syndicated loans in which LCFIs other than the US commercial banks have acted as lead arranger has increased significantly, particularly for LBO-related transactions for which the fees and commissions are especially lucrative (**Chart 2.13**). A similar pattern can be seen for non LBO related leveraged lending. There is also evidence that the US securities houses are increasing their off balance sheet commitments, traditionally a commercial bank activity that allows companies to access credit on demand.

...but exposing the group to common sources of risk...

As the activities of different LCFI subgroups are becoming less distinct, there are signs of exposure to some common sources of risk. Increased trading activity clearly exposes the LCFIs to a sharp rise in asset price volatility and/or correlation. However, reported VaR measures continue to suggest that exposure to market risk is limited, despite strong trading revenues (**Chart 2.14**). This could be indicative of a genuine increase in risk-adjusted returns, but is more likely to reflect the influence of current benign conditions, including low volatility, on the VaR measures. If market conditions were to change rapidly, this could have a potentially significant impact on VaR (see Box 4). The complexity of instruments traded in the credit markets and held by LCFIs raises further concerns as to the adequacy of models used to assess and manage their risks, particularly where these have not been tested during a downturn.

The recent increase in defaults on US sub-prime lending has raised concerns about the future profitability of business models that rely on the generation of revenue through the origination and distribution of credit exposures. These concerns are apparent in the rise in the market's assessment of the default probabilities of the US securities houses, albeit from low levels, as proxied by credit default swap (CDS) premia (**Chart 2.15**). These institutions have been the most active issuers of residential mortgage-backed securities (RMBS) backed by US sub-prime mortgages in recent years (**Chart 2.16**), exposing them to losses on their warehouses of sub-prime mortgage loans. In addition, LCFIs would suffer a loss of future revenue if demand in the market for new securitised notes was to dry up.

The more modest rise in CDS premia for other institutions, including the major UK banks, reflects their relatively limited exposure to the US sub-prime mortgage market. But this episode does highlight the risk that credit spreads could rise in other, more significant, structured credit markets — for example, a rise in corporate defaults could lead to warehousing losses and reduce LCFI revenues from their LBO-related activity and subsequent distribution of leveraged loans (see Box 3 in Section 1).

In large part, the continued appetite of the LCFIs to take on risk, despite a growing recognition that market conditions are

Box 4

Assessing the sensitivity of Value-at-Risk to measures of stress

As noted in previous *FSRs*, disclosed Value-at-Risk (VaR) measures have remained relatively stable in recent years while the trading revenues of the major UK banks and LCFIs have risen strongly.⁽¹⁾ One explanation for this is that current measures of VaR may be understating risk due to the combined effects of their largely backward-looking nature and the recently benign financial market conditions. This highlights the need (which is recognised by most financial firms) to examine VaRs under stressed market conditions.

The VaR of a portfolio is affected by the volatility of asset returns and the correlations between them. A change in either of these measures can have a significant impact on VaR. This point can be illustrated by testing the effect of 'stressed' volatilities and correlations on the VaR of a simple theoretical portfolio. This portfolio is intended to proxy the decomposition of VaR by asset class of a representative UK bank.⁽²⁾

The portfolio contains exposures to: interest rate risk through a long position in government bonds; spread risk through a swaps book that generates a profit when swap spreads rise; and a long position in equities and foreign exchange.⁽³⁾

The stylised scenario is based on the events of Autumn 1998, around the time of the difficulties at the hedge fund Long-Term Capital Management (LTCM). It is treated as a global event (with no foreign exchange impact), characterised by a perfectly correlated move out of risky assets (equities and swaps) into government bonds, representing a so-called 'flight to quality'.⁽⁴⁾ Volatilities are doubled compared with the baseline scenario, broadly capturing the change in observed market behaviour during the most volatile period of 1998 (between LTCM's recapitalisation on 23 September and the US Fed inter-meeting rate cut on 15 October) compared with the first half of the year (Table 1).

The results of applying stressed volatilities and correlations to the baseline VaR are shown in Chart A.

Stressing volatilities alone causes individual VaRs to double. Correlations are stressed both within asset classes and between asset classes, and both of these changes act to increase VaR. First, as intra-asset class correlations are set to one, any diversification benefit within each asset class is reduced, causing individual VaRs to increase. Second, as inter-asset correlations are stressed, the risks of the two largest positions — the government bond and swaps books — are compounded at the portfolio level. This reduces the portfolio diversification effect relative to the baseline VaR.

Table 1 1998 average volatility indices^{(a)(b)}

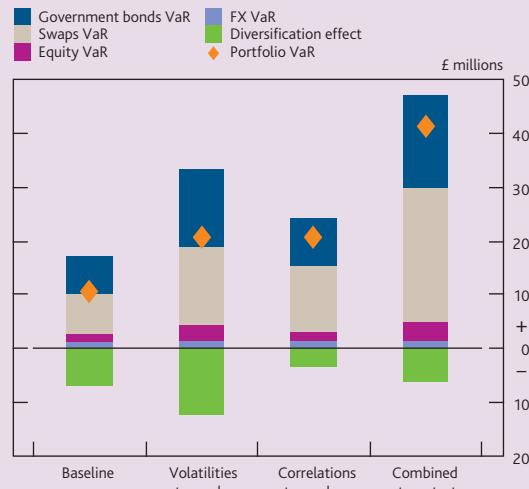
Significant news:	6 July: Salomon Bros. arbitrage desk disbanded	17 August: Russian ruble devaluation	23 September: LTCM recapitalisation	15 October: Inter-meeting US Fed rate cut
Asset class	6 July to 14 Aug.	17 Aug. to 22 Sept.	23 Sept. to 15 Oct.	16 Oct. to 31 Dec.
Swap spreads	103	181	250	162
Equity prices	121	229	248	134
Government bond yields	63	148	226	142
Average volatility (unweighted)	96	186	241	146

Sources: BIS and Bank calculations.

(a) Volatility over period 1 January to 3 July 1998 = 100.

(b) The volatility for each asset class is calculated as the simple average of the volatilities of a range of assets denominated in different currencies and, where relevant, maturities.

Chart A Baseline versus stressed VaRs^(a)



Sources: Bloomberg, Board of Governors of the Federal Reserve, Thomson Datastream and Bank calculations.

(a) The diversification effect is calculated as the sum of individual asset class VaRs minus portfolio VaR.

Combining stressed volatilities and correlations amplifies the effects of these movements, leading to an almost fourfold increase in portfolio VaR. This probably provides an upper bound on the sensitivity of VaR measures given the severity of the underlying assumptions: the rise in VaR would be lower for a more diversified portfolio under the flight to quality scenario, for example if the swaps book position was reversed or was replaced by a larger long exposure in equities. Nonetheless, the stressed VaR measures further underscore the pitfalls of using VaR as an indication of future risk, or as a basis for setting margining policy.

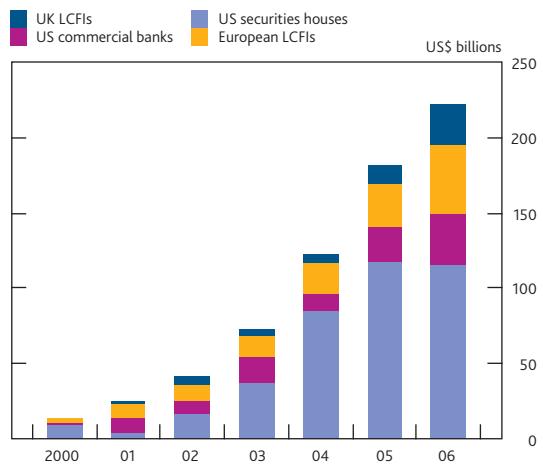
(1) See, for example, July 2006 Report, Box 3 'Trading revenues and Value-at-Risk'.

(2) VaR measures the worst loss likely to occur over a given holding period, for a chosen level of confidence. Baseline results are presented for a 95th percentile VaR calculated over a one-day holding period, using market data from March 2005 to March 2007. The underlying portfolio does not include complex positions such as options.

(3) Exposures to government bonds, swaps and equities are in three currencies — sterling, euro and US dollar. The swaps book exposure may arise from customer business where the bank is consistently paying fixed on swaps. Exposures to equities and foreign exchange are small relative to government bonds and swaps.

(4) So correlations across risky assets are set to +1, and set to -1 with government bonds.

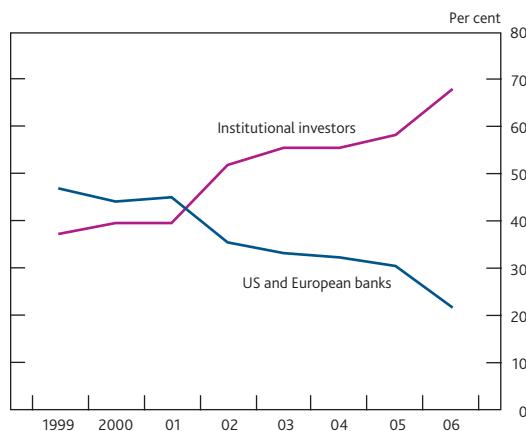
Chart 2.16 LCFIs' issuance of RMBS backed by sub-prime lending^(a)



Sources: Dealogic and Bank calculations.

(a) Data include residential mortgage-backed securities (RMBS) backed by sub-prime and non first lien mortgages.

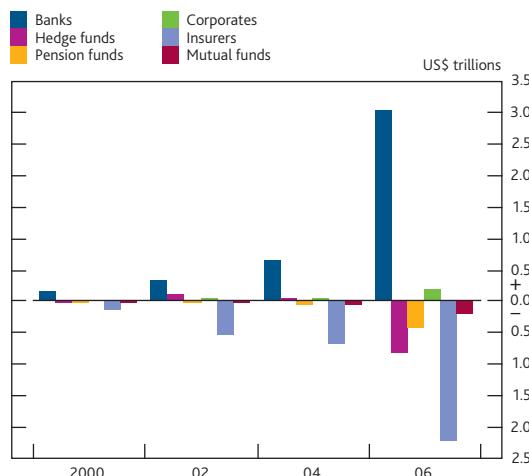
Chart 2.17 Investor shares of US and European leveraged loan markets^(a)



Sources: Standard & Poor's Leverage Commentary and Data, and Bank calculations.

(a) Shares weighted by European and US leveraged loan market volumes.

Chart 2.18 Outstanding global amounts of credit protection bought by institution^(a)



Sources: BBA and Bank calculations.

(a) Amounts netted across long and short positions.

liable to change, can be attributed to the desire to make the most of a benign environment, combined with a reluctance to rein in risk-taking activity before competitors. The incentive structures faced by managers may be contributing to a heightened emphasis on scale, revenue growth and maintaining market share. For example, benchmarks for performance (and thus remuneration) often include targets for market share and industry rankings. This may mean that managers are incentivised to pursue short-term growth opportunities with less reference to the implications of a change in market conditions than might be desirable from a systemic risk perspective.

...with hedge fund performance increasingly important...

Hedge funds remain an important source of revenue for LCFIs through prime brokerage and trading income. Contacts also report that hedge funds provide a key source of demand for debt securitisations, particularly for the higher-risk tranches and, along with other non-bank financial institutions, are increasingly important investors in the leveraged loan market (Chart 2.17). Hedge funds have also become significant net sellers of credit protection through the credit derivatives market, with a global amount outstanding of \$800 billion in 2006 (Chart 2.18).

Assets continued to flow into hedge funds rapidly during the latter half of 2006, but at a reduced rate relative to earlier in the year. Net inflows fell from \$66 billion in 2006 H1 to \$40 billion in 2006 H2 (Chart 2.19), possibly reflecting concerns over losses experienced during the market turbulence in May/June 2006 and following the failure of Amaranth in September. Hedge fund full-year returns for 2006 were on average around 13%, in excess of the 8%–9% reported in 2005. Market contacts report that hedge funds' aggregate long market positions to net equity — one measure of their leverage — fell during 2006.⁽¹⁾ And embedded leverage, which is more difficult to measure, also appears to have fallen over the year.⁽²⁾ The collapse of Amaranth did, however, highlight the risk of highly concentrated trades.⁽³⁾ Box 5 discusses the risks posed to financial stability by hedge funds.

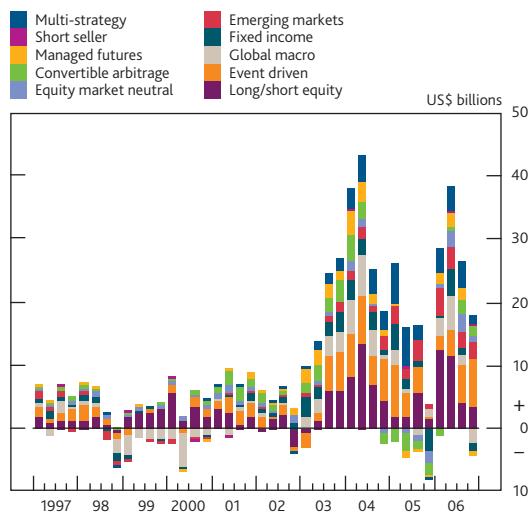
...while risk management activities rely on institutions and infrastructure.

Greater levels of financial intermediation and credit risk transfer in recent years have increased dependence on market infrastructure, including institutions supplying such infrastructure. The notional amounts outstanding in the credit derivatives market, for example, doubled between June 2005

(1) This measure of leverage only captures leverage obtained through borrowing funds from prime brokers.

(2) The estimate of embedded leverage is provided by the BIS and is a refinement of the procedure detailed in McGuire, P, Remolona, E and Tsatsaronis, K (2005), 'Time-varying exposures and leverage in hedge funds', *BIS Quarterly Review*, March.

(3) Despite classifying itself as a multi-strategy fund, more than half of Amaranth's assets were positioned in the energy sector. In particular, it had a highly concentrated position in the natural gas market. When the position began to lose money, Amaranth found it difficult to trade out of its position to limit its losses.

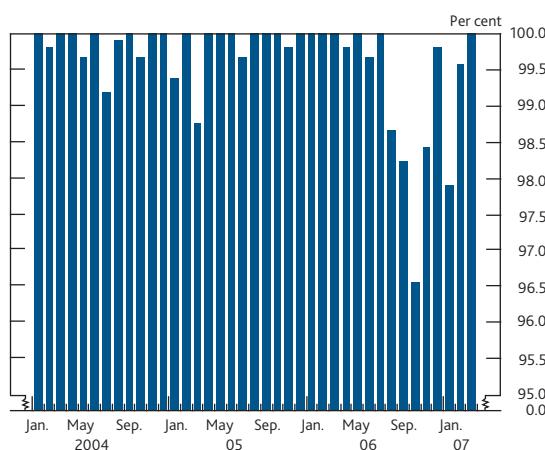
Chart 2.19 Net capital flows into hedge funds

Source: Lipper (a Reuters company).

and June 2006, with three LCFIs dominating the market in their role as intermediaries. The infrastructure supporting this market has developed substantially in recent years, with levels of automation boosted by the emergence of new centralised systems to perform trade processing functions. Combined with concerted regulatory attention, this has contributed significantly to the clearing of processing backlogs in the credit derivatives market. A group of over-the-counter (OTC) derivatives dealers has succeeded in meeting (and exceeding) targets for backlog reduction. This group also worked closely with the Depository Trust and Clearing Corporation to launch a Trade Information Warehouse in November 2006. Box 7 in Section 4 discusses these initiatives further.

