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Financial Stability Review

June 2004

The **Financial Stability Review** aims:

- to encourage informed debate on financial stability issues, domestically and internationally
- to survey potential risks to financial stability
- to analyse ways of promoting and maintaining a stable financial system

Essential information

The *Financial Stability Review* is available as a complete document in pdf format, together with additional information about the *Review*, on the Bank of England's website: www.bankofengland.co.uk. The *Financial stability themes and issues* section is at: www.bankofengland.co.uk/fsr/themesandissues.htm and the *Financial stability conjuncture and outlook overview* is at: www.bankofengland.co.uk/fsr/overview0312.pdf.

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themes and issues

The near-term risks to UK financial stability from credit losses have eased somewhat over the past six months as the economic outlook, both in the United Kingdom and elsewhere, has improved. But considerable challenges remain in an environment of firming interest rates and, for many borrowers, historically high levels of debt. And the uncertainty about the future paths of interest rates and what impact that could have on the ‘search for yield’ highlighted in previous *Reviews* has brought potential market and liquidity risks to the fore. Against this background, UK financial institutions generally remain in sound condition, as do the major internationally active financial institutions to which they are exposed, primarily through activity in global banking and capital markets. These issues are discussed in the Bank of England’s regular assessment of the *Financial stability conjuncture and outlook*.

Efforts to improve the resilience of financial systems are reviewed in *Strengthening financial infrastructure*, which focuses in this issue on two international aspects of supervision: the regulation of multinational providers of infrastructure, and the Basel II framework for capital adequacy, on which agreement has now been reached. Recent focus on the former reflects the growing internationalisation of infrastructure providers and the challenges this poses for financial authorities. The latter represents a significant achievement in the development of an improved framework for the regulation of financial institutions.

Although central banks have long been concerned with maintaining financial system stability, there remains no consensus on how it should be defined and measured, or on a framework within which to analyse financial stability issues. In *Financial stability and macroeconomic models*, Andrew Haldane, Victoria Saporta, Simon Hall and Misa Tanaka propose a definition of financial stability which recognises the cost – in terms of economic welfare – of deviations from optimal savings and investment plans due to financial sector imperfections. Using a range of macroeconomic models, the authors demonstrate that financial frictions can have significant macroeconomic implications.

Considerable work remains to develop an overarching analytical framework for financial stability. But, meanwhile it is still possible to identify some of the potential vulnerabilities – a key aim for financial stability authorities. In emerging market economies (EMEs), for example, periods of financial instability have often followed a sharp reversal in private sector capital flows. In *Understanding capital flows to emerging market economies*,

themes and issues



Gianluigi Ferrucci, Valerie Herzberg, Farouk Soussa and Ashley Taylor analyse the determinants of these flows and the cost of financing for EMEs. The authors find that factors specific to creditor countries ('push' factors) are important, and have accounted for the majority of the compression in EME bond spreads that has occurred since late 2002. They argue that this points to the need for EMEs not to borrow too heavily abroad when financing conditions are benign, because a reversal in credit conditions may only partly be determined by fundamental factors in EMEs ('pull' factors).

Developments in financial markets and products more generally are also a key focus for financial stability surveillance as activity and the capacity to transfer risk in these markets has increased. In *Structured note markets: products, participants, and links to wholesale derivatives markets*, David Rule, Adrian Garratt and Ole Rummel examine developments in the market for structured notes: bonds with embedded derivatives. These increasingly complex products have developed hand in hand with growth and innovation in wholesale derivatives markets. The authors point out that positions in exotic derivatives have the potential to lead to 'crowded trades' – where traders simultaneously try to unwind common positions in potentially illiquid markets – which have in the past been associated with episodes of market stress. As such, there is a need for authorities concerned with financial stability to understand how the use of structured notes influences the distribution of risk among market participants.

As financial instruments have become more complex, there has been increased attention to the importance of adequate disclosure of meaningful information to financial market participants. In *Accounting and financial stability*, Ian Michael considers the important role accounting standards play in facilitating this disclosure and hence in promoting market discipline. He argues that recent initiatives to promote the convergence of accounting standards globally should improve the transparency of accounting information but, on a range of issues, agreement has yet to be reached. The author argues in favour of prompt resolution of these issues in order to reinforce the benefits of international convergence.

Another important aspect to financial stability surveillance is the identification of key structural developments. In the late 1990s, the pace of merger and acquisition activity in major industrial nations increased. Andrew Logan, in *Banking concentration in the UK*, analyses a Bank of England data set on UK banks' balance sheets to assess concentration in the UK banking sector and how it has changed over the past 15 years. He finds that the majority of non-financial private sector deposits and loans are held by relatively few banks, with UK-owned banks having the dominant market share.

While regular surveillance of the threats to financial stability and an understanding of structural developments can help avoid the costs of financial stability, the strength and resilience of the financial infrastructure are also vital factors. In *Assessing operational risk in CHAPS Sterling: a simulation approach*, Paul Bedford, Stephen Millard and Jing Yang use a stress-testing approach to assess the resilience of a key part of the UK's financial infrastructure – the large-value payment system CHAPS Sterling – to operational disruption. Based on analysis of various scenarios, the authors conclude that CHAPS Sterling is a highly resilient system, because of the effectiveness of the operational risk controls in place and the ample liquidity in the system. Nonetheless, control of operational risk should be seen as a constant objective for sound risk management.





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The financial stability conjuncture and outlook

An overview of UK financial stability: threats and resilience

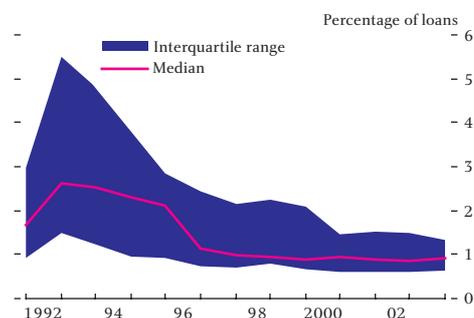
The stability of UK financial institutions and markets has not been under serious pressure in recent months, but considerable challenges remain in an environment of rising global interest rates and, for many borrowers, historically high levels of debt. Backward-looking indicators present a reassuring picture. For example, the provisions that the major UK-owned banks have had to put aside for bad and doubtful debts have remained very low (Chart A); mortgage arrears fell last year to their lowest levels in a decade; and UK corporate insolvencies have continued to fall. Nor have major problems been transmitted to the UK financial system via its links with the international financial system through capital markets, wholesale lending and ownership. These links – always significant because of London’s role as a major international financial centre – have become increasingly important as capital market innovation and integration have continued apace and the capital market activities of major UK-owned banks have expanded. The so-called large complex financial institutions (LCFIs), which dominate many of these markets, have generally reported strong results (Chart B).

There were signs, however, of a significant change in the outlook of market participants from around mid-April, reflected in equity price falls, a widening of some credit spreads and increased uncertainty about the future path of various asset prices. These developments have highlighted the challenges of managing market and liquidity risks during the ‘exit’ from the environment of low official interest rates and stimulative fiscal policies, during which many investors and intermediaries have sought to enhance otherwise low nominal returns by taking on more risk.

Credit risk

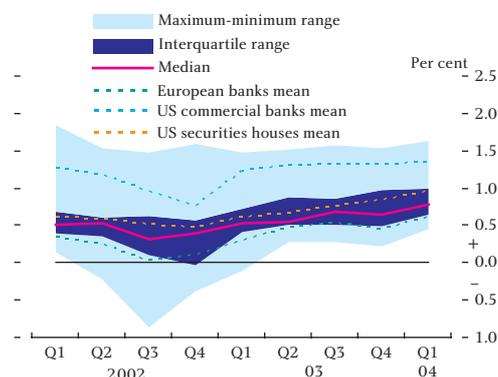
Since the December *Review*, the outlook for GDP growth around the world in 2004 has generally improved, reducing the downside risk to borrowers’ incomes and profits. But, reflecting that improvement, market participants now expect UK and US interest rates to rise faster than they expected last December. Historical experience suggests that the net effect in the near term is likely to be a reduction in UK banks’ provisions against losses. But there are three general concerns. First, high debt

Chart A:
Large UK-owned banks’ provisions for bad and doubtful debts



Source: Published accounts.

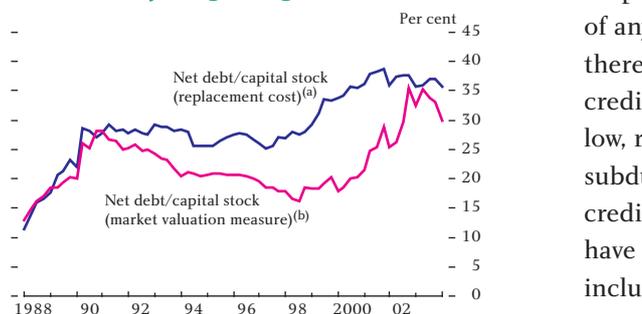
Chart B:
Return on assets for non-UK LCFIs^(a)



Sources: Earnings releases and Bank calculations.