Since the July 2006 Report, there have been a number of unconnected operational incidents at major market infrastructures. The recent market turbulence highlighted how infrastructure risks can crystallise as a result of increased volumes of financial market activity. A minor systems capacity issue at the New York Stock Exchange caused a backlog in the processing of order messages on a day in which the market came under heavy selling pressure. The execution of a number of trades was delayed and the problem was compounded as the Dow Jones was unable to calculate reliably its Industrial Average index for approximately one hour. However, these incidents do not appear to have significantly exacerbated the market falls, or to have resulted in major losses among market participants.

CREST⁽¹⁾ has also experienced a number of settlement outages, following the launch of new settlement software on 28 August (Chart 2.20). Some of the outages lasted over an hour and required an extension to the settlement day. The first quarter of 2007 saw isolated operational incidents at three other infrastructures: SWIFT⁽²⁾ suffered a brief loss of messaging services due to power supply problems; a software fault within BACS⁽³⁾ caused delays to 400,000 salary payments (1.6% of BACS volumes); and the United Kingdom's real-time gross settlement system operated by the Bank of England suffered SWIFT connectivity problems. In all cases steps were taken quickly to minimise the impact. The systems are producing full incident reports to ensure that they, and their members, learn from the experience and introduce controls to prevent similar events going forward.

Chart 2.20 CREST system availability for settlement

Source: CRESTCo.

(1) CREST is the United Kingdom's high-value securities settlement system.

(2) SWIFT is a provider of secure messaging services between financial institutions and infrastructures.

(3) BACS is the United Kingdom's largest retail payment system by volume.

Box 5

Hedge funds and financial stability

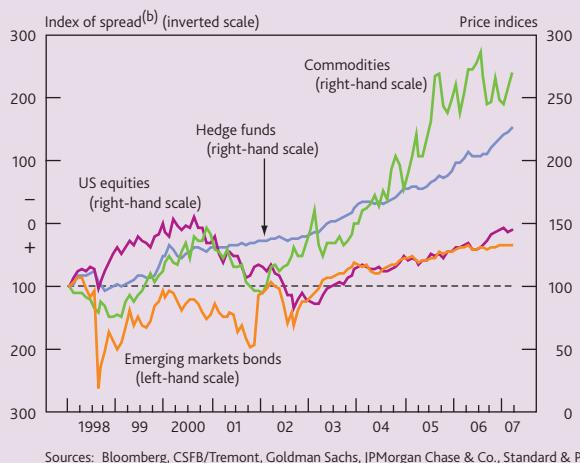
Hedge funds are high on the agenda of policymakers internationally, including the G8. One of the questions at the heart of the debate is the nature and scale of the risk that the activities of hedge funds may pose to financial stability.

The hedge fund industry

While there is no single definition of a hedge fund, they are generally privately offered investment pools that invest in traded instruments, and in which managers seek superior risk-adjusted returns. In doing so, they make extensive use of leverage, derivatives and other techniques to 'short'⁽¹⁾ the market.⁽²⁾

The average performance of hedge funds seems impressive over the past decade and less volatile than for other asset classes (**Chart A**). These estimates may be overstated, however, as they are calculated only for those funds that continue to function, and there is a high rate of attrition. In 2006 it is estimated that about 1,500 new funds were launched and about 700 were liquidated.

Chart A Hedge fund returns versus returns on selected assets^(a)



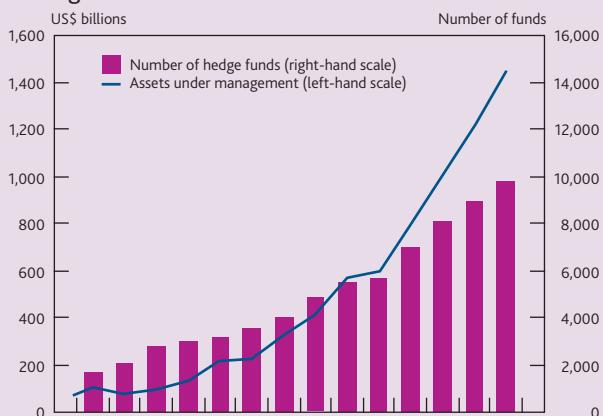
Sources: Bloomberg, CSFB/Tremont, Goldman Sachs, JPMorgan Chase & Co., Standard & Poor's, Thomson Datastream and Bank calculations.

(a) Monthly indices rebased to 100 in January 1998.

(b) Spread measured as yield to maturity over US Treasuries.

Hedge funds have attracted high inflows of capital over the past decade. Assets managed by hedge funds totalled US\$1.4 trillion at end-2006 (**Chart B**). The number of hedge funds has also grown significantly, although many funds are small. Of the 9,800 hedge funds operating at end-2006, the 20 largest accounted for nearly a third of assets under management. Wealthy individuals have traditionally accounted for the majority of hedge fund investors, but recently institutional investors have increased in importance (**Chart C**).

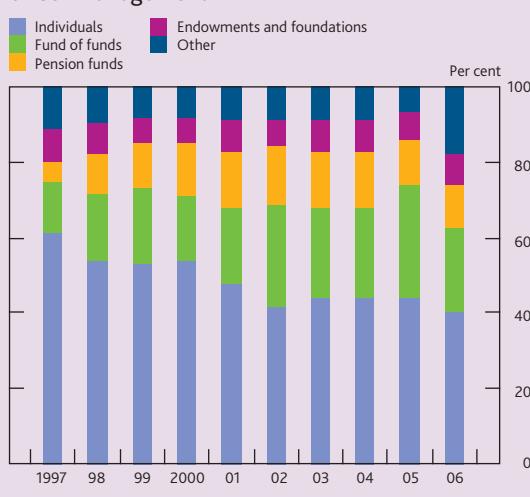
Chart B Number of hedge funds and assets under management^(a)



Source: Hennessee Group LLC.

(a) Data are reported as of January each year.

Chart C Source of hedge fund capital by share of assets under management



Source: Hennessee Group LLC.

The active investment approach of hedge funds means that they account for a high proportion of market activity. For example, hedge fund trading activity was estimated to account for up to 40%–50% of daily turnover on the New York Stock Exchange and the London Stock Exchange in 2005. Long/short equity remains the most common strategy for hedge funds, but they are also increasingly important in credit markets. They currently account for around 60% of total trading volume in the credit derivatives market. And, as discussed in Section 2, hedge funds are also now significant net sellers of credit protection and investors in structured credit markets.

Systemic risks posed by hedge funds

In considering whether hedge funds have a systemic impact, it is worth distinguishing two potential channels. First, they are a direct source of counterparty credit risk to large, systemically important institutions, notably LCFIs. Second, their active trading, including in credit and derivatives, affects the liquidity of those markets. The question is whether that could make markets less stable in some circumstances.

Hedge funds are an increasingly important source of revenue for LCFIs. In 2005, hedge funds were estimated to generate \$25.8 billion in revenue for major investment banks, of which around two thirds related to execution activities (sales and trading) and the other third to prime brokerage. Market contacts suggest that competition for prime brokerage accounts has encouraged some brokers to take on greater market risk in order to preserve or gain market share and future earnings. For example, there is evidence of an erosion of lending terms, particularly of initial margins. However, most estimates of the direct exposures of prime brokers to hedge funds remain small relative to capital.

The risk hedge funds pose to markets is much harder to measure and manage. In general, the dispersion of risk from the banks at the centre of the financial system to hedge funds and other institutional investors should be a stabilising influence on markets. For example, the dislocations in the structured credit and convertible bond markets in 2005, following the downgrades of GM and Ford, are believed by some market participants to have been alleviated by the activities of hedge funds in the broader credit markets. Against that, the reactions of hedge funds could serve to amplify market movements during periods of more severe stress by, for example, withdrawing liquidity rapidly from markets.

Hedge funds themselves have sought to reduce potential liquidity pressures. For example, they have been seeking more stable sources of funding, such as through longer investor lock-in periods, public listings and debt issues. The greater share of institutional investors further points to more stable sources of capital. As noted in the July 2006 Report,⁽³⁾ estimates also suggest that the leverage of hedge funds has fallen since 2000, thereby lowering the sensitivity of earnings to market prices.

The experiences of LTCM and Amaranth appear to have been quite different in terms of counterparty risk and the extent of market disruption. The near-collapse of LTCM provided an example where concerns over the wider destabilising impact of the rapid contraction of a large hedge fund's balance sheet led several LCFIs to provide financial support. By contrast, Amaranth was able to meet its margin calls without disrupting the markets in which it had positions. Amaranth's failure occurred at a time when financial market conditions were generally benign. In more adverse circumstances, fire sales of assets could have been more disruptive and the impact wider.

More generally, in assessing the dangers of market disruption it is necessary to consider the combined impact of all market participants and not just hedge funds. LCFIs, for example, are also providers of liquidity to the financial markets, typically on a much larger scale than hedge funds.⁽⁴⁾ The risks of sharp changes in prices and reductions in market liquidity are

greatest when a number of participants have similar positions (or positions that could become closely correlated) and react to developments in the same way. Hedge funds could certainly play a role in such 'herding' behaviour, but could also help to stabilise markets by adopting contrarian strategies.

Means of monitoring hedge fund risk

Given their increased role in certain markets, steps have already been taken to improve the monitoring of counterparty risk and the risk of market disruption posed by hedge funds, including through both private and public sector initiatives.

For example, the FSA has taken an 'indirect approach' to the monitoring of hedge fund counterparty risk, by looking at the exposures of prime brokers (typically LCFIs) to hedge funds. This approach has the advantage of being focused precisely on the core institutions and channels through which systemic risk would be likely to propagate. It is also practical from a regulatory perspective, since it focuses on the activities of institutions that are the subject of existing prudential supervision. As part of this, the FSA conducts a regular six-monthly survey of the main dealers' prime broker and OTC derivatives exposures to hedge funds. The FSA is also working with international regulators in assessing the hedge fund counterparty risk management practices of large dealers. In December 2006, a number of supervisory agencies including the FSA, SEC and Federal Reserve Bank of New York jointly met with US-based dealers to discuss margin setting, collateral management, hedge fund due diligence and risk management.

Although hedge fund investment vehicles are usually based off-shore and unregulated, hedge fund managers in the United Kingdom are subject to regulation by the FSA in respect of their governance and market conduct. Such regulation, particularly in respect of valuation procedures and redemption policies, contributes to greater market transparency and facilitates better risk management by a fund's counterparties. Various initiatives have been undertaken to improve and make consistent the level of disclosure across the industry — for example, the Managed Funds Association's 2005 report on sound practices for hedge fund managers and the 2005 report by the Counterparty Risk Management Policy Group. Although only a nascent development, public listings and debt issues by, and ratings of, hedge funds — and the public disclosure of information that these necessitate — will improve disclosure further.

(1) That is, investors speculate on the price of assets falling, rather than rising.

(2) A further feature is that, while they are typically managed in the United States or Europe, most hedge funds are legally incorporated off-shore for regulatory and tax reasons.

(3) See Box 4 of the July 2006 Report, page 32.

(4) Clearly, the exposure of an individual hedge fund to financial markets is likely to be considerably less diversified than that of an LCFI, and there is therefore a greater chance of an idiosyncratic failure. But hedge funds are individually much smaller than LCFIs, reducing the risk they pose to the system as a whole.

3 Prospects for the UK financial system

The UK financial system remains highly resilient, with banks well capitalised and highly profitable. But strong flows into riskier assets and a gradual increase in corporate indebtedness have caused risks to the UK financial system to edge up. Structural developments in financial markets and in banks' business models have increased the risk-bearing capacity of the system. But these same developments have also encouraged expansion into new and risky markets and have increased the dependency of firms on sustained liquidity in, and the operational resilience of, these markets. Recent experience in the US sub-prime mortgage market raises questions about the effectiveness of risk assessment and monitoring in such risk transfer markets.

Table 3.A Change in assessment since the July 2006 Report

Vulnerability	Probability ^(a)	Impact ^(b)
Low risk premia	■ A significant increase in risk ■ A slight increase in risk	■ Broadly unchanged
Global corporate debt		■ A slight decrease in risk
LCFI distress		
Infrastructure disruption		■ A significant decrease in risk
Global imbalances		
UK household debt		

Source: Bank calculations.

(a) Assessed change in the probability of a vulnerability being triggered over the next three years.
(b) Assessed change in the expected impact on the UK financial system if a vulnerability is triggered.

This section assesses the overall resilience of the UK financial system, in the light of developments in the global economy and financial markets (discussed in Section 1) and in the structure of the financial system (discussed in Section 2).

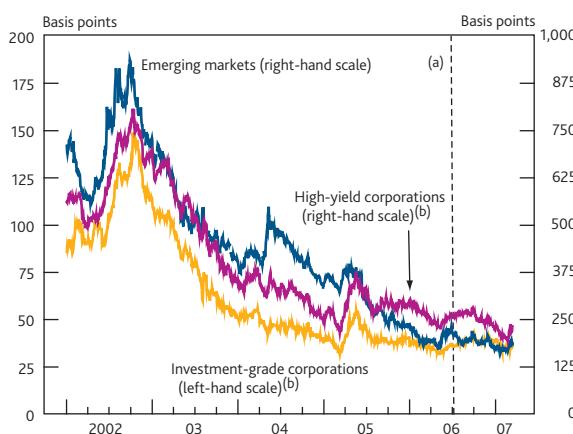
In the July 2006 *Report*, the Bank identified six sources of potential vulnerability for the UK financial system. These possible sources of weakness are not new and are familiar to market participants and risk managers. Nevertheless, they could cause disruption to the financial system if individual firms are not managing or preparing for them adequately. This section explores how the Bank's assessment of these vulnerabilities has changed over the period (summarised in **Table 3.A**) and considers the potential impact of these vulnerabilities crystallising, individually or in combination. It also draws out risk management lessons for the UK financial system from developments since the previous *Report*.

3.1 How have developments affected the key vulnerabilities?

The unusually low premia for bearing risk

Despite a pickup in volatility in late February and early March, in general, asset prices have continued to rise and spreads have continued to fall (**Chart 3.1**), over the period since the July 2006 *Report*. The compression in credit spreads over recent years is partly the result of financial innovation that allows risks to be divided and repackaged to match investor demand more closely. And, over a much longer perspective, spreads on investment-grade bonds do not appear to be unusually low (**Chart 3.2**). But against that, there are concerns among market contacts that investors may not be adequately compensated for credit risk, much less liquidity risk, within some sub-investment grade corporate markets. And this is supported by model-based decompositions of spreads on these bonds (**Chart 1.8** in Section 1).

Chart 3.1 Spreads on bond indices

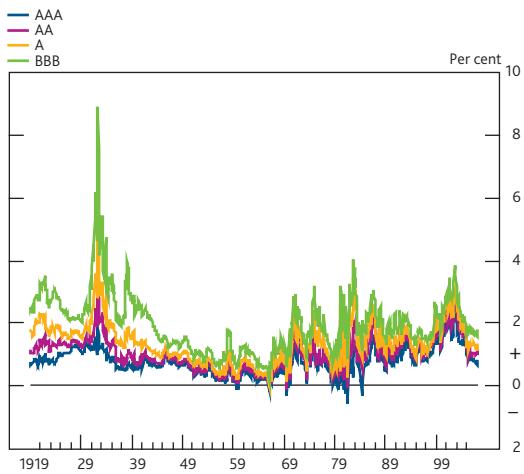


Source: Bloomberg, JPMorgan Chase & Co and Merrill Lynch.

(a) July 2006 Report.

(b) Option-adjusted asset swap spreads.

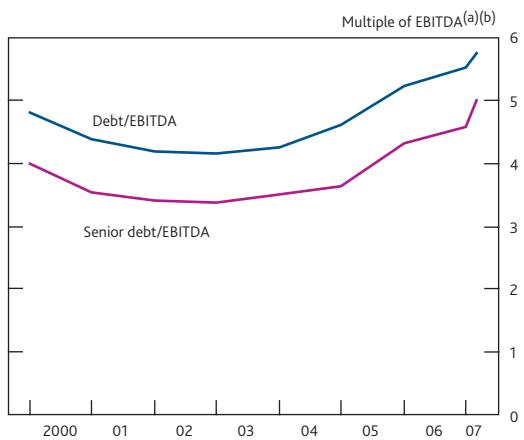
Chart 3.2 Spreads on US investment-grade corporate bond indices^(a)



Source: Global Financial Data, Inc.

(a) Difference between yields on US corporate bond indices and ten-year US Treasury bonds. Since the corporate bond indices have variable maturities, the pattern in spreads partly reflects the evolution of the slopes of the corporate and Treasury yield curves.

Chart 3.3 Debt multiples in S&P-rated European LBO deals

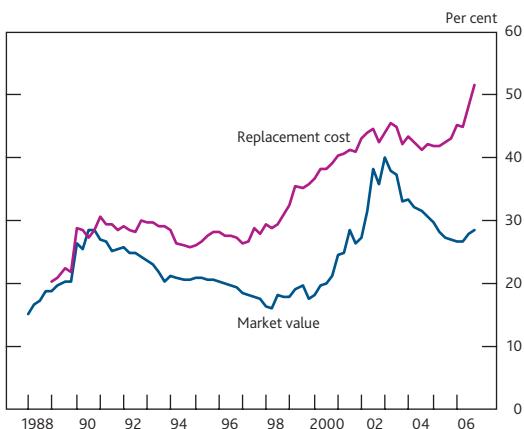


Source: Standard & Poor's.

(a) Data for 2007 are Q1 data only.

(b) EBITDA = earnings before interest, tax, depreciation and amortisation.

Chart 3.4 UK PNFCs^(a) capital gearing^(b)



Sources: ONS and Bank calculations.

(a) Private non-financial corporations.

(b) Gearing is calculated as the ratio of debt, net of liquid assets, to the market value or replacement cost of capital.

Market participants appear to be basing their valuations of assets on strong economic conditions, low levels of volatility and high levels of market liquidity persisting. This represents a potential undervaluation of future risk. Against this backdrop, the probability of a sharp rise in risk premia, perhaps triggered by a reappraisal of macroeconomic prospects or lower risk appetite among investors, is judged to have risen slightly since July.

Meanwhile, strong flows into hedge funds, emerging market bonds, leveraged lending and structured credit products, among other risky assets, have continued. As described in Section 2, trading assets account for a growing proportion of large complex financial institutions' (LCFI) balance sheets. These developments are judged to have increased the potential impact on the UK financial system should risk premia rise sharply.

High and rising leverage in parts of the corporate sector

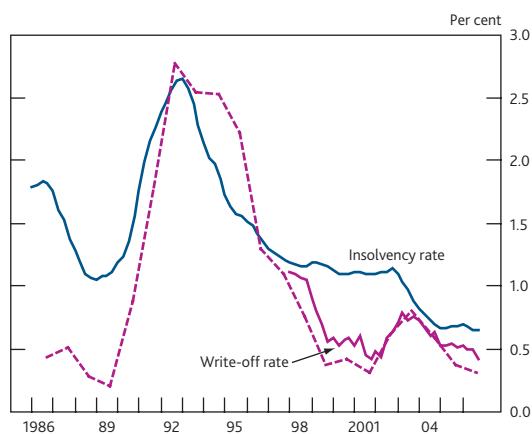
Strong and stable macroeconomic conditions have underpinned both high corporate profitability and low rates of corporate insolvency. The associated low cost of credit has encouraged an increase in UK corporate debt issuance (Chart 1.12 in Section 1) including to finance leveraged buyout (LBO) activity. While the overall size of UK banks' exposures to LBOs remains small, in the event of stress in corporate credit markets more generally, banks' exposures would be more significant. At the same time, LBO deals are including higher leverage (Chart 3.3) and there are signs of some erosion in protection for corporate lenders through weaker covenant structures. Overall, following a number of years of balance sheet consolidation, UK corporate debt gearing has begun to rise (Chart 3.4). Strong commercial property price inflation has also contributed to continued growth in banks' lending to commercial property companies, write-offs on which are typically more cyclical than other types of corporate lending.

Expectations of a turn in the credit cycle have been pushed further out (Chart 1.14 in Section 1), though financial markets still expect some pickup in defaults in the future (Chart 1.13 in Section 1). A greater share of sub-investment grade debt in total corporate syndicated loan issuance (Chart 1.10 in Section 1) could lead to a more rapid rise in corporate defaults than anticipated if credit conditions were to tighten. The sharp increase in corporate insolvencies and write-off rates for UK banks in the early 1990s illustrates the speed at which the credit cycle can turn and it provides a cautionary tale on the importance of effective monitoring of corporate credit risk (Chart 3.5). Taken together, these developments are judged to have increased slightly the impact on the UK financial system from a sharp turn in the corporate credit cycle.

Rising systemic importance of LCFIs

Given the scale of their activities, and their pivotal position in certain markets, distress at an LCFI could have a large impact

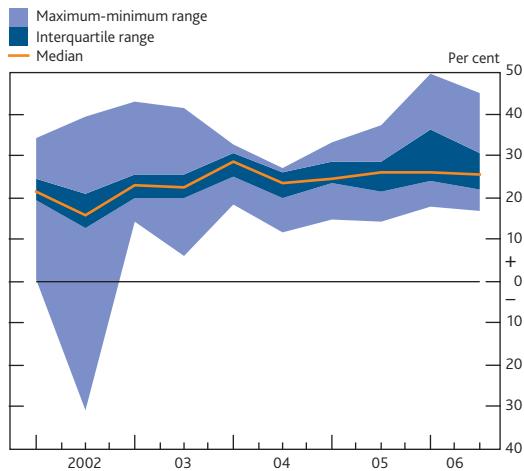
Chart 3.5 Corporate write-offs and insolvency rates^{(a)(b)(c)}



Sources: Bank of England and Insolvency Service.

- (a) Insolvency data are for England and Wales. Data are company and creditors' voluntary liquidation rates.
- (b) Annual rates, by value.
- (c) Solid line shows write-off rate for UK-owned banks, dashed line for all UK-resident banks (interpolated annual data).

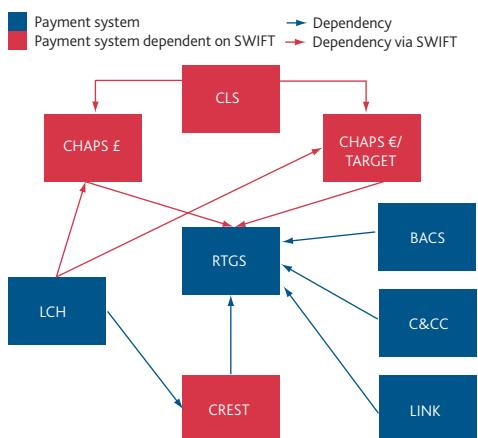
Chart 3.6 LCFI pre-tax return on equity^(a)



Sources: Bloomberg and Bank calculations.

- (a) Annualised data using semi-annual operating income divided by total common equity.

Chart 3.7 Simplified representation of dependencies in UK payment systems^{(a)(b)}



- (a) See glossary for description of terms.

- (b) In some cases, alternative network providers to SWIFT are also used. BACS, C&CC and LINK depend on RTGS once a day to effect multilateral interbank settlement.

on other financial market participants, including UK banks. This could arise from losses on direct exposures to an LCFI in distress or from the wider market implications of actions taken by an LCFI to manage emerging problems, for example through asset sales to lower exposures or by the withdrawal of market making in some instruments.

Strong profit and revenue growth among LCFIs has supported their continued resilience (Chart 3.6). This makes the chances of distress at an LCFI remote. But buoyant market conditions and strong incentives to match performance by competitors have encouraged LCFIs to expand their business. Their balance sheets have continued to grow rapidly as they have acted as the conduit for increased risk-taking by other investors, as well as engaging in increased proprietary risk-taking themselves. That suggests that the impact on the UK financial system of distress at an LCFI has increased slightly over the period.

Dependence of UK financial institutions on market infrastructures and utilities

UK financial institutions rely on the smooth functioning of market infrastructure and payments systems.

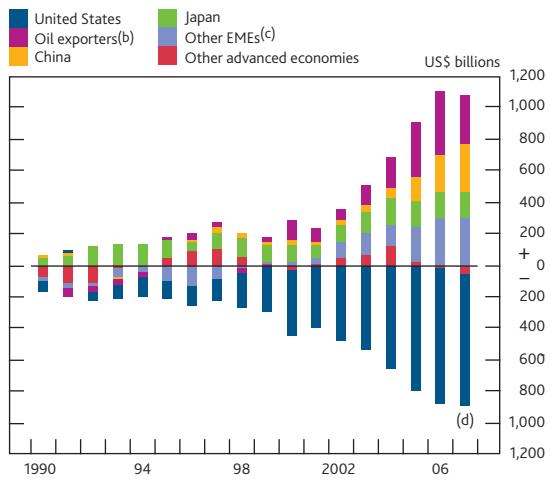
Interdependencies between these systems mean that a failure in any one system could quickly cause wider disruption (Chart 3.7). The growing use of markets for distributing credit risk increases the UK financial system's dependence on these markets and their supporting infrastructures.

As outlined in the Bank's *Payment Systems Oversight Report 2006*, UK payments systems continue to exhibit a high level of robustness. Nevertheless, payment systems are susceptible to occasional disruption, as the recent operational incidents detailed in Section 2 illustrate. While the recovery from these outages was rapid, with limited impact on markets and firms, these incidents are timely reminders of the centrality of these market infrastructures and hence the need for them to have effective contingency plans.

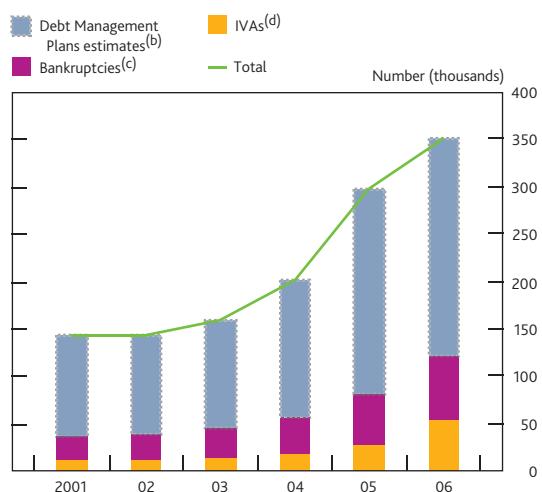
Taken together, these developments have contributed to the Bank's assessment that the impact of infrastructure vulnerability has edged up slightly.

Large financial imbalances across the major economies

Large current account imbalances among the major economies persist, along with associated cross-border financial flows (Chart 3.8). As discussed in Section 1, interest rate differentials and low expected foreign exchange volatility have encouraged 'carry trades' funded in yen and other low yielding currencies, which have helped to sustain some of these financial imbalances. In the event of a disorderly unwinding of global imbalances, these financial flows could reverse sharply, acting as an amplifier of adjustments in financial markets. Market participants may be underestimating the speed or extent of the resulting asset price disruption.

Chart 3.8 Global current account balances^(a)

- (a) Global current account balances do not sum to zero due to errors and omissions.
 (b) The sum of the ten largest oil exporters in 2004 — Saudi Arabia, Russia, Norway, Iran, United Arab Emirates, Nigeria, Kuwait, Venezuela, Mexico and Algeria.
 (c) Other EMEs includes the newly industrialised Asian economies.
 (d) IMF estimate, April 2007.

Chart 3.9 Distressed debt resolutions^(a)

- (a) Excluding informal bilateral agreements.
 (b) No formal statistics on debt management plans are available. Estimates are derived from partial data released by consumer credit organisations.
 (c) Bankruptcies include Sequestrations in Scotland.
 (d) IVAs include Protected Trust Deeds in Scotland.

Since the July 2006 *Report*, the US current account deficit has fallen and domestic demand growth differentials in the major economies have narrowed. There are also signs of gradual diversification in the reserve management strategies of some Asian central banks. This has reduced slightly the probability that global imbalances will adjust in a disorderly fashion.

High UK household sector indebtedness

Low interest rates and macroeconomic stability have encouraged household borrowing over recent years. The ratio of household debt to income has risen from around 100% in the late 1990s to over 150%, increasing the vulnerability of some households to an abrupt change in macroeconomic conditions. As Section 2 discusses, the vast majority of banks' lending to households is secured on property and write-off rates on this lending have remained very low. But write-offs on unsecured lending have increased, in part as a result of a sharp rise in personal insolvencies over the past nine months (**Chart 3.9**). Some of this increase may reflect a structural change in household attitudes towards insolvency. That makes predicting the future course of insolvencies particularly uncertain, so there is a chance that UK banks may be underestimating future losses from this source. The Bank's judgement is that, while the probability of large-scale losses arising from distress in the household sector remains low, it has increased slightly over the period.

Summary assessment of the key vulnerabilities

Table 3.A summarises changes to the Bank's assessment of the key vulnerabilities to the UK financial system since the July 2006 *Report*. Overall, these changes point to an edging up of aggregate risk to the UK financial system. This reflects the combined effects of increased risk-taking, on the one hand, and a greater dependence on the UK institutions and infrastructures responsible for pricing and managing that risk, on the other. The increase in risk-taking can, in turn, be traced to anchored expectations of macroeconomic stability, combined with continuing intense competition in the financial sector for new business. Meanwhile, growing dependencies within the system are the result of a shift towards capital markets for the pricing and managing of risk. Acting in combination, these conjunctural and structural factors have amplified risks to the UK financial system over the period since the July 2006 *Report*.

3.2 Assessing the overall level of risk from the vulnerabilities

Vulnerabilities individually appear manageable...

Gauging the level of risk posed by these vulnerabilities is altogether more challenging. Stress tests are one useful input to such an assessment. Box 6 presents updated results of the stress tests which were first presented in the July 2006 *Report*. The results continue to show that the main vulnerabilities could lead to material losses if they crystallised individually.