(a) Net income divided by average assets, annualised.

Chart C:
UK PNFCs' capital gearing

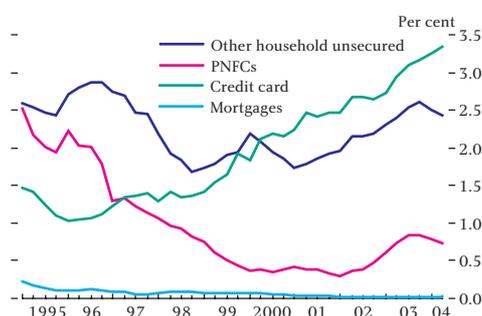


Sources: ONS and Bank of England.

(a) PNFCs' net debt divided by the total value of capital at replacement cost.

(b) PNFCs' net debt divided by the market value of assets of UK-resident firms.

Chart D:
UK-resident banks' annualised write-off rates on domestic loans^{(a)(b)}

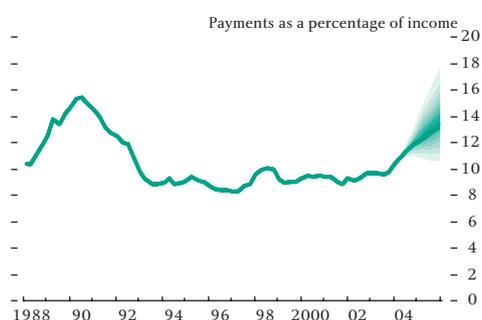


Source: Bank of England.

(a) Calculated as rolling quarterly data, annualised.

(b) Adjusted to reflect a bank's change in accounting method.

Chart E:
UK households' aggregate debt-servicing costs^(a)



Sources: Bank of England estimates and LIFFE.

(a) Total interest payments plus regular mortgage principal repayments as a percentage of annual post-tax household income (See Chart 10 for a description and the May 2004 *Inflation Report*, pages 8–10, for further details).

levels, notably in the UK household sector but also still for many corporate borrowers at home and abroad, mean that the impact of any increases in interest rates will be the greater. Second, there may be a tendency for the rigour with which corporate credit quality is assessed to slacken when interest rates have been low, recent default experience has been good and loan demand is subdued. There have, for example, been signs of relaxation of credit terms in some lending markets. Although many companies have been repairing their balance sheets, in several countries – including the United Kingdom (Chart C) – corporate debt still appears high by historical standards. Third, the risk of significant pressure on firms' costs and profits from higher oil and other commodity prices is greater than six months ago.

Some credit risks merit especially close monitoring because of the size or the concentration of exposures. For UK banks, secured lending to UK households is substantial. The relative importance of domestic mortgages has increased in recent years, and they now account for around 20% of the on-balance-sheet assets of the large UK-owned banking sector. Write-off rates on mortgages have in the past been low – compared, for instance, with those on corporate lending (Chart D). Given the prospects for UK households' income and employment, lenders generally believe that default rates on secured lending are likely to remain low, even if interest rates follow the path expected by financial market participants, raising debt-servicing costs (Chart E). In addition, banks have a measure of protection from the value of the underlying housing collateral. The proportion of mortgages granted at high loan-to-value ratios has decreased and loan-to-value ratios on the stock of mortgages are reported to average only around 40 to 50% for most of the large UK-owned banks. Nevertheless, given the size of the exposures, stress testing for the implications of various low-probability but high-impact scenarios – for example, sharp house price falls coinciding with a significant deterioration in the employment outlook – remains important. The strong expansion of unsecured lending merits attention, given the relatively high and variable write-off rates to which it is subject; loans may have been priced to reflect current risk, but pricing models may not be robust to changing economic circumstances, particularly given the short runs of data for some lines of business on which to base the underlying credit analysis.

Previous *Reviews* have flagged the growing share of UK banks' corporate lending going to the UK commercial property sector (Chart F), a possible concentration risk. Lending to commercial real estate companies now accounts for around a third of the stock of UK-resident banks' non-financial corporate lending; and its growth is still outpacing the growth of lending to the rest of the non-financial corporate sector. There are signs that commercial property borrowers are more highly geared than they were five years ago. Reports suggest that arrears remain very low

but, with some 50% of all property loans due for refinancing over the next five years and property prices at risk of softening if interest rates were to rise more rapidly than expected, exposures in this area warrant continued close monitoring.

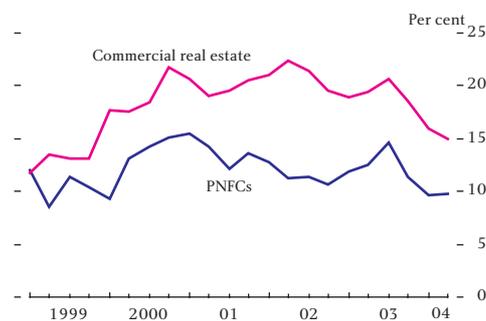
The large UK-owned banks have also been expanding their overseas operations (Chart G), notably in the United States. Insofar as this has diversified exposures across countries it may have helped to reduce the overall riskiness of loan portfolios. And, as in the United Kingdom, indicators of stresses on household and corporate sectors have generally been pointing towards improvement in the short term, reducing not only direct credit risk but also the credit risk affecting other lenders, to some of which UK banks are in turn exposed. For example, corporate bankruptcy rates in the United States have fallen sharply and, although US households' capital and income gearing remain high by historical standards, the prevalence of fixed-rate mortgages is likely to soften the impact on households of any rise in US interest rates. In continental Europe, developments have been more mixed: economic growth has quickened, but remains patchy. Most banks reported higher profits, but some German ones reported losses, having faced difficult conditions for some time. The high-profile failure of Parmalat, however, does not appear to have triggered any instability. The outlook for Hong Kong – the jurisdiction where major UK-owned banks have the second largest on-balance-sheet exposure after the United States – has improved significantly, notwithstanding uncertainty about whether the recent rapid rates of Chinese economic growth are sustainable. But, as with domestic exposures, the downside risks from many of these international exposures, in the event of any unexpected downturn, have been amplified by high debt-to-income ratios in some countries.

Risks in the international financial system

With the rapid growth of international capital markets over recent years, market and liquidity risks have become more important for financial stability. The uncertainty about the future paths of interest rates, and the impact that could have on asset concentrations built up in response to the 'search for yield' discussed in recent *Reviews*, have underlined those risks.

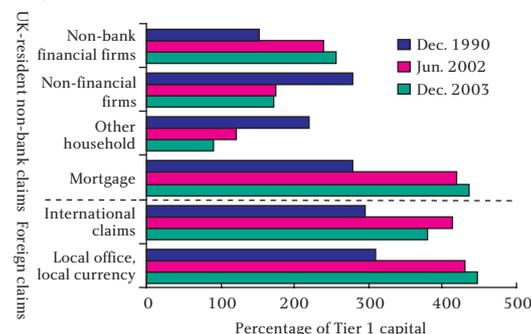
Some of the 'search for yield' may simply reflect one facet of the monetary policy transmission mechanism, encouraging investment by reducing the cost of capital. But to the extent that it reflects a higher risk appetite or a misperception of risk, it raises issues for financial stability. The compression of credit spreads on emerging market and high-yield corporate bonds from autumn 2002 until the beginning of this year, when compared with the more modest improvements suggested by fundamentals and rating agency ratings, points in this direction. So, perhaps, do the substantial recent inflows into hedge funds

Chart F:
Large UK-owned banks' annual growth in lending to UK-resident PNFCs



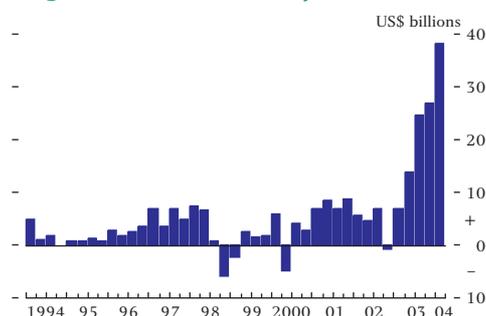
Source: Bank of England.

Chart G:
Large UK-owned banks' claims



Sources: FSA regulatory returns and Bank of England.