But these losses, equivalent to between 10% and 25% of UK banks' Tier 1 capital, appear manageable given the strong capital base of the UK financial system.

...but vulnerabilities in combination could have a more material impact...

In practice, vulnerabilities are unlikely to be exposed in isolation. For example, an increasingly likely stress scenario in the near term would be a reversion of risk premia. If this adjustment happened quickly, it could have knock-on effects to some of the other vulnerabilities. For example, a tightening of corporate credit conditions could lead to a sharp rise in corporate defaults and a loss of revenue for LCFIs. In such a scenario, the impact on UK banks' balance sheets could be significantly more severe.

To illustrate quantitatively such interdependencies between the vulnerabilities, Bank staff have considered two severe, but unlikely, broad stress scenarios — a prolonged global macroeconomic slowdown in which risk appetite falls sharply in financial markets; and a severe flu pandemic among the human population (**Table 3.B**). The first stress scenario involves a large supply shock which results in a slowdown of similar depth to the UK recession in the early 1990s. This triggers both the household and corporate debt vulnerabilities. Slowing economic activity reduces growth in UK banks' revenues and increases volatility in financial markets, triggering a fall in risk appetite and asset prices and leading to losses in banks' trading book positions. In an illustrative calibration of this severe scenario, losses to the major UK banks through these channels could amount to the equivalent of between 30%–40% of their Tier 1 capital.

A severe outbreak of pandemic flu, either in the United Kingdom or elsewhere, could affect UK financial stability through a number of channels. Perhaps the most immediate effect would be financial market turbulence, as investors assessed the potential economic impact. Growing absenteeism could affect operations at major financial institutions and infrastructure providers. Over time, credit losses for UK banks could increase as a contraction in activity, both domestically and abroad, leads to financial distress among households and companies. Banks' incomes would also fall as a result of lower lending volumes and financial market activity. There are obviously enormous uncertainties around quantifying the potential impact of such a scenario. But in an illustrative calibration of a severe pandemic, losses to major UK banks could be equivalent to around 30%–50% of their Tier 1 capital.

...although major UK banks remain highly resilient.

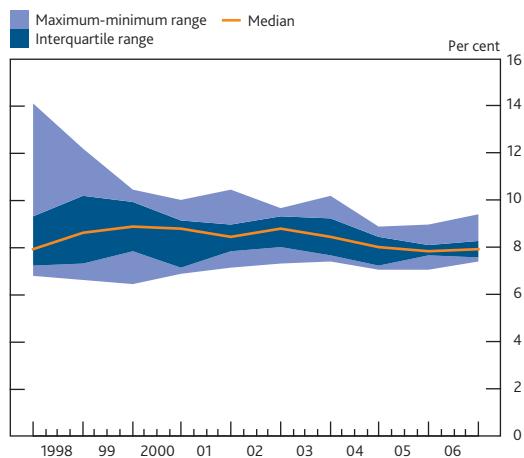
Major UK banks remain profitable and well capitalised, providing a strong buffer against potential losses from these vulnerabilities. Capital ratios are well above Basel regulatory

Table 3.B Summary of broad severe stress scenarios

Severe global macroeconomic slowdown	A combined supply shock to both the UK and overseas markets leads to a macroeconomic slowdown and rising inflation. Over three years, UK GDP growth falls to -1.5% and asset prices fall sharply.
A severe flu pandemic	A pandemic spread over two waves. 25% of the UK population falls ill in line with Department of Health contingency planning assumptions. ^(a) Asset prices fall sharply and UK GDP falls by over 7% relative to base in the first year before recovering.

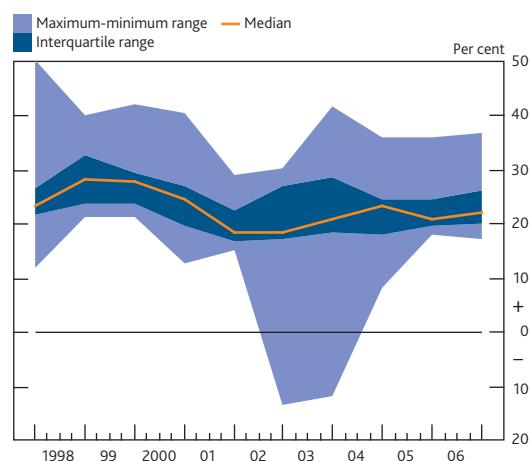
Source: Bank calculations.

(a) See UK Health Departments' influenza pandemic contingency plan (October 2005), available on their website: www.dh.gov.uk.

Chart 3.10 Major UK banks' Tier 1 capital ratios^(a)

Sources: Published accounts and Bank calculations.

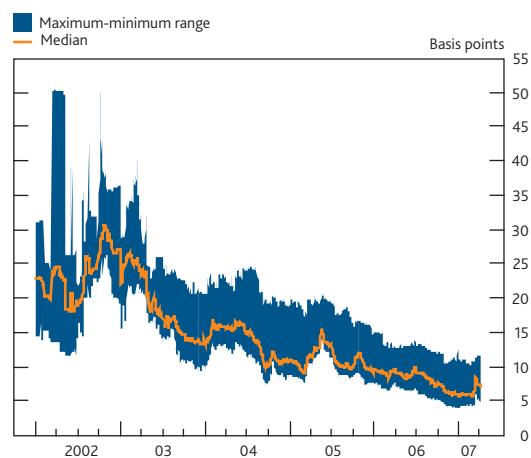
(a) Tier 1 capital includes ordinary shares associated reserves and retained earnings.

Chart 3.11 Major UK banks' pre-tax return on equity^{(a)(b)}

Sources: Published accounts and Bank calculations.

(a) Data for major UK banks, excluding building societies.

(b) Pre-tax return on equity calculated as pre-tax profit as a proportion of shareholders' funds and minority interests.

Chart 3.12 Major UK banks' credit default swap premia^(a)

Sources: Bloomberg, Markit Group Limited and Bank calculations.

(a) Average premia weighted by total assets.

minima, with the median Tier 1 capital ratio stable at just below 8% (**Chart 3.10**). Profitability also continues to be strong, with the median pre-tax return on equity rising to 22% in 2006 (**Chart 3.11**). Strong revenue growth at major UK banks in 2006 more than offset the effect on profits of a rise in credit losses from unsecured household lending, and write-offs on corporate and secured household lending have remained low. The strong performance of the major UK banks is reflected in their continuing high credit ratings and low credit default swap (CDS) premia (**Chart 3.12**).

3.3 Prospects for the UK financial system

The strong financial position of the UK banking system provides a substantial buffer against future disturbances. But resilience in future adverse circumstances will also depend on the strength of firms' risk management systems. And developments since the July 2006 *Report* — such as problems at Amaranth and in US sub-prime markets — have highlighted several risk management shortcomings, which could amplify shocks in more adverse circumstances.

Recent events indicate potential weakspots in risk management...

The July 2006 *Report* highlighted how low macroeconomic and financial market volatility had encouraged some financial firms to take on greater risk to generate business revenues. That process has, if anything, intensified over the past nine months. It has led to a further easing of terms and conditions across a number of credit markets as firms have sought to sustain lending volumes, including in the US sub-prime mortgage markets.

As Section 2 discusses, at the same time financial firms, including UK banks, have continued to expand their use of techniques for unbundling and distributing risks in financial markets. These techniques provide firms with the opportunity to improve the management of funding liquidity and credit risks. But their effective functioning depends on strong credit assessment and sustained market liquidity. Recent events have given cause for concern about both aspects.

...such as weakened credit risk assessment...

The separation of the origination of risk from its ultimate incidence may mean that less information on underlying credit quality is available to the bearers of risk. In US sub-prime markets, end investors appeared not to be able to determine the credit quality of lending being securitised very accurately. Originators with incentives to sustain lending volumes originated poorer quality lending. While market mechanisms exist to maintain credit quality by ensuring that originators remained exposed to some of the potential credit loss (see Box 3), the high levels of arrears in recent vintages of US sub-prime mortgage lending (**Chart 1.18** in Section 1) raise questions about the effectiveness of those mechanisms.

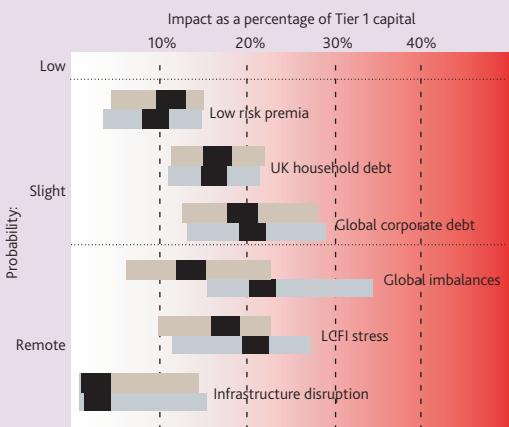
Box 6

Uncertainty in systemic stress testing

The July 2006 Report described an approach for illustrating and measuring how stress scenarios might affect UK banks and the financial system.⁽¹⁾ There were four steps to this approach, starting with the identification of potential vulnerabilities, the construction of stress scenarios that exposed these vulnerabilities, a mapping of the channels through which stress might propagate through the economy and the financial system and, finally, an estimation of the overall impact on the major UK banks.

These scenarios have been updated since the July 2006 Report.⁽²⁾ **Chart A** presents the calibrated impact on the major UK banks over a three-year horizon if each of the identified vulnerabilities crystallised in a severe stress scenario. The impact estimates are in most cases equivalent to between 10% and 25% of UK banks' current Tier 1 capital.

Chart A Impact of 'severe stress scenarios' affecting vulnerabilities^(a)



Sources: Published accounts and Bank calculations.

(a) Total impact for major UK banks of individual scenarios over a three-year horizon, expressed as a percentage of current Tier 1 capital. Central bands show quantified estimates of the scale of loss under each scenario, wider bands calibrate some uncertainties around these estimates. The top bar presents the latest results and the bottom bar the July 2006 Report results.

These estimates are broadly comparable with the July 2006 Report results. The estimated impacts of a sharp unwinding of global imbalances and a LCFI falling into distress have decreased somewhat since the July 2006 Report, mainly reflecting methodological revisions to the scenarios.⁽³⁾

The value of this approach is in improving understanding of the channels through which stress might affect the financial system and broadly gauging the level of materiality of each vulnerability. Movements in these measures over short periods of time are less important, especially given the

significant degree of uncertainty — both on the upside and downside — around the calibrated levels of UK banks' losses. Uncertainties can arise from various sources, including the models used for quantification, the particular stress scenarios examined or data uncertainty. So far, wide confidence bands, reflecting model and data uncertainty, have been drawn around calibrated impacts using a combination of statistical methods and staff judgement. This box explores ways to calibrate impact in alternative stress scenarios.

Using sensitivity analysis to quantify the impact of financial stress

Designing alternative 'what if' scenarios with different macroeconomic developments and variations in the behaviour of banks, individuals and corporates can help uncover the relative importance of key assumptions used in the stress scenarios. Sensitivity analysis may take different forms depending on how the stress scenario is defined.

Stress scenarios built around a model: global imbalances
For scenarios that are built around a model, there can be a high degree of uncertainty as to how and why the vulnerability crystallises. The disorderly unwinding of global imbalances is one example. The severe scenario describes a combined shock to the US exchange rate and property and equity prices, such that the US current account deficit shrinks to 3% of GDP over three years. Outlined below are three alternative 'what if' scenarios, which attempt to uncover the relative importance of the assumptions underlying the scenario.

What if... US policy rates remained flat?

The baseline stress scenario makes a simplifying assumption that US monetary policy evolves according to a Taylor rule. This mechanical rule suggests policy rates rise to counteract the inflationary consequences of the US dollar depreciation. To test the sensitivity of the results to this assumption, an alternative scenario looks at the impact if policy rates are unchanged.

What if... sterling depreciated in trade-weighted terms?

The baseline scenario assumes that sterling appreciates by the same amount as the euro against the US dollar, and as a result appreciates in trade-weighted terms. An alternative scenario considers what would happen if sterling were to appreciate by less than the euro against the falling dollar (15% instead of 30%). This implies that, in trade-weighted terms, sterling may depreciate rather than appreciate.

What if... property prices in the United Kingdom and Europe fell sharply?

The baseline scenario assumes residential and commercial property prices fall sharply in the United States, but only modestly in the United Kingdom and Europe. It is possible that during a global unwinding and sharp shock to asset

markets, property prices in the United Kingdom and Europe may fall sharply as in the United States.

Results of sensitivity analysis on global imbalances unwinding scenario

For the global imbalances vulnerability, the alternative scenarios suggest that the evolution of US policy rates and UK and European property prices during the unwinding are important for the scale of UK banks' losses. How sterling moves seems relatively less important for UK banks. The results suggest that the 'central estimate' of the impact of the severe global imbalances unwinding scenario could be equivalent to as low as 8% or as high as 18% of major UK banks' Tier 1 capital.⁽⁴⁾

Stress scenarios built around historical episodes: UK household debt

For some vulnerabilities historical episodes of financial stress have been used to model stress scenarios — as in the case of the household debt stress scenario, which was designed to resemble the UK recession in the early 1990s. However, some features of this historical precedent may not be a reliable guide to the future. For example, households' ability to repay debt, especially unsecured, may be different if a similar macroeconomic slowdown occurred today, especially considering the sharp increase in personal insolvencies over recent years. It is useful to consider how the impact would change if individuals were more prone to default on their debt obligations now than they have been in the past.

What if... unsecured write-off rates were higher than expected?

The UK household debt stress scenario models the unlikely event that unsecured write-off rates rise to 9% over a three-year horizon, up from the current 5%. But more recent international experience provides examples of both higher and lower unsecured write-off rates. After the 2001 downturn, write-offs in the United States peaked at a lower level (8%), while in Hong Kong they almost trebled (from 5.5% to 13.3%) within the space of a year.

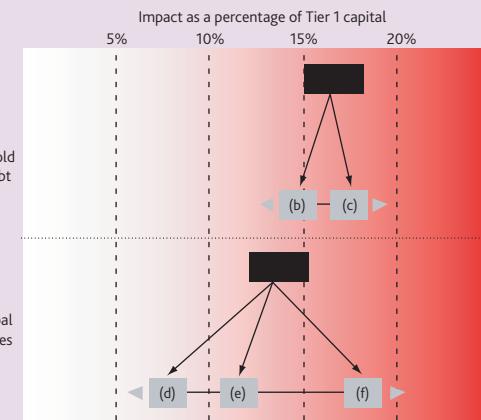
Results of sensitivity analysis on UK household debt stress scenario

In order to test the sensitivity of the UK household debt stress scenario to different assumptions on the evolution of unsecured write-off rates, alternative stress tests were calibrated using the three-year average write-off rates seen during these earlier episodes in the United States and Hong Kong, of around 6% and 10% respectively. On this basis, the impact on UK banks could be equivalent to between 15% and 18% of their Tier 1 capital, not substantially different to the baseline estimate.

Chart B shows the range of impact that results from applying the sensitivity analysis described above to the global imbalances and household debt stress scenarios.

Taken together, this analysis can help inform judgements on the scale of uncertainty around the impact of stress events triggering the identified vulnerabilities. In the period ahead, the Bank intends to do further sensitivity checks on the stress-testing results, alongside improvements to the underlying methodology.

Chart B Sensitivity analysis around severe stress scenarios^(a)



Sources: Published accounts and Bank calculations.

- (a) The black bars show the central estimate of impact and the grey ones the range around it under the severe scenarios as suggested by sensitivity analysis.
- (b) Unsecured write-offs at US 2001 Q3–2004 Q2 average levels.
- (c) Unsecured write-offs at Hong Kong 2001 Q3–2004 Q2 average levels.
- (d) Interest rates in the United States remaining flat.
- (e) Sterling depreciating in trade-weighted terms.
- (f) Property price shock in the United Kingdom and Europe.

(1) See July 2006 Report, Box 6: Systemic stress testing, pages 45–49 and Haldane, A, Hall, S and Pezzini, S (2007), 'A new approach to assessing risks to financial stability', Bank of England *Financial Stability Paper No. 2*.

(2) This update was based on information on banks' balance sheet exposures, the latest macroeconomic outlook as set out in the February 2007 *Inflation Report* and staff assessment of developments since the July 2006 Report.

(3) The property price component of the global imbalances stress scenario has been changed to focus on US developments, and the LCFI stress scenario is now built more closely around the episode of stress in capital markets in October 2002.

(4) This sensitivity analysis is distinct from the bands in Chart A, which only measure the uncertainty associated with UK banks' losses in the baseline scenarios.

Where risk transfer leads to a greater dispersion of individual credit risks across investors, the fixed costs of monitoring credit risk may mean that the standards of individual investors' own credit risk assessments are lowered as they hold smaller exposures. In such circumstances, credit risk assessment is often partly delegated to third parties, including rating agencies, lead arrangers and managers of structured credit vehicles, such as collateralised debt obligations (CDOs). But there are risks that investors could become overly reliant on the assessment of others.⁽¹⁾ The less-developed-country debt crisis of the early 1980s provided an earlier example of this type of risk, when junior participants in lending relied heavily on lead underwriters' risk assessment.

One concern is that some investors may not understand fully the limitations of ratings or the implications of ratings downgrades. Ratings do not provide a complete summary of the riskiness of a product, as the differential pricing of products within a similar ratings band shows (**Table 3.C**). Some investors with mandates restricting their investment to certain ratings bands may be attracted by higher-yielding products within those bands, without fully appreciating the associated risks. And ratings downgrades of assets can have effects that are difficult to predict or model. So far, there have been only limited ratings downgrades of the US sub-prime mortgage-backed securities that are included in CDOs. But the stress in CDS index tranches in May 2005, following downgrades to the debt of GM and Ford, indicated how downgrades to the assets backing structured credit instruments can have unexpected spillover effects.

Table 3.C Spread-for-rating comparison^(a)

Ratings	Underlying	Indicative spread (basis points)
AAA	Corporate bonds	<5
AAA	UK credit card asset-backed security (ABS)	15
AAA	iTraxx series 6, 6% to 9% standard tranche ^(b)	22
AAA	Commercial mortgage-backed security	25
AAA	Cash-flow collateralised debt obligation of mezzanine ABS (average life seven to nine years)	32
AAA	Constant proportion debt obligation (CPDO)	200

Source: JPMorgan Chase & Co.

(a) From JPMorgan Chase & Co. (2006), *Understanding CPDOs and Credit Derivatives Handbook*, December.
(b) Under typical assumptions. iTraxx is the name of a family of credit default swap index products covering regions of Europe, Japan and non-Japan Asia. The constituents of the indices are changed every six months. The series referred to in this table is the European investment-grade series.

Recent events have also highlighted risks from excessive reliance on, or confidence in, historical credit-risk scoring models for credit assessment. Models can break down when the attitudes of borrowers towards default are shifting, as may have been the case recently in the UK unsecured lending market. And modelling risks will be heightened when these models are applied to new forms of lending, such as loans with low introductory interest rates in the US sub-prime mortgage market. There may be specific concerns where borrowers provide only limited and/or self-validated information on their ability to repay.

These experiences raise the question of whether similar effects could arise in other markets more central to the operations of major UK banks, such as in the corporate debt and commercial real estate markets, where credit extension has also been rapid. Although there is little evidence to date of rising repayment difficulties in these markets, they do share some structural similarities to the US sub-prime mortgage markets (see Box 3).

(1) See Committee on the Global Financial System (2005), *The role of ratings in structured finance: issues and implications*, January, available at www.bis.org/press/p050117.htm.

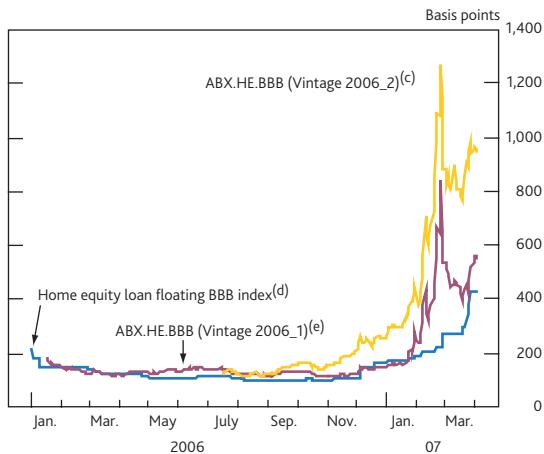
...increased susceptibility to market illiquidity...

Some bearers of credit risk may overestimate their ability to manage down their exposures in markets that subsequently become illiquid. This may be a growing risk because market liquidity has remained high over recent years (**Chart A** in Box 2) and firms have no recent experience of a generalised drying up of liquidity across markets. There have, however, been examples of illiquidity in specific markets, most recently the reported difficulties in closing out positions in synthetic US sub-prime indices (the ABX.HE indices) in February 2007.

...including through trading activities...

The 'originate and distribute' business model exposes banks to other liquidity-related risks. One is the 'warehousing risk' on debt held prior to onward sale, as described in Section 2. This would be exposed if, following a deterioration in credit quality, the market for onward sale were to dry up, leaving banks with a larger-than-expected portfolio of assets whose value may be falling. An associated risk (described in Box 3) is that the hedging of the market and credit risks involved in the process of securitisation or market making is complex and likely to be imperfect, exposing firms to so-called 'basis risk'. Such hedging strategies, particularly if they are dynamic and so rely on frequent adjustments, can be problematic if market liquidity in the range of hedging instruments dries up. Market contacts have pointed to the recent volatility of prices in the synthetic US sub-prime markets (**Chart 3.13**) as suggestive of how, during a period of stress, prices in the cash and derivative markets may become disconnected, causing the correlation assumptions underpinning hedging to break down and crystallising basis risks. Although LCFIs appear to have comfortably weathered any losses from warehousing and basis risk during the US sub-prime episode, these risks could be significant in a more adverse scenario where underlying risk exposures were larger, such as in the corporate credit markets.

Chart 3.13 ABX and home equity loan index spreads^{(a)(b)}



Source: JPMorgan Chase & Co.

- (a) The ABX.HE index is a family of sub-indices, each of which consists of a basket of 20 credit default swaps referencing US sub-prime home equity securities.
- (b) There are substantial differences in the assets underlying the ABX index and the home equity loan (HEL) index. For example, the HEL index includes a range of loan vintages, whereas ABX indices are referenced to specific vintages.
- (c) Loans originated in 2006 H1.
- (d) Five-year spread to one-month Libor.
- (e) Loans originated in 2005 H2.

...and in funding their business...

The major UK banks have increasingly used wholesale markets for their funding in recent years. As Section 2 discusses, that partly reflects the growing use of securitisation. Issuance of residential mortgage-backed securities, in particular, matches assets to liabilities and so limits the UK banks' reliance on alternative sources of wholesale funding, such as short-term unsecured borrowing. But securitisation still leaves the UK banks exposed to a deterioration in market conditions. If they were unable to securitise existing assets, new lending would need to be financed through other wholesale sources, which may be difficult or costly to access during times of stress. The recent difficulties faced by some sub-prime originators in funding an unanticipated flow-back of assets to their balance sheets showed how funding risks in wholesale markets can arise in rapid and sometimes unexpected ways.

Chart 3.14 Concentration in natural gas futures^(a)

Source: Commodity Futures Trading Commission.

(a) Top four or less large traders' share of total open interest in New York Mercantile Exchange Henry Hub gas swap contracts.

...with concerns about counterparty credit risk management...

In intermediating between risk-takers and risk-bearers, banks are exposed to significant counterparty credit risk. Both public sector and private sector initiatives have helped improve counterparty credit risk management over the past decade, following difficulties at Long Term Capital Management (LTCM) in 1998.⁽¹⁾ Margining and collateral practices, in particular, have been strengthened over this period. But the Amaranth hedge fund proved vulnerable to substantial margin calls in September 2006 on its very large positions in natural gas markets. **Chart 3.14** indicates that concentration in those markets had risen earlier in the year. That episode highlighted the importance of stress testing margining arrangements and, in particular, ensuring that those arrangements adequately recognise concentration risk.

The earlier difficulties at LTCM highlighted the risk that a counterparty may only be able to meet margin payments by a 'fire sale' of assets, potentially triggering wider market distress. The fact that the sale of assets by Amaranth during the episode did not trigger wider difficulties reflected the willingness of others to take on its natural gas positions at a discount, as well as the generally benign state of markets at the time. In conditions of generalised stress across markets, the overall impact could be much greater. This highlights the importance of prime brokers' margining and collateral practices taking such potential spillovers to markets into account.

...underscoring the importance of improved stress testing.

Problems at Amaranth and in the US sub-prime mortgage market over the period have highlighted some potential areas of relative weakness in risk management. These weaknesses could be more material if a number of vulnerabilities were to be triggered in combination, such as the low risk premia, corporate and LCFI vulnerabilities. That underscores the need for stress testing of plausible, but extreme, stress scenarios. These stress tests need importantly to take account of the likely actions and interactions of others under stress, such as those arising because of the increasing importance of market liquidity. Section 4 details the work being undertaken to address risks, in these and other areas.

(1) For example, see the Counterparty Risk Management Policy Group II report, 27 July 2005, *Toward greater financial stability: a private sector perspective*, available at www.crmpolicygroup.org/.

4 Mitigating risks to the UK financial system

This section identifies key areas for risk reduction work arising from the risk assessment in earlier sections. It discusses progress with work under way and new work that might be undertaken by the private and public sectors to address potential gaps. One such area is stress testing of firms' balance sheets to examine their resilience to system-wide shocks. Another is liquidity risk, reflecting firms' increasing dependence on well-functioning markets for funding and risk management. Working with other authorities and the wider financial sector, the Bank continues to seek greater operational resilience in the financial system and to improve planning for crises.

4.1 Mitigating risks to the UK financial system

Publicising the Bank's assessment of the major risks to the UK financial system is one way of helping to mitigate them — for example, by bringing particular risks to the attention of risk managers, or by highlighting possible co-ordination failures among market participants.

The Bank also takes action directly to reduce risks. For example, the key payment and settlement systems in sterling (notably CHAPS and CREST) settle in real time in central bank money, the safest means of settlement in sterling, thereby eliminating counterparty credit risk between member banks. More broadly, the Bank supplies funds (against eligible collateral) in normal and stressed circumstances to eligible institutions.

The Bank is also involved in targeted initiatives to influence financial institutions' risk-taking behaviour and improve the system's resilience. These initiatives are typically undertaken in collaboration with other financial sector authorities — the FSA, HMT and international counterparts. One prominent example is capital regulation, which is designed to ensure that banks hold enough capital to cover unexpected losses arising from a range of sources. Through Basel II and the EU Capital Requirements Directive, this has been the focus of much risk reduction work by official authorities in recent years.

The increased dependence of UK banks on wholesale markets highlights, however, the importance of some more specific channels through which shocks could generate instability, in particular market and funding liquidity risk, and counterparty credit risk. Some of the work being undertaken to address these risks is described in Sections 4.2 to 4.4.

The Bank and other authorities also plan for possible financial crises and work closely with firms to prepare for operational disruptions to the financial sector. The aim here is to ensure that any crisis could be resolved in a way that minimises, as far as possible, the wider disruption to the financial sector and the real economy. These initiatives are discussed in Sections 4.5 and 4.6.

4.2 Systemic stress testing and monitoring of capital requirements

Banks' stress tests should use severe scenarios and consider 'feedback' effects...

The relative stability of the financial system in recent years raises concerns that some firms may be taking insufficient account of the possibility of large shocks to the real economy or financial markets in the future. For example, there are signs that some firms may be making optimistic assumptions about the behaviour of the macroeconomy and of other market participants under conditions of stress, which would have implications for the robustness of asset market liquidity under such conditions.

Stress testing can be a useful means of assessing resilience to shocks and is already an important part of most financial firms' risk management. To be effective, it is important that such stress testing consider events that are plausible yet severe.⁽¹⁾ In particular, in a 'stress' situation, the initial impact of adverse shocks may be amplified through the behavioural responses of other firms and so increase the impact on the system as a whole.⁽²⁾

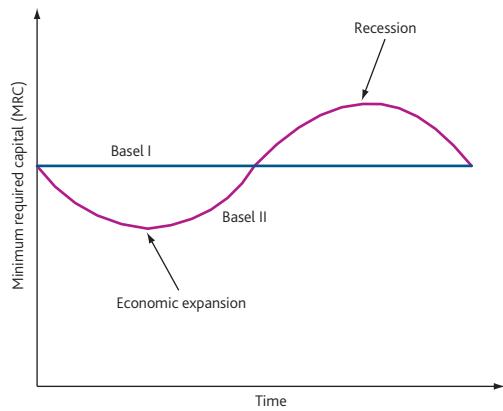
For example, if other banks responded to an adverse system-wide shock by tightening lending conditions, that could affect the ability of borrowers to service their loans, above and beyond the impact of the initial shock. Similarly, if banks responded to a system-wide shock by selling assets, either to generate cash or to close out positions, that could amplify asset price falls. While it is difficult for individual firms accurately to model these system-wide risks, they can allow for them by adopting more extreme scenarios in their tests. Banks' losses in these severe scenarios may be greater than implied by models that use data drawn mostly from normal conditions.

Together with the FSA, the Bank has initiated a discussion about stress testing with a group of major banks operating in the United Kingdom. It is hoped that this initiative will help to improve understanding of stress testing and the dynamics and impact of severe stress scenarios.

(1) For more detail, see the FSA's stress testing thematic review, available at www.fsa.gov.uk/pubs/ceo/stress_testing.pdf.

(2) See Haldane, A, Hall, S and Pezzini, S (2007), 'A new approach to assessing risks to financial stability', Bank of England *Financial Stability Paper No. 2*, available at www.bankofengland.co.uk/publications/fsr/fs_paper02.pdf.