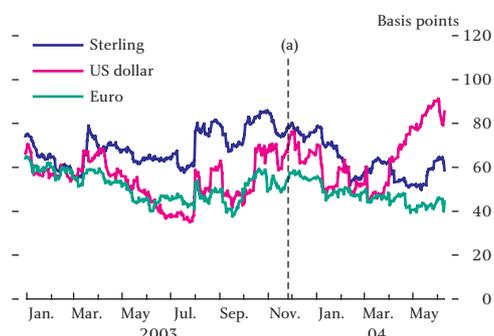
Chart H:
Hedge funds: inflows of capital^(a)



Source: TASS Research.

(a) Figures are based on the TASS hedge fund database, which currently contains 2,802 live and 1,967 dead funds. The total number of live funds is estimated to be around 5,000.

Chart I:
Implied volatility of three-month interest rates six months ahead



Sources: LIFFE, Chicago Mercantile Exchange and Bank calculations.

(a) Dec. 2003 Review.

(Chart H) and other 'alternative investments' from many large institutional investors, the entry of new funds, the increased use of financial instruments with novel pay-off structures, the willingness of some major investment banks to hold more illiquid assets in their portfolios and the increases in their exposures to market risk. Some of these developments have helped investors to diversify their portfolios. But this does not appear to have been the sole motive.

One likely counterpart to the 'search for yield' is greater exposure in the event that interest rates increase faster than expected. Although, judging by options prices, uncertainty about the future course of most financial asset prices is not particularly high, market uncertainty about the near-term path of US interest rates has risen significantly (Chart I) and there has also been some increase in uncertainty about exchange rates.

Some market participants have been seeking yield by means of 'carry trades' of various kinds – exploiting yield differentials between different markets without hedging the risks. The profitability of such trades depends upon asset prices not moving against the investors. Recently, some such movements have taken place, possibly reflecting some unwinding of positions, apparently without triggering financial distress. So far there have been few signs of the increased volatility and pressure on market liquidity seen at times last summer when uncertainty about the path of US interest rates also increased, although some emerging-market bonds may have been affected when spreads increased sharply.

Nonetheless, further price changes could trigger other sharp asset price movements or market liquidity problems were investors simultaneously to try to unwind common positions, leading to 'one-way' trading. Such risks are difficult to monitor and measure. Asset price volatility can be amplified and market liquidity impaired if decisions by hedge funds and other portfolio managers are driven not only by fundamentals but also by what they think other financial intermediaries are doing, or by trading models that do not allow fully for the possibility that other financial intermediaries will try to engage in, or exit from, similar trades. Those risks may have been exacerbated by the rapid growth and proliferation of hedge funds over the past year, possibly bringing in less experienced fund managers. There have also been some reports of increased use of leverage amongst hedge funds and so-called funds of hedge funds, but leverage continues to be moderate compared with 1997-98 (although that may not be the most sensible benchmark). In this environment, the challenges to internationally active banks include careful management of proprietary trading and hedge fund exposures; and stress testing of their risk-management strategies – some of which depend on the ability to trade continuously in high volume – in the face of impaired market liquidity.

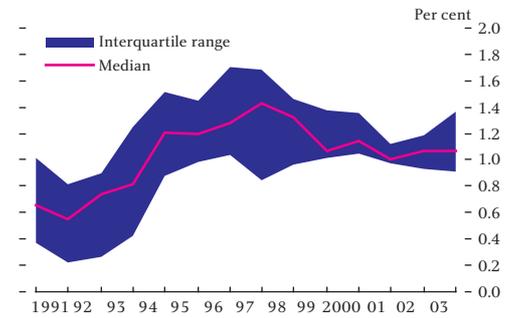
The robustness of the UK financial system

The UK banking system seems well-placed to cope with the risks discussed above in the event that they crystallise. It has continued to report robust profits, and maintains a substantial cushion of capital. The average pre-tax return on assets for the ten largest UK-owned banks last year was around 1% (Chart J), the average pre-tax return on equity was 20% and the average published Tier 1 capital ratio was over twice the minimum level laid down for internationally active banks (Chart K). Profitability is likely to be resilient in the near term, despite some signs of competitive pressures on interest margins (on unsecured lending, for example) and the possibility of some slowdown in the growth of mortgage lending from the current very high rate. Holdings of high-quality liquid assets have remained in excess of regulatory minima (Chart L).

But, although banks can afford to be reasonably sanguine about the central outlook in the near term, there are a number of downside risks in the current environment that warrant careful evaluation via stress tests and other techniques. As well as the possibility of house price falls and weaker income growth, there may be larger-than-usual interest rate and other market risks; increased liquidity and concentration risks in the markets used to manage market risk and raise wholesale funding; and possible weaknesses, in changing macroeconomic circumstances, of increasingly complex credit and market risk models based on limited historical experience. Some of these risks may be linked.

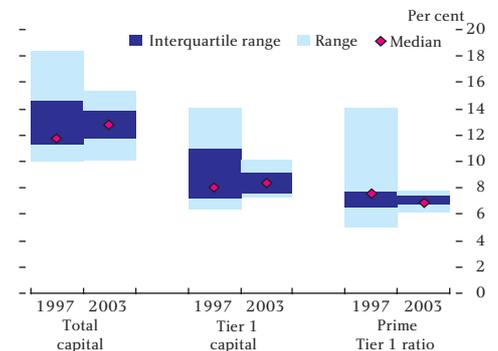
In addition, financial stability authorities must continue to address the dependence of expanding capital markets and financial intermediaries on certain parts of the market infrastructure, which gives rise to 'key system' risk that a single point of failure could disrupt clearing, payment and settlement systems. One important strand of work, for example, is the drive further to reduce settlement risks in payment systems in the event of participants' default. *Strengthening financial infrastructure* (pages 69–78) also draws attention to some of the other current initiatives designed to improve the overall resilience of the financial system. Amongst the most important are: agreeing on an improved framework for risk-based capital standards for internationally active banks (Basel II); advancing accounting standards to improve transparency and market discipline, and to reduce incentives to target reported profits rather than economic returns; and developing the framework for addressing cross-border regulatory challenges.

Chart J:
Large UK-owned banks' pre-tax profits as a percentage of total assets



Sources: Thomson Financial Datastream and published accounts.

Chart K:
Large UK-owned banks' capital ratios^{(a)(b)}

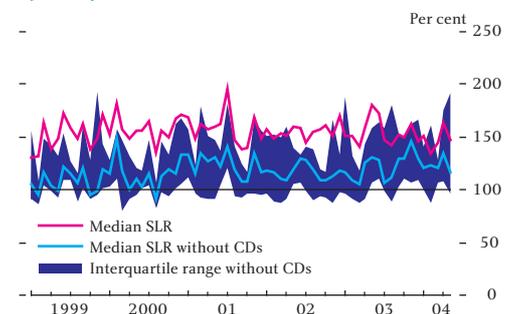


Sources: Published accounts, FSA regulatory returns and Bank calculations.

(a) Percentage of risk-weighted assets.

(b) Prime Tier 1 capital includes ordinary shares, associated reserves and retained earnings.

Chart L:
Large UK-owned banks' sterling stock liquidity ratios



Source: FSA regulatory returns.

Introduction

The *Review's* regular assessment of the financial stability conjuncture and outlook focuses on (i) major sources of risk to the UK and international financial systems, primarily from a UK perspective, and (ii) the resilience of the UK financial system.

Chapter 1 considers the credit risk facing the major UK-owned banks as a result of lending to non-financial sectors, not only directly but also indirectly through the credit exposures of the foreign banks with which they do business. The majority of the large UK-owned banks' credit exposure is to households and non-financial firms in the United Kingdom and abroad. Any substantial and systematic deterioration in the creditworthiness of these borrowers would be likely to place pressure on the banking system, with the risk of provoking a further general tightening in credit conditions and, in more serious instances, pressures on the liquidity and ultimately solvency of weaker banks. Past banking crises in developed countries have tended to be triggered by such problems.¹

Chapter 2 considers market, liquidity and other risks arising from developments in international financial markets and institutions, including the risks associated with the possibility of correlated shocks to asset prices. If major globally active financial institutions were to suffer pressures on liquidity or solvency, the effects could be pervasive. And if market risk were amplified or distorted by the ways in which financial intermediaries and markets reacted, that could impose additional macroeconomic costs. UK financial stability is intimately connected with the stability of the international financial system, not least because of the pivotal role of London in global capital markets and their ever-increasing importance in financial intermediation and risk management.

The impact on UK financial stability of any crystallisation of these various risks – and in particular the likelihood of systemic instability – depends on the resilience of the UK financial system. This is considered in Chapter 3. Resilience is a function of the capital, profits and liquidity of the major banks, and of the pattern of the links between them and to other financial institutions. But it also depends on the financial and operational robustness of key 'nodes' or possible single points of failure within the financial system (eg central counterparties and other key market infrastructure). This assessment touches on recent major developments in this area, while a companion article, *Strengthening financial infrastructure*, focuses on some of the initiatives financial stability authorities are undertaking to mitigate such risks.

¹: See, for example, Basel Committee on Banking Supervision., 2004. 'Bank failures in mature economies' BIS Working Paper 13, April.

1 Credit risk

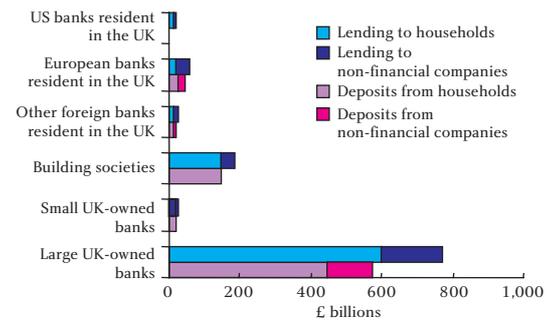
The risks that household, corporate and sovereign borrowers pose to lenders affect the UK financial system through direct exposures – at home and abroad – and also through the impact credit risk can have on the financial institutions with which UK banks are linked via wholesale activities and capital markets. This chapter focuses on the credit risk (from outside the financial system itself) facing UK banks via these direct and indirect channels. Other risks arising from exposures to financial markets and institutions (including some issues of counterparty credit risk) are addressed in Chapter 2.

While more than 400 banks and building societies operate in the United Kingdom, ten large banking groups² undertake the majority of UK households' and companies' banking activities (Chart 1).³ By type of borrower, households and non-financial companies, both in the United Kingdom (Chart 2) and abroad, together are likely to be responsible for the majority of these banks' collective on-balance-sheet claims given the probable mix of local office, local currency lending. The indirect risks they pose via UK banks' financial counterparties depend upon the diversification of those counterparties' exposures, the correlation of shocks to those exposures and counterparties' buffers against loss. Overseas exposures account for around 40% of the total assets of the large UK-owned banks, although there is considerable dispersion across institutions. Foreign claims arising through the local activities of UK-owned banks' overseas branches and subsidiaries have increased in recent years through acquisitions of foreign financial institutions, especially in the United States.

Backward-looking indicators suggest that household and corporate credit risks have been low. This has been evident in large UK-owned banks' provisions for bad and doubtful debts, especially when compared with the early 1990s (Chart 3). Most other major banking systems have also been benefiting from relatively low losses on lending portfolios; their experience is explored in later sections of this chapter.

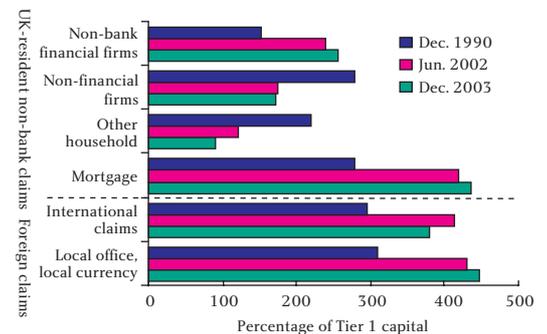
The improvement in short-run prospects for growth will tend to reduce near-term credit risk. For the United Kingdom, the central projection for GDP growth in 2004 in the Monetary Policy Committee's May forecast was higher than the projection in

Chart 1:
UK-resident financial institutions' UK-based lending and deposit-taking activities, March 2004



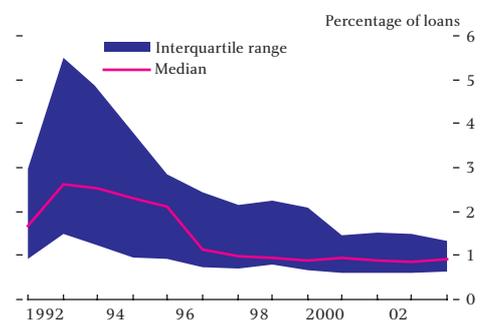
Source: Bank of England.

Chart 2:
Large UK-owned banks' claims



Sources: FSA regulatory returns and Bank of England.

Chart 3:
Large UK-owned banks' provisions for bad and doubtful debts

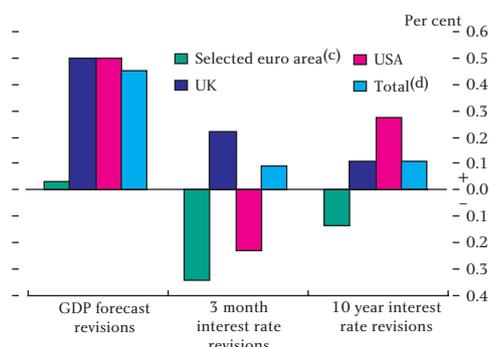


Source: Published accounts.

2: The ten largest banking groups are: Abbey, Alliance & Leicester, Barclays, Bradford & Bingley, HBOS, HSBC Holdings, Lloyds TSB, Northern Rock, RBS Group and Standard Chartered. Throughout this *Review*, these banks are described as the large UK-owned banking sector. Unless otherwise stated, charts include data for these banking groups' subsidiaries prior to merger or acquisition, while figures for demutualised building societies are included from the date that data became available.

3: The concentration of these financial institutions' activities in different types of financial services is covered in Logan, A 'Banking concentration in the UK', pages 129–134, this *Review*.

Chart 4:
Revisions to expected real GDP growth^(a)
and interest rates^(b)



Sources: Bloomberg, Consensus Economics Inc, Reuters and Bank calculations.

(a) Jun. 14 Consensus forecast for real GDP growth for 2004 less Consensus forecast at Dec. 2003 *Review*.

(b) Current interest rate at stated maturity less 6-month forward rate at that maturity at Dec. 2003 *Review*.

(c) Includes Ireland, Netherlands, Spain, France, Italy and Germany, weighted by large UK-owned banks' claims on those countries.

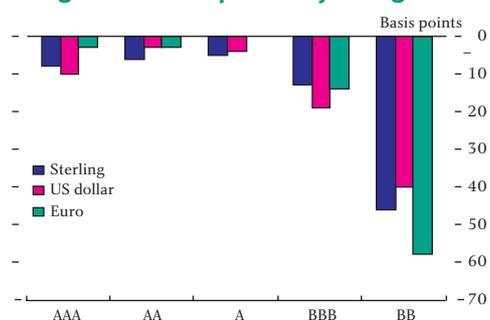
(d) Sum of selected euro area, UK and US, weighted by large UK-owned banks' total claims on those countries.

November (on the assumption that the official interest rate follows the upward path implied by market interest rates at the time of the relevant projection).⁴ (Chart 4) shows that, overall, net revisions since the December *Review* to Consensus forecasts, when weighted by the pattern of large UK-owned banks' exposures across the major regions, have been upwards. But nominal interest rates, taking account of the country mix of credit exposures, are now also higher than market participants had been expecting at the time of the December *Review*.

Past experience suggests that the impact of the improved short-term outlook for growth on the provisions of the large UK-owned banks is likely to outweigh the impact of the shifts in short-term interest rates.⁵ But the impact on borrowers' creditworthiness of any given rise in interest rates may be greater than in the past, given borrowers' generally higher debt-to-income ratios. The overall impact of these developments on credit risk is not therefore clear cut. A deeper assessment requires a more detailed examination of risks.

Some indicators of distress have fallen; for example, corporate bond default rates internationally have dropped further. Aggregate financial market indicators also suggest that prospects have improved somewhat: corporate bond spreads are in general similar to or lower than at the time of the December *Review* (Chart 5) and over the intervening six months ratings upgrades have outweighed downgrades (Chart 6). In addition, until April, equity markets were signalling reduced corporate default risk; broad market indices had risen significantly and their implied volatility had fallen. Since then, however, equity market indices have fallen back near to the levels at the time of the December *Review*. Many bond spreads have also increased since around mid-April, but there remains a question about the extent to which falls in bond spreads since the peaks in autumn 2002 have reflected changes in risk appetite as well as falls in perceived credit risk. These issues are explored further in Chapter 2, where the implications of the market environment for market and liquidity risks in the international financial system are analysed. The rest of this chapter considers in more depth the major factors affecting near-term credit risk.

Chart 5:
Changes in credit spreads by rating^{(a)(b)}

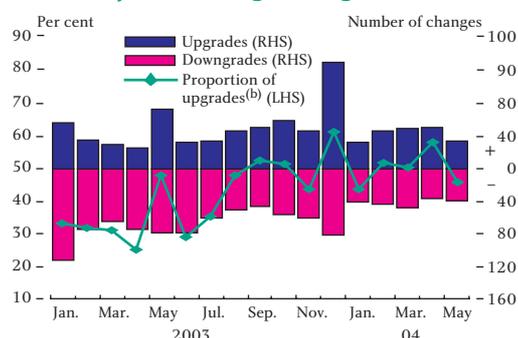


Source: Merrill Lynch

(a) Spread over swaps.