Chart 4.1 Illustrative example of potential changes to Basel II minimum capital requirements over the economic cycle^(a)



(a) This chart contrasts the *volatility* of Basel II minimum capital requirements for a fixed portfolio, relative to Basel I. The chart is not intended to make any statement about the *level* of aggregate Basel II capital requirements relative to Basel I at any stage in the economic cycle.

...and the authorities will monitor the impact of the new capital rules on firms' capital and lending behaviour.

Under the advanced approaches of Basel II, banks' capital requirements will be determined partly by internal ratings assigned to banks' exposures (and partly by stress testing and supervisory review). Cyclical downgrades in internal ratings could cause minimum capital requirements to rise significantly (Chart 4.1), potentially prompting banks to tighten credit supply. This could adversely affect the provision of funds in aggregate, and hence financial stability.

The FSA and the Bank have recently developed a system that will enable the authorities to examine the sensitivity of aggregate minimum capital requirements to credit conditions, and to monitor the impact of changes in these requirements on both actual capital and lending. Internationally, the Basel Committee on Banking Supervision (BCBS) has established a Basel II Capital Monitoring Group that will share national experiences in monitoring the level and cyclicity of capital requirements, and a European Union Task Force on the impact of the new capital framework has recently been set up.⁽¹⁾

4.3 Liquidity risk

As noted in Section 3, financial firms are becoming increasingly reliant on the continued liquidity of asset markets in managing their cash flows and risks to their balance sheets. But, given the recent long period of low volatility, firms have little experience with which to test their assumptions about the behaviour of these markets under stressed circumstances.

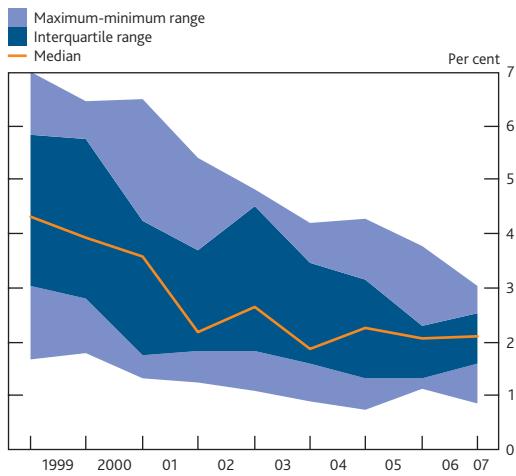
Central bank eligible assets provide a useful 'backstop' of liquidity...

Prudential liquidity standards help to ensure that banks are able to withstand abnormal demands on their liquidity. The design of these standards is a core issue for central banks as well as regulators, because they influence banks' demand for central bank funds in both normal and exceptional circumstances. The Bank considers a 'backstop' of central bank eligible assets to be an important element of liquidity standards. Through central bank standing facilities, such assets can be exchanged for central bank money on demand at pre-announced terms. If wholesale funding markets are temporarily unavailable (either for operational reasons, or because markets lose confidence in a bank), access to standing facilities allows a bank to meet payment obligations without resorting to asset sales which, by depressing prices, may result in larger losses and wider market disruption.

In the case of major UK banks, the current sterling stock liquidity regime (SLR) provides such a 'backstop' by requiring banks to hold Bank of England eligible assets against a

(1) The European Commission is committed, through Article 156 of the Capital Requirements Directive, to 'periodically monitor whether Basel II ...has significant effects on the economic cycle and... consider whether any remedial measures are justified'.

Chart 4.2 Major UK banks' sterling stock liquidity requirement relative to total assets^{(a)(b)}



Source: FSA regulatory returns.

(a) Data exclude Nationwide and Banco Santander.

(b) The sterling stock liquidity requirement shown above is calculated as net sterling wholesale liabilities, and 5% of sterling retail deposits, maturing over the next five days. Under the sterling stock liquidity regime (SLR), banks can offset up to 50% of this five-day net wholesale outflow with discounted holdings of other banks' sterling certificates of deposit. The rest of the sterling stock liquidity requirement must be met with holdings of Bank of England eligible assets.

potential non-renewal of maturing sterling wholesale funding and a withdrawal of sterling retail deposits. However, a number of the major UK banks now make greater use of non-sterling wholesale funding sources and have increased their exposure to off balance sheet liquidity risk. Off balance sheet products can result in liquidity demands through drawdowns on committed lines and requests for margin on derivative transactions. These sources of liquidity risk are not covered by the existing SLR.

...it is desirable to seek greater consistency in the objectives of liquidity standards...

As a result, there is a risk that UK banks' 'backstop' holdings have fallen relative to the amount of liquidity that they could require in stressed conditions (**Chart 4.2**). Moreover, the increasingly cross-border nature of banks' liquidity management has also drawn attention to the lack of a common international approach to liquidity standards.⁽¹⁾ It has been agreed that the authorities should seek an improved understanding of the impact and implications of diverse liquidity standards, and of the scope for greater consistency in objectives. The BCBS's Liquidity Working Group is therefore carrying out a wide-ranging stock-take of existing regulatory and supervisory standards for liquidity risk management.

...and for central banks to make it easier for banks to use collateral across borders.

Banks' increased recourse to cross-border liquidity management also highlights the desirability of central banks improving operational arrangements for pledging collateral held in one country to a central bank in a different country.⁽²⁾ For example, the Bank of England routinely employs such arrangements to accept euro-denominated government securities as collateral for sterling liquidity, and also stands ready to accept US Treasuries in exceptional circumstances. Cross-border use of collateral can help internationally active banking groups manage their liquidity needs across different jurisdictions and offers access to contingent sources of liquidity during periods of market disruption.

More might be done to improve arrangements for pledging collateral to central banks across borders. For example, the G10 Committee on Payment and Settlement Systems (CPSS) is considering practical ways to strengthen cross-border collateral arrangements, including greater information-sharing and enhanced operational co-ordination among central banks. Euro-area central banks also recently announced plans to enhance the Correspondent Central Banking Model (CCBM) for the delivery of cross-border collateral within the European Union.⁽³⁾ In the United Kingdom, the Bank is currently

(1) See, for example, the Joint Forum report on the 'Management of liquidity risks in financial groups', available at www.bis.org/publ/joint16.pdf, and the Institute of International Finance report on 'Principles of liquidity risk management', available at www.iif.com/press/press+25.php.

(2) As recommended by the G10 Committee on Payment and Settlement Systems last year, available at www.bis.org/publ/cpss71.htm.

(3) Available at www.ecb.int/press/pr/date/2007/html/pr070308_2.en.html.

examining a range of additional mechanisms through which banks could deliver cross-border collateral to raise liquidity at the Bank of England, including whether to allow banks to transfer collateral via links between international and national securities depositories.

4.4 Interlinkages between firms: counterparty risk

As Section 2 explains, financial sector firms are highly interconnected through direct financial exposures, arising from liquidity management, and payment, settlement and trading activities. Because problems at one firm could be rapidly transmitted to others, financial sector authorities have a particular interest in ensuring these exposures are appropriately managed.

The Bank supports initiatives to mitigate counterparty risk in over-the-counter (OTC) derivatives markets...

Arrangements for processing OTC derivatives trades have tended to lag the rapid growth in their use. This has led to regulatory action, for example the 2005 initiative led by the Federal Reserve Bank of New York focusing on the reduction of processing backlogs in credit derivatives. Partly in response to this, the industry has made good progress in improving operational processes, which in turn have improved firms' risk management. However, further work is needed on processing backlogs in other derivative products, preparing for 'closeout' of one or more major participant and achieving greater interoperability⁽¹⁾ between service providers (see Box 7).

...and in more traditional banking activities.

As discussed in Section 2, some foreign exchange transactions give rise to counterparty risk. Central banks are currently assessing the scale of this risk, drawing on information from their 2006 survey of key firms, and are discussing whether or not there may be a need for action to reduce further foreign exchange settlement risk. More generally, many banks rely on other banks to access payment and settlement systems, resulting in sometimes large uncollateralised exposures between them. The Bank has encouraged increased direct membership of CHAPS to address the associated risks, with some success; Abbey joined in 2005 and UBS will join in 2007. The FSA also reviewed banks' intraday risk management practices in this area during 2006.

(1) Interoperability is where a system or product can be used in conjunction with other systems or products without imposing unnecessary costs on users.

Box 7

OTC derivatives clearing and settlement arrangements

The CPSS recently published a report⁽¹⁾ reviewing developments in the clearing and settlement infrastructure supporting OTC derivatives markets. While the report found that substantial progress had been made in automating and centralising key post-trade functions, a number of areas for further work were identified.

- While backlogs in processing credit default swaps (CDS) have been reduced substantially, they remain sizable in other derivative products. The report encourages increased automation in post-trade processes and mitigation of risks arising between trade and legal execution.
- Market participants were encouraged to consider actions to mitigate potential spillovers arising from the replacement of contracts following the closeout (default) of one or more major participants.
- Interoperability should be sought between core post-trade services supporting OTC derivatives markets. This should encourage continued innovation and further automation in post-trade processes, enhancing operational efficiency and feeding firms' risk management systems with consistent and accurate data.

In each case, initiatives are already under way in both the private and public sectors, among the most important of which are:

Processing backlogs

The Federal Reserve Bank of New York brought together a group of fourteen firms and their regulators in 2005 to address processing backlogs in the credit derivatives market. The extension of the scope of this initiative to 17 firms and a broader range of OTC products is welcome, as is dealers' commitment to work, over time, towards tighter deadlines for issuing and completing confirmations.

But, as the report notes, dealers might do more to mitigate risks associated with unconfirmed positions. This is particularly important for: complex products, where processing lags are longer and automated solutions may be unavailable; and products carrying high market risk (such as equity derivatives), where processing errors or delays can leave large uncovered exposures.

Regular portfolio reconciliation and affirmation of the core economic terms of a trade can ensure that risk management is

based upon an accurate record of positions. New vendor services are emerging to support both practices.

Closeout

Portfolio reconciliation might also help in mitigating the risk of market disruption following the default of one or more large market participants. It has been argued that one of the barriers to an orderly unwind of positions is dealers' imperfect records of their outstanding exposures to a stricken party; daily portfolio reconciliation could certainly help, while also improving counterparty risk management more broadly. Recourse to voluntary multilateral contract terminations⁽²⁾ might also be expected to make closeout more efficient, by reducing the volume of trades brought to market.

Interoperability

The CPSS report remains open on the important question of whether a broader range of OTC products should be cleared via a central counterparty clearing house (CCP).

A CCP can offer multilateral netting of exposures, centralised risk management and both operational and liquidity risk reduction. But there are several challenges associated with CCP clearing in OTC, as compared with exchange-traded, derivatives markets. For instance, risk management is complicated by difficulties in valuing more complex products. And relative illiquidity in the underlying markets makes it harder to close out a defaulting dealer's positions; default management procedures therefore leave members with potential contingent exposures. Given these limitations, access criteria will be demanding and product coverage perhaps restricted to vanilla products.

However, a network of interoperable central services offering particular post-trade functions might deliver broadly equivalent benefits in the areas of operational and liquidity risk reduction. Such a model might be built around the data integrity delivered by a service such as DTCC's Trade Information Warehouse. DTCC's commitment to facilitate connectivity to the Warehouse is therefore welcome and interoperability of other core post-trade services would bring further benefits.

(1) 'New developments in clearing and settlement arrangements for OTC derivatives', available at www.bis.org/publ/crss77.htm.

(2) For instance, TriOptima's triReduce service runs regular termination cycles, identifying offsetting positions in dealers' interest rate and credit portfolios and, within certain tolerances, terminating as many contracts as possible without altering dealers' net market exposures.

4.5 Operational risk

Continued progress in planning domestically for operational disruption...

During 2005, a survey of the operational resilience of around 60 of the main financial institutions and infrastructures in the United Kingdom was carried out.⁽¹⁾ The survey is currently scheduled to be repeated in Autumn 2007 to assess how the sector as a whole has improved its resilience and to allow individual institutions to benchmark progress against their peer groups. One of the main conclusions was the need for more co-ordinated testing of the financial sector's resilience as a whole. Institutions find it easier to run exercises internally than to plan joint exercises with competitors, so the Tripartite Authorities (Bank, FSA and HMT) have a role in encouraging and delivering co-ordinated testing.

A recent Foreign Exchange Joint Standing Committee (FXJSC) tabletop exercise examined how the foreign exchange market would respond to an outage of CLS. Further exercises of this type are expected to take place. The Bank, together with the Money Market Liaison Group, is also planning a co-ordinated live test of the sterling money markets in which participants will trade core sterling market instruments from their backup sites. The Bank is also discussing with the CHAPS banks the timing of a test running members' key CHAPS payment operations from backup sites.

Table 4.A Market Wide Exercise 2006: issues for follow-up

Workstream	Questions addressed
Cash	What arrangements can be made to make cash distribution more resilient to a pandemic?
Retail	Can improvements be made to co-ordination between high street banks to enhance the availability of branch networks and ATMs to consumers during a pandemic?
Wholesale	Do the various concerns raised by firms about reliance on home working undermine its potential role in a pandemic?
Infrastructure	What are the impacts of disruption or closure of exchanges or infrastructure providers?
Regulatory forbearance	In what areas, and when, would firms be seeking regulatory forbearance during a pandemic?

Source: *Market Wide Exercise 2006 Report*, available at www.fsc.gov.uk/section.asp?catid=468.

One of the main business continuity initiatives in 2006 was a Market Wide Exercise based on a flu pandemic scenario, which was conducted over six weeks in October and November 2006.⁽²⁾ This highlighted a number of potential vulnerabilities. **Table 4.A** lists some of the workstreams now under way to tackle issues raised by the exercise.

...is complemented by international co-ordination.

More broadly, the UK authorities have been working to enhance international co-ordination through bilateral discussions with the United States and other countries, and multilaterally through international bodies such as the Joint Forum⁽³⁾ and the Financial Stability Forum (FSF).⁽⁴⁾ In late 2006 an FSF workshop, hosted by the United Kingdom, discussed international co-ordination in the face of major operational disruption or a potential financial crisis. Work is being carried out through the FSF to share information on operational (and financial) disruptions over recent years and on national crisis management arrangements, with a view to drawing out the common lessons.

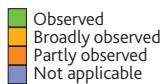
(1) Available at www.fsc.gov.uk/section.asp?catid=320.

(2) Available at www.fsc.gov.uk/section.asp?catid=468.

(3) Available at www.bis.org/bcbs/jointforum.htm.

(4) Available at www.fsforum.org.

Table 4.B Summary assessment of the main wholesale UK payment systems against Core Principles^(a)



 Observed
 Broadly observed
 Partly observed
 Not applicable

	CHAPS £ and €	CREST £ and €	CREST US\$	LCH.Clearnet Ltd PPS ^(b)
I: Legal basis	Green			
II: Understanding financial risks	Green			
III: Management of financial risks	Green		Yellow	Yellow
IV: Prompt final settlement	Green		Yellow	Green
V: Settlement in multilateral netting systems	Blue		Blue	Blue
VI: Settlement asset	Green		Yellow	Green
VII: Security and operational reliability	Green	Yellow	Yellow	Green
VIII: Efficiency	Green			
IX: Access criteria	Yellow			
X: Governance	Yellow		Yellow	Green

Source: *Payment Systems Oversight Report 2006*, Bank of England.