(b) Changes since Dec. 2003 *Review*.

Chart 6:
Global corporate ratings changes^(a)



Source: Moody's Investors Service.

(a) Excludes structured finance and US public sector.

(b) Upgrades as a percentage of total ratings changes.

4: The May Bank of England *Inflation Report* gives a full account of the MPC's most recent projections for inflation and output.

5: See Hoggarth, G and Pain, D 2002 'Bank provisioning: the UK experience', Bank of England *Financial Stability Review*, June.

1.1 UK household sector credit risks

Large UK-owned banks' lending to UK households has been increasing over the past 15 years as a percentage of Tier 1 capital (Chart 2). UK mortgages constitute around 20% of the total on-balance-sheet assets of the large UK-owned banks, and the growth rate of their mortgage lending remained around 10% over the four quarters to 2004 Q1, considerably faster than nominal GDP growth. Mortgage lending by building societies and 'other specialised lenders' (OSL) grew faster still last year, at 15% and 35% respectively. Large UK-owned banks are also exposed to the UK mortgage market through direct ownership and counterparty relationships with these OSLs.

Unsecured lending to households by the large UK-owned banks continued to grow quickly too, at 13% in the four quarters to 2004 Q1, although its pace has slowed from around 19% at the beginning of 2002. Given the recent rapid growth in large UK-owned banks' credit card lending, it now amounts to a third of unsecured lending to households; personal loans account for 60% and overdrafts for 7%. Unsecured lending to households amounts to only 5% of the large UK-owned banks' total assets, although over the past ten years it has accounted for the vast majority of their write-offs on household lending.

Financial pressures on households

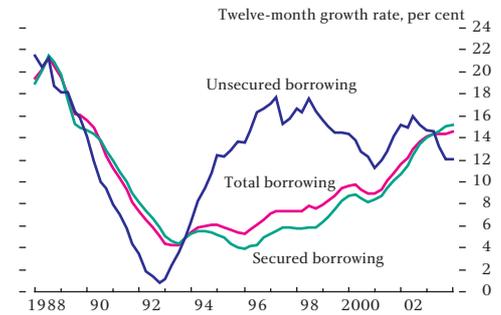
Growth of debt

Considering the growth of debt from the point of view of the borrowers rather than the major banks, the growth rate of total lending to individuals – including borrowing from *all* banks and other lenders – has remained strong since the *December Review* (Chart 7); recent developments were examined in the *May 2004 Inflation Report* (pages 7–10). As a result, the UK household sector debt-to-income ratio has continued to rise rapidly (Chart 8), increasing households' vulnerability to any unexpected rises in interest rates or falls in incomes. The growth of *total* mortgage borrowing has been at levels last seen in 1989. Total unsecured borrowing growth, although slackening a little, has also been rapid, and lenders suggest that borrowers' demand will remain high, at least in the short term.

Income and employment

The ability of households to continue servicing their debts depends largely on the size of the debt burden, the level of repayments associated with that debt burden, and their future income. Household nominal post-tax income rose 5.7% in the year to 2003 Q4, although the rate of growth is expected to ease somewhat during the next two years. Job prospects are a key factor influencing individual households' income prospects. Unemployment has fallen further since the *December Review*, continuing the decline in recent years. Falls in long-term unemployment have been particularly pronounced over the past

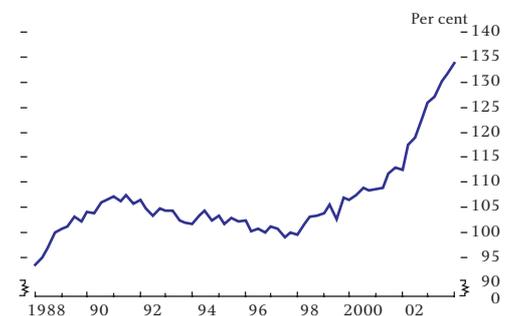
Chart 7:
Households' secured and unsecured borrowing^(a)



Source: Bank of England.

(a) Data are seasonally adjusted and quarterly.

Chart 8:
Ratio of household sector debt to income^{(a)(b)(c)}



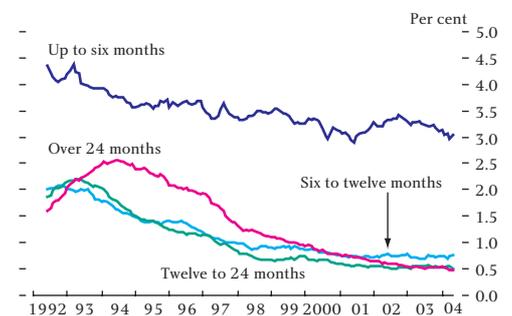
Sources: ONS and Bank of England.

(a) Percentage of annualised post-tax income.

(b) Debt equals total liabilities.

(c) Debt data are not seasonally adjusted.

Chart 9:
Unemployment by duration^(a)

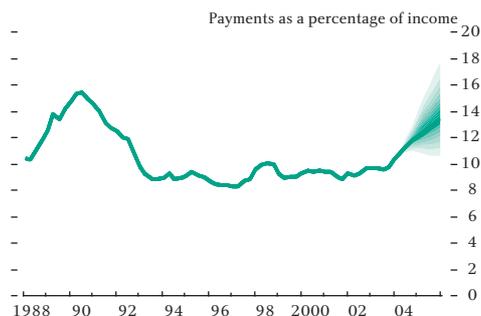


Sources: ONS and Bank calculations.

(a) Unemployment rates by duration for individuals over the age of 16. Data are seasonally adjusted.

ten years (Chart 9). So even for those who do lose their jobs unexpectedly, the risks of a sustained loss of income that could threaten debt servicing capacity may have fallen.

Chart 10:
Aggregate household sector debt-servicing costs^(a)



Sources: Bank of England estimates and LIFFE.

(a) Total interest payments plus regular mortgage principal repayments as a percentage of annual post-tax household income (See page 82 of the Jun. 2002 *Review* for details of how this series is constructed). Over the projection, debt and income are assumed to continue to rise at their average rate of the past two years; and both the ratio of regular payments to debt and the spread between effective mortgage rates and the three-month LIBOR interest rate are assumed constant. Estimates are based on risk-neutral probabilities for the three-month LIBOR interest rate, implied by option prices on 5 May. These are different from the probabilities market participants attach to alternative outcomes, given the need to compensate investors for risk. Also, trading in the underlying option contracts with horizons of more than one year is limited.

Income gearing

The current pressure on most households' ability to service their debts, as indicated by income-gearing measures, is low. Measures that include both interest payments and regular mortgage principal repayments have remained subdued, reflecting low interest rates. The May *Inflation Report* (pages 8–9) described how estimates of probabilities of different future interest rates could be derived from interest rate options prices and presented the implied distribution of debt servicing under the assumption that debt and income rise at their average rates of the past two years (Chart 10). That suggests that debt-servicing costs could rise over the next two years, perhaps towards levels last seen at the beginning of the 1990s. But the Bank/NOP inflation attitudes survey for May suggested that households, like financial market participants, have to an extent factored higher interest rates into their expectations.

Aggregate income gearing measures are likely to mask vulnerabilities to higher interest rates for some highly indebted households. One potentially vulnerable group might be new mortgage borrowers, given the rise in their loan-to-income ratios in recent years, associated with rising house prices. However, as explained in the May 2004 *Inflation Report* (page 10), it still appears that interest rates would have to rise substantially, other things being equal, for the distribution of new borrowers' debt servicing burdens to deteriorate to the position experienced in 1990. In part that reflects the effects of lower inflation in reducing the initial real burden of servicing a mortgage. But with lower inflation, high levels of household debt and debt servicing will be eroded less quickly, and the associated risks will persist for longer, over the life of loans.

Unsecured debt principal repayments, which are not included in Chart 10, could be an important additional element in households' debt servicing burdens. It is difficult to assess the weight to attach to this element, partly because borrowers of some types of unsecured credit are often able to roll over the repayment of principal. The share of new unsecured loans undertaken for the consolidation of other debts has risen in recent years⁶, perhaps reflecting an effort to refinance on extended terms to reduce the potential burden of debt principal repayment. In the unlikely event of any substantial rise in financial distress, however, banks' appetite to lend might be markedly reduced. If that were to happen – and if other specialist distressed lenders did not step in – households wishing to refinance debt might be required to repay some of the principal and to pay higher interest rates on the

6: Based on data from the NOP Financial Research Survey.

remainder, further raising financial pressures on households and the risk of household default.

Capital gearing

Aggregate capital gearing is a helpful proxy for pressures on borrowers' solvency, and also for possible future pressures on cash flow and liquidity. Household capital gearing has remained stable in recent quarters (Chart 11), as rises in housing and equity wealth have offset the increase in debt. The household sector's saving ratio has edged up and its financial deficit has narrowed (Chart 12), although this still represents a shift from the more common surplus position.⁷ The ratio of unsecured debt to households' total financial assets has fallen slightly but remains above its long-run average.

Developments in the housing market will affect capital gearing through their impact on housing wealth and mortgage borrowing. The MPC's (Monetary Policy Committee) central projection is for house price inflation to slow sharply during the next two years. But, as the Governor of the Bank of England noted recently, prospects for house prices are highly uncertain, and, after the strength of house price inflation in recent years, the chances of a fall have risen.⁸ If that were to happen, housing equity would be reduced and capital gearing raised, increasing household mortgage arrears, and thus raising the risk of write-offs. But Bank research suggests that arrears are more sensitive to income gearing than to housing equity.⁹

Risks to banks

Secured lending

Backward-looking indicators continue to suggest that credit risk on household lending is low. Mortgage arrears fell in 2003, to their lowest levels in over ten years (Chart 13). The share of buy-to-let (BTL) mortgages has risen, and so far they have been subject to lower-than-average arrears (Box 1 discusses the BTL mortgage market in more detail). And arrears on other secured loans, such as second mortgages, have also fallen.¹⁰ Indeed, write-offs on mortgage lending have been very low in the past ten years, accounting only for around 3% of UK banks' total write-offs to households and companies (Chart 14), and less than 0.1% of outstanding mortgage lending. Even when UK house prices fell in the early 1990s, total provisions at the large UK-owned banks most exposed to the mortgage sector rose to only about 1% to 1.5% of those banks' total assets. This compares with a median rate of around 2.5% for the large UK-owned banks' in this period. Total provisions in 2003 were around 1% of total assets.

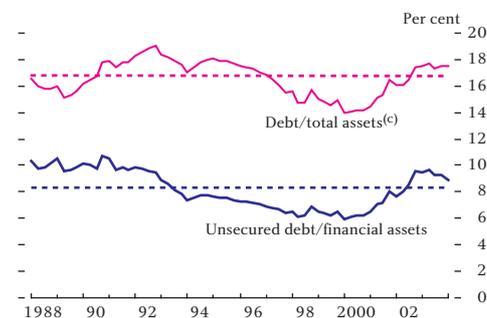
7: Although the saving ratio and financial balance have remained well below their long-term averages recently, they do not appear so low when adjusted for inflation (see the May 2004 Bank of England *Inflation Report*, page 13).

8: See the Governor's speech to the CBI Scotland Dinner at the Glasgow Hilton Hotel, June.

9: See Whitley, J, Windram, R, and Cox, P (2004) 'An empirical model of household arrears', Bank of England Working Paper no. 214.

10: Based on data from the FLA (Finance and Leasing Association).

Chart 11:
Household sector capital gearing^{(a)(b)}



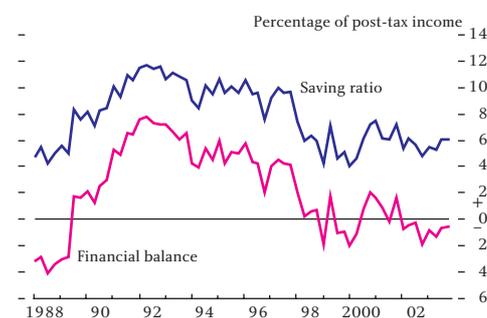
Sources: ONS and Bank of England.

(a) Dashed lines indicate averages of series from 1988 Q1 to 2003 Q4.

(b) Data are not seasonally adjusted.

(c) Financial wealth plus housing wealth.

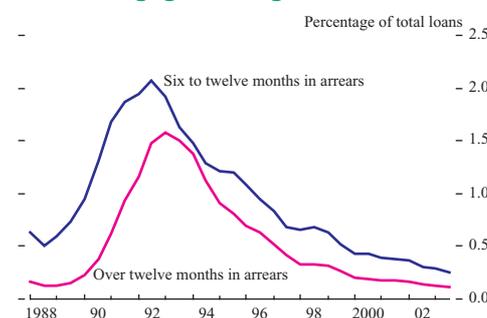
Chart 12:
Household financial balance and saving ratio^(a)



Sources: ONS and Bank of England.

(a) Data are seasonally adjusted.

Chart 13:
UK-resident financial institutions' arrears on UK mortgage lending



Source: Council of Mortgage Lenders.

(a) Sample covers members of the CML, who together undertake around 98% of residential mortgage lending in the UK.

Box 1: The buy-to-let mortgage market

Chart A:
New lending for house purchase to first-time buyers and buy-to-let investors



Sources: Council of Mortgage Lenders and Bank calculations.

Chart B:
Ratio of buy-to-let to total mortgage lending



Sources: Council of Mortgage Lenders and Bank calculations.

Since the mid 1990s, investors in the private rented sector have been able to obtain finance via tailored buy-to-let (BTL) mortgage products. BTL mortgage lending has since grown rapidly.¹ Investment demand, including for BTL properties, has been a source of rising demand in the housing market in recent years, supported by anticipated rental incomes, rising capital values and a possible fall in the risk premium attached to housing.² The number of BTL loans has risen as the number of loans to first-time buyers has fallen (Chart A). However, BTL lending is still small relative to the mortgage market as a whole: accounting for only 5% of the total stock of mortgages outstanding at the end of 2003 (Chart B).³

BTL lending is predominantly conducted by specialist lenders including the subsidiaries of some large UK-owned banks. The median limit set on loan-to-value (LTV) ratios was 80% in 2003, having risen from 75% in 1999. That remains below the median LTV on new lending to first-time buyers. The median minimum rental cover required by lenders has remained at 130% of rental income.

Arrears have been low so far; 0.5% of BTL mortgages in the second half of 2003 were in arrears, compared with 0.8% of all mortgages.⁴ Borrowers' ongoing debt servicing capabilities will be determined, amongst other factors, by their gross rental income relative to interest and other costs. Higher interest rates could put pressure on those who have borrowed heavily using interest-only loans. However, gross rents across the private rented sector, with some regional variation, appear to be rising gently.

1: ODPM (Office of the Deputy Prime Minister) data show that the stock of private rented properties rose marginally between 2000 and 2002. Some new BTL investors may simply have replaced existing investors.

2: For further analysis of housing risk premia, see Weeken, O (2004) 'Asset pricing and the housing market', Bank of England *Quarterly Bulletin* (Spring).

3: Data on the size of BTL lending, lending requirements and arrears are available from the Council of Mortgage Lenders from 1998 onwards.

4: Data relate to mortgages more than three months in arrears.

Most large UK-owned banks do not expect a significant increase in mortgage arrears in the near term. Furthermore, securitisations of UK mortgage assets have typically been over-subscribed and issued at low credit spreads in the past six months, suggesting investors are confident about the outlook for the mortgage sector.

Even were defaults to rise, banks would not necessarily face material losses, because mortgage lending is backed by housing collateral. According to the Council of Mortgage Lenders (CML), the number of new mortgages at high loan-to-value (LTV) ratios has fallen since the late 1980s (Chart 15). Disclosures in annual accounts show that LTVs on the stock of mortgages for most large UK-owned banks are around 40 to 50% – lower than LTVs on new lending because of the rises in house prices since the loans were made. Average LTV ratios could, however, mask vulnerabilities if, for example, unsecured debt was being used to fund mortgage deposits; if any downward adjustment in house prices were unexpectedly large; or if a significant number of loans, notwithstanding the average, were at very high LTV levels. Regulatory data suggest that, during 2003, the proportion of mortgage loans made with both high LTVs (+90%) and high loan-to-income ratios (over three) remained broadly static, and only a small part of the market.

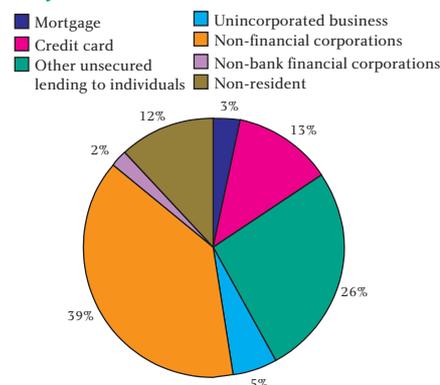
Banks can in principle acquire a further cushion on top of collateral when mortgage borrowers take out mortgage payment protection insurance (MPPI), which provides insurance against factors that reduce borrowers' capacity to meet payment obligations, and hence reduces the probability of default. Mortgage borrowers' use of MPPI has risen in recent years. According to the CML, around 36% of new mortgage lending was covered by MPPI in 2003 H2, compared with 26% for the stock of outstanding mortgages. Market contacts suggest that some lenders make MPPI compulsory for high LTV borrowers. However, MPPI may not completely remove the credit risk from the banking sector, as typically it provides only partial cover.¹¹ Furthermore, around 80% of MPPI cover is provided by the lenders themselves. It is unclear to what extent this risk is transferred to external insurers and reinsurers, and how far the premium income adequately compensates for MPPI claims.