- (a) The Core Principles for Systemically Important Payment Systems, designed by the G10 Committee on Payment and Settlement Systems, provide a set of minimum standards for risk management in systemically important payment systems. See www.bis.org/publ/cpss43.pdf for a description of the Core Principles.
- (b) The LCH.Clearnet Ltd Protected Payments System (PPS) enables settlement of obligations between LCH.Clearnet Ltd and its members in twelve currencies. The assessment shown above relates to the main three currencies settled, namely sterling, euro and US dollar. One exception to the assessment shown above is that the Bank continues to assess the UK PPS's arrangements for US dollar settlement partly to observe Core Principle VI, and for the US PPS's arrangements for US dollar settlement broadly to observe Core Principle VI.

Market infrastructures are a particular focus...

UK payment systems continue to exhibit a high degree of robustness (**Table 4.B**). One of the follow-ups to the Market Wide Exercise is to assess the importance of interlinkages between key market infrastructures such as CHAPS, CREST and SWIFT, to improve understanding of the wider impact of disruption or closure of particular infrastructure providers.⁽¹⁾ These interlinkages highlight the need for clear cross-system co-ordination and testing of plans, with good communication to the users of these systems.

...and it is important that users of systems observe high standards too.

Systems' users may also experience operational difficulties, which could spill over to affect other firms that depend on the same systems. Basel II has already led to an improvement in firms' operational risk management, including by prompting banks to improve data collection on losses arising from operational incidents (including data sharing across firms) and to upgrade their operational risk management systems.

Operational resilience is particularly critical for institutions that settle payments and securities transactions on behalf of other banks — that is, for providers of correspondent banking and custody services. These institutions are acting as an important component of the infrastructure. It is important that banks which choose to operate via correspondents and custodians manage their operational dependence appropriately, including developing and maintaining robust contingency plans.

4.6 Financial crisis management

For firms, as well as the official sector, it is important to have crisis plans in place...

The UK Tripartite Authorities have put in place domestic arrangements for responding to financial crises.⁽²⁾ Private sector participants will also want to ensure that they have arrangements in place which would allow them quickly to establish their overall exposures and to implement their contingency plans should that prove necessary. But a contingency liquidity plan which works well when implemented in isolation could break down if several firms implement their plans at the same time. For example, the combined pressure to close out positions or access a particular market could lead to a severe drain in market liquidity. So it is important to consider the likely response of other firms when developing contingency plans. Work on systemic stress testing (discussed in Section 4.2) may help in this respect.

(1) Chapter 3 of the *Payment Systems Oversight Report 2006* highlighted the need for further work in this area, available at www.bankofengland.co.uk/publications/psor/index.htm.

(2) See the July 2006 Report, Box 8: Risk assessment and crisis management, page 58, and the Memorandum of Understanding on financial stability between HM Treasury, the FSA and the Bank, available at www.bankofengland.co.uk/financialstability/mou.pdf.

Crises tend to be characterised by incomplete and imperfect information, which complicates decision-making. As reported in the July 2006 *Report*, the FSA is leading a tripartite project — ‘Factbooks’ — to establish a central resource of key information on major firms to facilitate prompt and efficient information-sharing among the authorities. The project includes collecting a limited amount of additional information (not already gathered by the authorities through existing channels) from those firms. Some of this information is provided in advance, while the rest would be provided ‘on the day’. This part of the project is nearing completion. Work continues on finding cost-effective mechanisms for enhancing the authorities’ ability to mobilise and share their existing data in a crisis.

Table 4.C Some recent testing involving the UK Tripartite Authorities^(a)

Main areas tested:

	Communications infrastructure ^(b)	Co-ordination	Information-sharing	Systemic assessment	Decision making	Cross-border co-ordination	Included private sector participants
EU FCM ^(c) simulation exercise (2003)				To test the provisions of the 2003 MoU ^(d) between EU central banks and banking supervisors			
UK FCM simulation exercise (2004)	✓	✓	✓				
UK BCP ^(e) market-wide exercise (2004)	✓	✓	✓	✓		✓	
UK BCP desktop exercise (2005)	✓	✓	✓	✓			
UK FCM simulation exercise (2005)	✓	✓	✓	✓			
UK BCP market-wide simulation exercise (2005)	✓	✓	✓	✓	✓	✓	✓
UK BCP communications test (2006)	✓						
EU FCM simulation exercise (2006)				To test the provisions of the 2005 MoU ^(f) between EU central banks, banking supervisors and finance ministries			
UK BCP simulation exercise (2006a)	✓	✓	✓	✓	✓		
UK BCP simulation exercise (2006b)	✓	✓	✓		✓		
UK BCP market-wide exercise (2006)	✓	✓	✓	✓	✓		✓
UK FCM desktop exercise (2006)				✓	✓		
BCP desktop exercise (2007)	✓	✓	✓	✓	✓	✓	
UK FCM desktop exercise (2007)				✓	✓		
BCP simulation exercise (2007)	✓	✓	✓	✓	✓	✓	

(a) Tests involving only one of the authorities are not listed in the table.

(b) Testing of phone lines, back-up sites etc.

(c) Financial crisis management.

(d) www.ecb.int/press/pr/date/2003/html/pr030310_3.en.html.

(e) Business continuity planning.

(f) www.ecb.int/press/pr/date/2005/html/pr050518_1.en.html.

...for both parties to consider testing them...

The UK authorities have conducted a number of exercises to test processes for co-ordination and information-sharing in operational and financial crises. A summary of recent testing is shown in **Table 4.C**. The emphasis now is on testing arrangements for effective decision-taking in a crisis. Private sector firms have been involved in several of these exercises.

...and for the authorities to co-ordinate their planning internationally, perhaps through ‘interest groups’.

There are a number of crisis management initiatives at the international level, and recent years have seen a number of cross-border memoranda of understanding signed among authorities, both at the EU level and in smaller regional groups. The FSF workshop in November 2006 discussed communication and information flows in-crisis. In the EU, work is under way to develop a framework for assessing the impact of financial sector disruption during a crisis.

The Bank’s view is that an effective way to make practical progress on international co-ordination is to discuss key issues in small ‘interest groups’ of relevant authorities.⁽¹⁾ Such groups would be formed of countries whose financial systems are closely linked and would focus on discussing practical arrangements for managing a disruption with cross-border implications.

More broadly, dealing with an insolvent bank raises a number of challenging issues in both a domestic and international context. Box 8 examines some of the bank resolution regimes currently in place in different jurisdictions.

(1) See Gieve, J (2006), ‘Practical issues in preparing for cross-border financial crises’, speech at a Financial Stability Forum Workshop, 13 November. Available at www.bankofengland.co.uk/publications/speeches/2006/speech290.pdf.

Box 8

Bank resolution regimes

Large bank failure is rare: the United Kingdom, in common with many of its European counterparts, does not have recent practical experience of a large bank failure. But the costs of such an event to the financial system and wider economy could be high. It is therefore important that bank resolution regimes are designed to minimise unnecessary disruption, by facilitating an orderly resolution of the failing firm.

The UK approach to bank resolution

Banks in the United Kingdom are subject to normal corporate insolvency procedures, which have a narrow focus on the failing firm and the interests of its creditors. The insolvency or sudden closure of a large bank could, however, raise wider issues: disorderly closure could impose widespread costs and disruption elsewhere in the financial system; and key functionality could be lost. Consideration of such factors would lie outside the statutory remit of an administrator or liquidator.

The nature of banks' business and role in the economy means that the authorities may sometimes want the flexibility to maintain operational continuity in a bank's key functions, so that they can provide uninterrupted services to customers and pass intact to new owners. This may not be possible under the moratorium which normally forms part of corporate administration processes, because the flow of payments into and out of the stricken bank will generally be integral to the continuity of its core functions. And other events triggered by insolvency — such as netting and closeout of derivatives contracts — may fundamentally compromise the business and its value to new owners.

Bank insolvency regimes in other jurisdictions

Like the United Kingdom, the majority of EU countries do not have a separate statutory regime governing bank insolvencies: bank resolution is largely based on general insolvency law. A common trend in recent years has been the assignment of greater powers to bank supervisors to initiate insolvency proceedings (powers which the FSA already enjoys) and to participate fully in all aspects of the insolvency. But insolvency courts and specialist insolvency practitioners generally take the lead in administration and liquidation procedures themselves.

Some countries, such as the United States,⁽¹⁾ have developed specific regimes for banks. These typically give bank supervisors and/or deposit insurance funds more central roles and greater powers, removing banks from the scope of normal corporate insolvency proceedings. In Canada, the bank resolution regime combines a court-driven approach which

draws on aspects of general insolvency law with the provision of extensive powers for the bank supervisor and deposit insurance fund. This represents a middle ground between the UK approach and a US-style separate regime for banks.

Some countries with special regimes have linked their insolvency procedures to pre-insolvency remedial actions, generally termed 'prompt corrective action' regimes. These aim to improve the chances of a successful resolution through the early identification of problems. In the United States, these actions are prescribed by law. The Canadian regime⁽²⁾ gives more discretion in enforcement and is more akin to the United Kingdom, where the FSA has flexibility to determine what actions to take if the solvency of a bank is deteriorating.

The challenges inherent in the resolution of a large potentially insolvent bank are further complicated if multiple jurisdictions are involved, each with its own approach and constraints. For example, some bank insolvency regimes contain rules which explicitly favour domestic creditors.

Exploring refinements and alternatives

Given the diversity of international practice and the potential constraints imposed by normal insolvency processes, it would seem to be worth considering whether refinements of, or alternatives to, the current UK approach are warranted.

There are a number of methods by which a 'continuity of function' objective could in principle be achieved. Bridge banks represent one such option: this involves either the transfer of the assets and liabilities of the existing legal entity to a new legal entity or the transfer of ownership of the existing legal entity to new owners. The 'new' bank would then continue to provide the critical functions while either a recapitalisation or a permanent transfer of business to new owners is organised. But making such options both feasible and practicable is not straightforward, and the full implications of implementing them in a crisis require careful thought.

(1) Federal Deposit Insurance Corporation Improvement Act (1991).

(2) See Office of the Superintendent of Financial Institutions, 'Guide to intervention'. Available at www.osfi-bsif.gc.ca/osfi/index_e.aspx?DetailID=282.

Other financial stability publications

This section provides a short summary of other financial stability related publications released by the Bank of England since the July 2006 Report.

Regular publications

The Payment Systems Oversight Report 2006.

The *Payment Systems Oversight Report* provides an account of how the Bank is discharging its responsibility for oversight of UK payment systems. The latest Report is available on the Bank's website at:
www.bankofengland.co.uk/publications/psor/index.htm.

Markets and operations article, Bank of England Quarterly Bulletin, 2007 Q1.

This article reviews recent developments in sterling financial markets, in market structure and in the Bank's official operations. The latest *Quarterly Bulletin* is available on the Bank's website at:
www.bankofengland.co.uk/publications/quarterlybulletin/qb0701.pdf.

Speeches

Financial system risks in the UK — issues and challenges.

John Gieve, Deputy Governor, July 2006.

www.bankofengland.co.uk/publications/speeches/2006/speech280.pdf

In this speech, John Gieve explained the Bank's role in financial stability, identified some of the key sources of vulnerability in the financial system, and highlighted actions that firms and authorities are taking to guard against these risks. The speech noted that fierce competition to establish positions in new markets was shifting the key financial firms up the risk spectrum. A key theme of the speech was that although changes to the structure of the financial system over recent years may have made it more efficient at sharing risk, these same changes may also have made the system more efficient at transmitting shocks. It was therefore possible that we were moving into a world of less frequent but higher impact crises.

Hedge funds and financial stability.

John Gieve, Deputy Governor, October 2006.

www.bankofengland.co.uk/publications/speeches/2006/speech285.pdf

In this speech, John Gieve discussed how the rapid growth of hedge funds forms part of a wider transformation in financial markets. He noted that in the long run this should help widen

the range of options for investors and promote stability, although in the short run there were risks while the funds, other market participants and the authorities gained experience of new products and markets. He concluded that the FSA and other authorities, including the Bank, were alive to the dangers and were doing what they could to assess and mitigate the risks.

Prudential regulation, risk management and systemic stability.

Alastair Clark, Adviser to the Governor, October 2006.

www.bankofengland.co.uk/publications/speeches/2006/speech286.pdf

In this speech, Alastair Clark discussed Basel II capital requirements and the cyclicity of credit conditions, the role of bank capital requirements in the face of greatly increased credit risk transfer and the importance of liquidity alongside capital as a factor in banks' overall financial position. He concluded that, although there were theoretical reasons for thinking that procyclicality might increase, it was too early to say how significant this effect would be in practice. Bank capital requirements against credit risk remained important given that banks were still a major, and often dominant, channel for the provision of credit. More intensive analysis was needed on whether, and if so in what form, it might make sense to establish international standards for liquidity, paralleling those for capital.

Managing a bank-specific crisis: a UK perspective.

Ian Bond, Head of Financial Resilience Division, October 2006.

www.bankofengland.co.uk/publications/speeches/2006/presentation061026.pdf

In this speech, Ian Bond discussed the UK arrangements for managing financial crises. Crisis management had probably become more challenging in recent years given the increased complexity and connectedness of the financial system. The speech outlined the arrangements within the United Kingdom, as reflected in the Tripartite Memorandum of Understanding which formalises the distinct but co-operative roles played by each of the Tripartite authorities, and reviewed several recent developments that support the arrangements. The arrangements for handling international crises and the steps that have been taken to improve international co-ordination were also discussed.

International monetary stability — can the IMF make a difference?

Rachel Lomax, Deputy Governor, November 2006.

www.bankofengland.co.uk/publications/speeches/2006/speech289.pdf

In this lecture, Rachel Lomax argued that in a more integrated world economy, there is a greater shared interest in identifying the risks to international monetary stability and in discussing the policy responses that might help to mitigate them. While she saw a central role for the IMF, as the permanent institution set up to promote international monetary co-operation, she argued that the Fund's current surveillance activities needed to be redesigned to provide a more operational focus on external stability. The IMF should devote more time to overseeing the system as a whole, and focus on the surveillance of those countries with the most potential to create waves in the international monetary system. She outlined proposals for grounding Fund surveillance in a more structured analysis of policy frameworks that countries themselves chose to adopt and for setting an annual surveillance remit against which the Fund could be held accountable.

Practical issues in preparing for cross-border financial crises.

John Gieve, Deputy Governor, November 2006.

www.bankofengland.co.uk/publications/speeches/2006/speech290.pdf

In this speech, John Gieve discussed the challenge that globalisation poses for handling and resolving financial crises. He argued that the machinery for co-operation between authorities had not kept pace with the internationalisation of markets, and suggested that a practical way to improve co-ordination was through discussion of operational issues in small 'interest groups' of authorities with a mutual interest in specific financial firms and the capital markets in which they interact. He concluded that the Financial Stability Forum could draw out the common messages and lessons from these 'interest groups' and help to establish a common framework for handling cross-border crises.