Other domestic household credit risks

Unsecured lending is always likely to experience proportionally higher loss-given-default than secured lending. Indeed, in the past ten years, unsecured household lending has made up around 40% of UK-resident banks' write-offs (Chart 14). Write-off rates on credit cards rose further to 3.3% per annum in

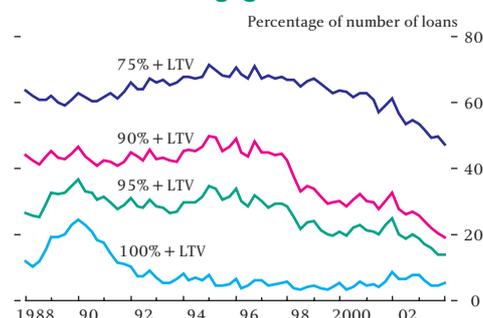
11: MPPI covers one or more of the following: loss of earnings due to accident or sickness; unemployment; and self-employed loss of earnings. It does not typically cover relationship breakdown, reduced earnings from employment, or an increase in expenditure (for example, from an increase in interest rates). Furthermore, only 30% of borrowers with MPPI cover both parties for unemployment and ill-health in households in which two adults contribute to the mortgage.

Chart 14:
UK-resident banks' write-offs over the past ten years



Source: Bank of England.

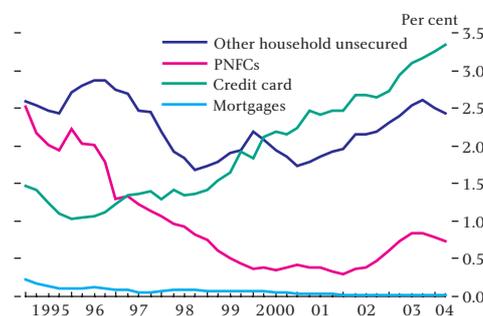
Chart 15:
Incidence of high loan-to-value ratios on new UK retail mortgages^(a)



Source: Council of Mortgage Lenders.

(a) By number of loans.

Chart 16:
UK-resident banks' annualised write-off rates on domestic loans^{(a)(b)}

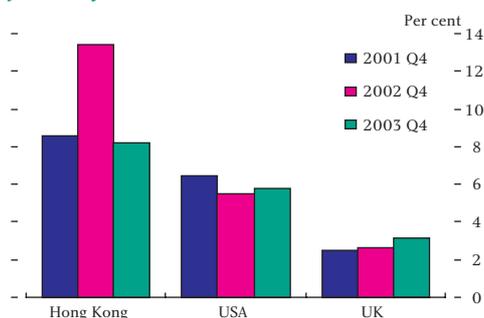


Source: Bank of England.

(a) Calculated as rolling quarterly data, annualised.

(b) Adjusted to reflect a bank's change in accounting method.

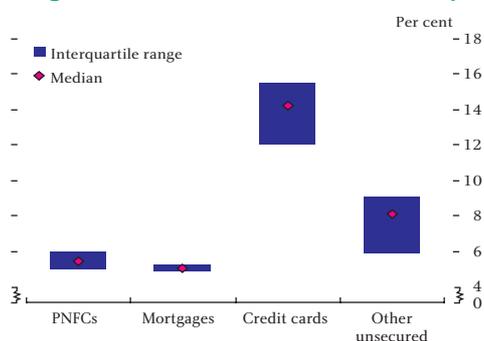
Chart 17:
UK, USA and Hong Kong annualised quarterly credit card write-offs^(a)



Sources: Bank of England, Hong Kong Monetary Authority and Federal Deposit Insurance Corporation.

(a) Charge-offs for Hong Kong and USA. 'Write-off' policies may differ in the three data sources.

Chart 18:
UK-resident banks' effective interest rates charged on domestic loans, March 2004^{(a)(b)}

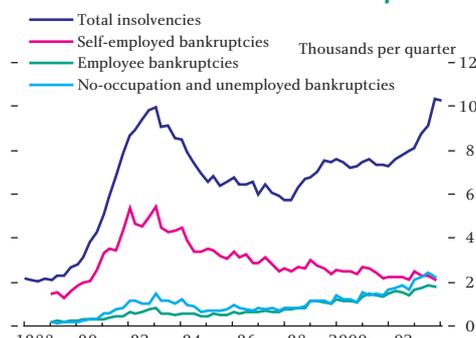


Source: Bank of England.

(a) Twelve-month average effective interest rates.

(b) Effective interest rates are calculated by dividing each bank's inflow of interest received by the average lending balance.

Chart 19:
Personal insolvencies and bankruptcies^{(a)(b)(c)}



Source: DTI.

(a) Data are for England and Wales. Total insolvencies are seasonally adjusted; bankruptcy data are not seasonally adjusted.

(b) Total insolvencies include bankruptcy orders and individual voluntary arrangements.

(c) Figures for 2004 Q1 are provisional.

2003, while those on other unsecured loans remained stable at around 2.5% (Chart 16).

Market contacts suggest that the rise in credit card write-offs in recent years reflects an extension of coverage to higher-risk customers, rather than a change in creditworthiness of established customers. Despite the rise in UK credit card write-off rates, they still remain lower than in some overseas markets, such as those of Hong Kong and the United States (Chart 17). Whether high credit card write-offs adversely affect a bank's profitability overall depends on whether the write-off rates have been anticipated and so reflected in the interest rates charged. Effective interest rates on credit cards in 2004 Q1 remained considerably higher than on other major forms of domestic lending (Chart 18).¹²

The widening divergence between write-offs on secured and unsecured lending may also indicate increased financial problems among those with high unsecured debt but no housing equity. Survey evidence suggests that those finding unsecured debt a heavy burden are concentrated among those living in rental accommodation.¹⁵ These borrowers have little or no room to refinance unsecured debt on more favourable terms, through the use of secured borrowing, and so could be particularly vulnerable to increases in interest rates or falls in incomes. The same survey evidence suggests renters account for less than 40% of all unsecured borrowing. For those reporting debt to be a heavy burden, the amount of unsecured debt owed by renters is on average lower than for those who hold mortgages or own their houses outright.

Personal insolvencies have risen sharply during the past year, with increases in both the number of employed and unemployed made bankrupt (Chart 19). Evidence about the size of debts held by those entering bankruptcy is scarce, but survey data suggest that, even if the rise in insolvencies had not been fully anticipated and priced into lending margins, the adverse impact on banks is likely to have been small.¹⁴

On 1 April 2004, with the introduction of the Enterprise Act, the legal regime for insolvencies changed. The new regime reduces the period for automatic discharge of most bankrupts and increases the penalties imposed on bankrupts whose conduct is deemed to have been irresponsible or reckless. Although the penalties for bankruptcy remain considerable, some lenders have expressed concerns that bankruptcies may rise as a result of the changes.

12: 'Effective interest rates' are calculated by dividing banks' inflow of interest received from a certain type of lending activity by banks' average lending balance for that activity. Effective interest rates may differ from 'quoted interest rates', as effective interest rates represent an average interest rate on the banks' outstanding lending activity.

13: See Tudela, M and Young, G (2003) 'The distribution of unsecured debt in the United Kingdom: survey evidence', Bank of England *Quarterly Bulletin* (Winter).

14: Based on the 9th Survey of Personal Insolvency by R3, the Association of Business Recovery Professionals.

1.2 UK corporate credit risks

The growth in large UK-owned banks' lending to UK non-financial companies eased to an annual rate of around 10% in the year to 2004 Q1 (Chart 20). Lending to the UK non-financial corporate sector is around 8% of the stock of the large UK-owned banking sector's total assets, compared with around 13% some 15 years ago.

Financial pressures on non-financial companies

Corporate borrowing and capital market finance

Despite robust growth in borrowing by non-financial companies from the large UK-owned banks in the past year, borrowing from all UK-resident banks has been subdued. Firms' bond issuance strengthened around the turn of the year although there are some signs of a slowdown in more recent months. Discussions with companies and lenders suggest that access to both bank and bond finance has improved further. Some companies have taken advantage by increasing the maturity of both their bonded debt and banking facilities. Issuance of new equity, an alternative means by which firms can adjust their balance sheets, has edged up, although remains modest overall.