Risks to the commercial property market and financial stability.

Nigel Jenkinson, Executive Director for Financial Stability, November 2006.

www.bankofengland.co.uk/publications/speeches/2006/speech293.pdf

In this speech, Nigel Jenkinson discussed risks to the financial system from the commercial property market, which in the past had been particularly vulnerable to any cyclical deterioration. He concluded that although there were currently similarities with previous booms, including sharp price rises and a major expansion in bank lending, there were also important differences, including the benefits of continued financial market innovation. Against this background, it was prudent to monitor market conditions closely and to stress test portfolios against adverse outcomes.

Macro, asset price, and financial system uncertainties.

Paul Tucker, Executive Director for Markets, December 2006.

www.bankofengland.co.uk/publications/speeches/2006/speech294.pdf

In this lecture, Paul Tucker discussed three related 'arenas' of uncertainty concerning the impact of structural changes in the economy and financial system. Beginning with the macroeconomy and against the background of his vote at the Monetary Policy Committee's November meeting, he looked at the challenges confronting policymakers from supply-side changes in the United Kingdom such as migration and globalisation, and stressed that the response of policymakers depended crucially on whether medium-term inflation expectations were well anchored. After exploring possible explanations for the volatility of financial-asset returns having fallen by rather less than macroeconomic volatility, he considered the limited degree of forward-looking uncertainty about asset prices implied by financial option prices. Noting that part of the explanation might lie in developments in the structure of the financial system, and in particular the process of disintermediation of the banking system, he examined the implications for assessments of money and credit conditions and of the resilience of the financial system as a whole. Bringing those uncertainties together raised questions about how markets and the system would respond if some of the risks to the outlook were to crystallise. Though the answers were unknowable, he emphasised that central bankers must strive to maintain the medium-term credibility of monetary policy; and must understand today's global banking system and capital markets well enough to tell the difference between a problem requiring solely a macroeconomic response and a more complex financial stability problem.

Pricing for perfection.

John Gieve, Deputy Governor, December 2006.

www.bankofengland.co.uk/publications/speeches/2006/speech295.pdf

In this speech, John Gieve cautioned that with implied volatilities and risk premia low by historic standards many markets appeared to be 'priced for perfection'. He noted that one factor that might have been driving down implied volatilities was the apparent popularity of selling deeply 'out-of-the-money' options, which equated to selling insurance to others against unlikely financial market events. He concluded that given the rapid pace of innovation in financial markets and products, investors needed to take particular care to understand the risks they were exposed to, and suggested that one approach would be to put greater emphasis on stress-test results alongside more conventional risk metrics.

Through the looking glass: reform of the international institutions.

Mervyn King, Governor, December 2006.

www.bankofengland.co.uk/publications/speeches/2006/speech296.pdf

In this speech, the Governor argued that a set of rules was needed to govern the process of globalisation. Those rules were embodied in international institutions. But the current set of institutions, designed at the end of the Second World War, was outdated. Since then, the number of nation states had increased sharply and countries had moved away from fixed exchange rates and capital controls to floating exchange rates and free movement of capital. These changes had made the post-war settlement less relevant. But by increasing the potential for decisions in one country to affect the lives of people in other countries, they had increased the need for international institutions. The Governor outlined five principles that should guide the reform of international institutions and, with these in mind, considered the challenge of reforming the IMF.

The City's growth: the crest of a wave or swimming with the stream?

John Gieve, Deputy Governor, March 2007.

www.bankofengland.co.uk/publications/speeches/2007/speech306.pdf

In this speech, John Gieve discussed the factors that underlay the growth of the City of London and considered whether the recent period of growth would continue or prove to be a passing phase. He concluded that while the current buoyancy in financial markets might not continue going forward, other factors suggested London would enhance further its position as a global financial centre in the long term. This would increase the dependence of the UK economy on wider international movements in financial markets.

Analytical models of financial stability.

Alastair Clark, Adviser to the Governor, March 2007.

www.bankofengland.co.uk/publications/speeches/2007/speech307.pdf

In this lecture, Alastair Clark discussed progress on developing analytical models of financial stability. He outlined three categories of models: macroeconomic models augmented to capture the effects of macro factors on key financial variables and financial institutions' balance sheets; dynamic stochastic general equilibrium models that attempt to offer firmer microfoundations for financial instability; and network models that capture how shocks propagate within a financial system and lead to non-linear dynamics in financial systems under

stress. The lecture concluded with an introduction to a modelling approach being developed at the Bank to assess systemic risk, which fuses elements of these three model types to create an integrated framework.

Financial stability papers

A new approach to assessing risks to financial stability.

Andrew Haldane, Simon Hall and Silvia Pezzini, April 2007.

www.bankofengland.co.uk/publications/fsr/fs_papers02.pdf

This paper explains the methodology and analysis behind a new approach to assessing risks to the stability of the UK financial system that was introduced in the July 2006 *Report* and outlines what is being done to improve and extend it. The paper sets out the conceptual rationale for the approach and describes its practical implementation in the July 2006 *Report*. Further detail on methodology is provided in a series of annexes. The paper concludes with a discussion of how this framework might be developed over time to improve the analysis of risks to the UK financial system and to strengthen the management of these risks by the financial sector.

Working papers

Procyclicality, collateral values and financial stability.

Prasanna Gai, Peter Kondor and Nicholas Vause, August 2006.

www.bankofengland.co.uk/publications/workingpapers/wp304.pdf

Fiscal rules for debt sustainability in emerging markets: the impact of volatility and default risk.

Adrian Penalver and Gregory Thwaites, September 2006.

www.bankofengland.co.uk/publications/workingpapers/wp307.pdf

Optimal emerging market fiscal policy when trend output growth is unobserved.

Gregory Thwaites, September 2006.

www.bankofengland.co.uk/publications/workingpapers/wp308.pdf

Do announcements of bank acquisitions in emerging markets create value?

Farouk Soussa and Tracy Wheeler, December 2006.

www.bankofengland.co.uk/publications/workingpapers/wp315.pdf

Financial infrastructure and corporate governance.

Helen Allen, Grigoria Christodoulou and Stephen Millard,
December 2006.

[www.bankofengland.co.uk/publications/workingpapers/
wp316.pdf](http://www.bankofengland.co.uk/publications/workingpapers/wp316.pdf)

**Corporate debt and financial balance sheet adjustment:
a comparison of the United States, the United Kingdom,
France and Germany.**

Peter Gibbard and Ibrahim Stevens, December 2006.

[www.bankofengland.co.uk/publications/workingpapers/
wp317.pdf](http://www.bankofengland.co.uk/publications/workingpapers/
wp317.pdf)

**Too many to fail — an analysis of time-inconsistency in
bank closure policies.**

Viral Acharya and Tanju Yorulmazer, February 2007.

[www.bankofengland.co.uk/publications/workingpapers/
wp319.pdf](http://www.bankofengland.co.uk/publications/workingpapers/
wp319.pdf)

Charts

Overview		
1 Tail risk	5	1.19 Prices of US sub-prime mortgage credit default swaps 21
2 Speculative-grade corporate bond default rate forecasts	5	1.20 Initial rental yield on commercial property and the swap rate 24
3 Global quarterly syndicated loan issuance	6	1.21 Global corporate bond spreads by rating 24
4 Arrears of 60+ days on US second-lien sub-prime home equity loans	6	1.22 Common component in asset prices 24
5 Equity prices	7	1.23 S&P 500 implied volatility 25
6 EME sovereign US\$ bond spreads and credit ratings	8	
7 Decomposition of borrowing costs for UK high-yield corporates	8	2 Structure of the UK financial system 26
8 UK PNFCs' capital gearing	8	2.1 Major UK banks' aggregate balance sheet at end-2006 26
9 US implied forward corporate credit spreads	9	2.2 Major UK banks' exposures as a share of total assets at end-2006 27
10 LCFIs' total assets	9	2.3 Major UK banks' aggregate trading income 27
11 Major UK banks' and LCFIs' credit default swap premia	10	2.4 Major UK banks' participation as lead arrangers in global syndicated lending 27
12 Major UK banks' pre-tax return on equity	10	2.5 Annual growth rate of major UK banks' lending to UK non-financial companies 28
1 Shocks to the UK financial system	12	2.6 Major UK banks' annual write-off rates 28
1.1 Official and forward interest rates	12	2.7 Annual growth in major UK banks' lending to UK households 28
1.2 US nominal interest rate volatility	12	2.8 Major UK banks' customer funding gap 29
1.3 Average implied volatilities of equity prices and exchange rates	13	2.9 Major UK banks' 'large exposures' by type of counterparty 30
1.4 Yen carry trade 'attractiveness'	13	2.10 Incidence of common 'large exposure' counterparts during 2006 Q4 30
1.5 Asset prices during recent market turbulence	13	2.11 Revenue and profit growth at LCFIs' corporate and investment banking units at end-2006 31
Box 1	14	2.12 LCFIs' total assets 31
A Volatility of real GDP growth	14	2.13 LBO lending by LCFIs 32
1.6 Foreign exchange reserve accumulation and real interest rates	14	2.14 LCFIs' Value-at-Risk 32
1.7 Real cost of capital for UK PNFCs	15	2.15 Major UK banks' and LCFIs' credit default swap premia 32
1.8 Decomposition of borrowing costs for UK sub-investment grade corporates	15	Box 4
1.9 Real LBO loan issuance	16	A Baseline versus stressed VaRs 33
1.10 Global quarterly syndicated loan issuance	16	2.16 LCFIs' issuance of RMBS backed by sub-prime lending 34
1.11 On-the-run CDO tranche spreads and fees	16	2.17 Investor shares of US and European leveraged loan markets 34
1.12 UK PNFCs' net equity issuance and change in net debt	17	2.18 Outstanding global amounts of credit protection bought by institution 34
Box 2	17	2.19 Net capital flows into hedge funds 35
A Financial market liquidity	18	2.20 CREST system availability for settlement 35
1.13 US implied forward corporate credit spreads	19	Box 5
1.14 Speculative-grade corporate bond default rate forecasts	19	A Hedge fund returns versus returns on selected assets 36
1.15 Personal insolvencies in England and Wales	20	B Number of hedge funds and assets under management 36
1.16 Profile of arrears performance of UK credit card lending vintages	20	C Source of hedge fund capital by share of assets under management 36
1.17 Residential rental yields and mortgage rates	21	
1.18 Arrears of 60+ days on US second-lien sub-prime home equity loans		

3 Prospects for the UK financial system	38	Tables	
3.1 Spreads on bond indices	38		
3.2 Spreads on US investment-grade corporate bond indices	39	Overview	5
3.3 Debt multiples in S&P-rated European LBO deals	39	A Change in assessment since the July 2006 Report	9
3.4 UK PNFCs' capital gearing	39		
3.5 Corporate write-offs and insolvency rates	40		
3.6 LCFI pre-tax return on equity	40	1 Shocks to the UK financial system	14
3.7 Simplified representation of dependencies in UK payment systems	40	Box 1	
3.8 Global current account balances	41	1 Equity and bond volatility	14
3.9 Distressed debt resolutions	41	1.A Price changes of risky assets	17
3.10 Major UK banks' Tier 1 capital ratios	43	Box 2	
3.11 Major UK banks' pre-tax return on equity	43	1 Liquidity measures	18
3.12 Major UK banks' credit default swap premia	43		
Box 6		2 Structure of the UK financial system	26
A Impact of 'severe stress scenarios' affecting vulnerabilities	44	Box 4	
B Sensitivity analysis around severe stress scenarios	45	1 1998 average volatility indices	33
3.13 ABX and home equity loan index spreads	47		
3.14 Concentration in natural gas futures	48	3 Prospects for the UK financial system	38
		3.A Change in assessment since the July 2006 Report	38
		3.B Summary of broad severe stress scenarios	42
		3.C Spread-for-rating comparison	46
4 Mitigating risks to the UK financial system	49	4 Mitigating risks to the UK financial system	49
4.1 Illustrative example of potential changes to Basel II minimum capital requirements over the economic cycle	51	4.A Market Wide Exercise 2006: issues for follow-up	55
4.2 Major UK banks' sterling stock liquidity requirement relative to total assets	52	4.B Summary assessment of the main wholesale UK payment systems against Core Principles	56
		4.C Some recent testing involving the UK Tripartite Authorities	57

Glossary of selected data and instruments

ABS – asset-backed security.

ABX.HE – a set of indices linked to credit default swaps on US sub-prime home equity loans of specific vintage and rating.

CDO – collateralised debt obligation.

CDS – credit default swap.

CLO – collateralised loan obligations.

CMBS – commercial mortgage-backed securities.

FX – foreign exchange.

GDP – gross domestic product.

HEL – home equity loan.

Libor – London interbank offered rate.

MBS – mortgage-backed security.

RMBS – residential mortgage-backed securities.

Abbreviations

ATM – automated teller machines.

BBA – British Bankers' Association.

BCBS – Basel Committee on Banking Supervision.

BCP – business continuity planning.

BIS – Bank for International Settlements.

C&CC – Cheque and Credit Clearings.

CCBM – Correspondent Central Banking Model.

CCP – central counterparty clearing house.

CHAPS – Clearing House Automated Payment System.

CIB – corporate and investment banking.

CLS – Continuous Linked Settlement.

CPDO – constant proportion debt obligation.

CPSS – Committee on Payment and Settlement Systems.

CRE – commercial real estate.

DTCC – Depository Trust and Clearing Corporation.

EME – emerging market economy.

EPD – early payment default.

EU – European Union.

FCM – financial crisis management.

FSA – Financial Services Authority.

FSF – Financial Stability Forum.

FSR – Financial Stability Review/Report.

FTSE – Financial Times Stock Exchange.

FXJSC – Foreign Exchange Joint Standing Committee.

G8 – Canada, France, Germany, Italy, Japan, Russia, the United Kingdom and the United States.

G10 – Belgium, Canada, France, Germany, Italy, Japan, the Netherlands, Sweden, Switzerland, the United Kingdom and the United States.

GM – General Motors.

HMT – Her Majesty's Treasury.

IMF – International Monetary Fund.

IPD – Investment Property Databank.

IPF – Institute of Public Finance.

IVA – individual voluntary arrangement.

LBO – leveraged buyout.

LCFI – large complex financial institution.

LTCM – Long-Term Capital Management.

MoU – Memorandum of Understanding.

MSCI – Morgan Stanley Capital International Inc.

ONS – Office for National Statistics.

OTC – over the counter.

PNFC – private non-financial corporations.

PPS – Protected Payments System.

RTGS – Real-Time Gross Settlement.

S&P – Standard & Poor's.

SEC – US Securities and Exchange Commission.

SLR – sterling stock liquidity regime.

SWIFT – Society for Worldwide Interbank Financial Telecommunication.

TARGET – Trans-European Automated Real-Time Gross Settlement Express Transfer.

VaR – Value-at-Risk.

© Bank of England 2007

ISSN 1751-7052

Printed by Park Communications Limited



 **Mixed Sources**
Product group from well-managed
forests and other controlled sources
www.fsc.org Cert no. SGS-COC-2842
© 1996 Forest Stewardship Council