Profitability

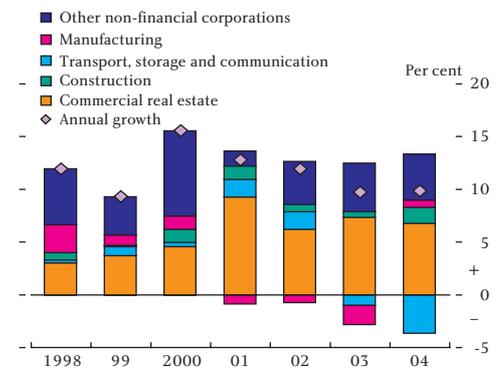
Corporate profits strengthened further in the second half of 2003, rising to their highest level as a share of GDP since 2000, although they remain well below their most recent peak in 1997 (Chart 21). Gross trading profits of non-oil private non-financial companies (PNFCs) rose 11% in the year to 2003 Q4. And discussions with large companies suggest that cash flow has also improved in the past year or so, consistent with aggregate data. Consensus forecasts for profits growth in 2004 have edged down since the *December Review*, although projections for 2005 have picked up since the start of the year.

The aggregate data for corporate profitability may, however, mask vulnerabilities within the sector. Company accounts data for 2003¹⁵ suggest that there is still a large tail of firms with low or negative profitability, concentrated among small firms; though many of those accounts cover periods prior to the recent recovery in aggregate profitability.

The rise in oil prices this year, if sustained, could increase company costs and so add to financial pressures, particularly in energy-intensive sectors such as airlines, road haulage and other transport industries, as well as in some chemical industries. But the effect of any given increase is likely to be smaller overall than in the past, as UK companies have become less reliant on oil for their energy needs. Furthermore, lending to the transport and

Chart 20:

Contributions to annual growth in large UK-owned banks' lending to UK PNFCs^{(a)(b)}



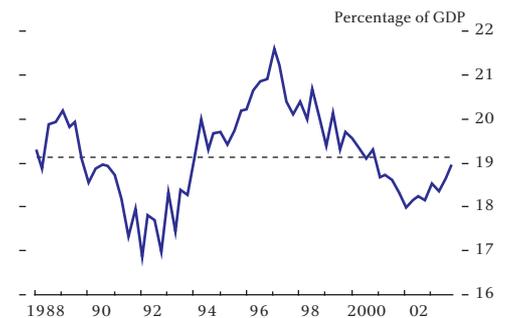
Source: Bank of England.

(a) PNFCs do not include unincorporated businesses, non-profit institutions serving households or public sector business which may be included in some of the component sectors shown.

(b) 2004 data up to end Q1.

Chart 21:

PNFCs' gross operating surplus^{(a)(b)}



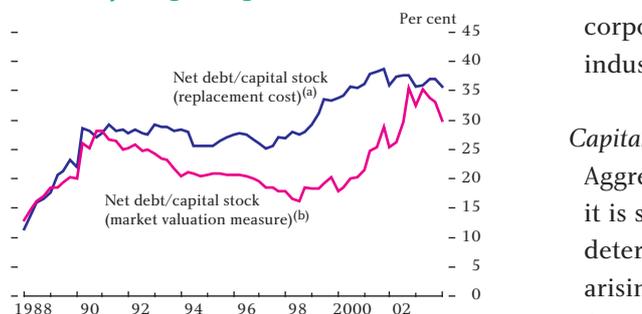
Source: ONS.

(a) Data are quarterly and seasonally adjusted.

(b) Dashed line indicates average of series from 1988.

15: Based on results for financial years ending in 2003 for 908 quoted companies, just over 70% of the full sample.

Chart 22:
PNFCs' capital gearing

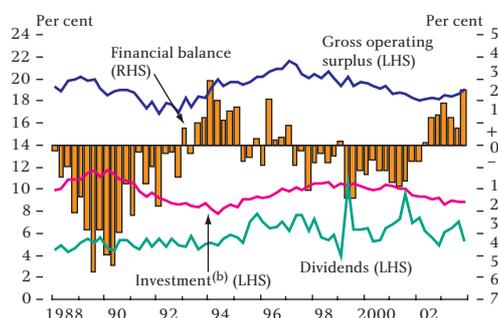


Sources: ONS and Bank of England.

(a) PNFCs' net debt divided by the total value of capital at replacement cost.

(b) PNFCs' net debt divided by the market value of assets of UK-resident firms.

Chart 23:
PNFCs' operating surplus, investment, dividends and financial balance^(a)

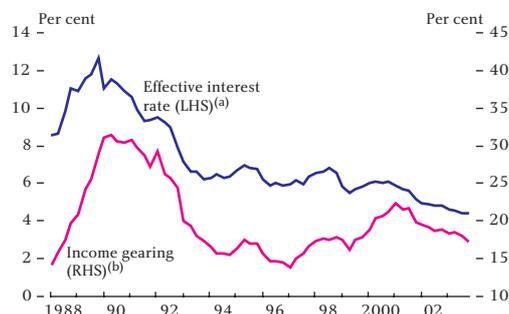


Source: ONS.

(a) As a percentage of GDP. Data are seasonally adjusted.

(b) PNFCs' gross fixed capital formation.

Chart 24:
PNFCs' income gearing and effective interest rate



Sources: ONS and Bank calculations.

(a) As measured by interest payments as a proportion of gross debt.

(b) As measured by interest payments as a share of gross operating surplus.

communication sector accounts for only around 5% of the large UK-owned banking sector's lending to the UK non-financial corporate sector, with lending to chemical and associated industries accounting for a further 1%.

Capital gearing and balance sheet adjustment

Aggregate capital gearing has edged down over the past year. But it is still high by historical standards (Chart 22), following a deterioration of balance sheets at the beginning of the decade, arising partly from the financing of high M&A (Mergers & Acquisitions) activity. Indeed, accounts for quoted companies suggest that, for the top 10% of firms by market value, capital gearing picked up slightly in 2003. Overall, capital gearing remains well above the levels likely to prevail in the long run, given the associated insolvency risks on the one hand and the tax advantages on the other. So firms remain more vulnerable than usual to adverse shocks, and corporate sector balance sheet adjustment could therefore have further to run, although discussions with firms suggest that many appear content with current levels of capital gearing.

For some companies, pension scheme deficits have contributed to financial pressures. Pension deficits have changed little over the past six months, reflecting modest changes in equity prices and bond yields. The aggregate deficit of FTSE-100 companies was probably around £56 billion as of 30 April 2004 (5.4% of market capitalisation), on an FRS 17 basis. But looking over the past year, pension deficits have fallen, and the dispersion of firms' pension deficits relative to capitalisation has narrowed.

Previous *Reviews* have discussed how firms have sought to repair their balance sheets by dividend cutbacks, reductions in capital expenditure and debt refinancing. Dividend payments have been volatile. But company accounts data suggest that the proportion of quoted companies not paying a dividend rose in 2003; and dividend payments overall fell back sharply in Q4. Capital expenditure was broadly stable as a share of GDP in 2003 H2. Together with rising profitability, that has enabled the corporate financial surplus to increase to its highest level as a share of GDP since 1994 Q1 (Chart 23).

Improved corporate profitability, together with low interest rates, has led to a further decline in corporate income gearing (Chart 24). On the basis of the MPC's May central projection, and market expectations for interest rates, income gearing is likely to remain stable and low. And, in aggregate, the corporate sector has increased holdings of liquid assets in recent years (Chart 25), which would help companies absorb any unforeseen rise in debt servicing. Discussions with companies suggest that high liquidity often reflects precautionary motives. Others cite strong cash flow combined with a lack of suitable investment opportunities and, in some cases, the costs of using surplus cash to pay down long-term debt.

Commercial property

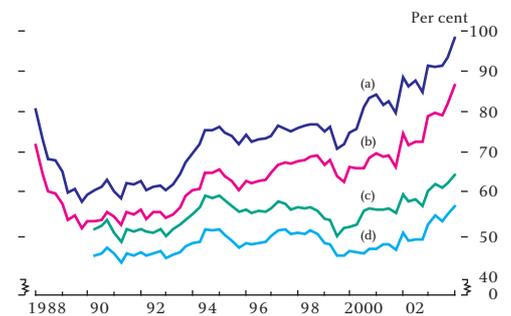
As highlighted in previous *Reviews*, the growth of commercial property sector borrowing has been rapid in recent years. The annual growth of sterling borrowing from UK-resident banks moderated to 15.5% in 2004 Q1, compared with the recent peak of 23.2% in 2003 Q2. Market contacts suggest that reflects a diminishing availability of suitable large-scale properties for investment, although there also appears to have been a small reduction in lending appetite. Loan demand from smaller-scale investors has remained strong, however, alongside rising buy-to-let investment. And discussions at the Property Forum¹⁶ suggest that investor demand for commercial property has remained strong overall, with recent signs of a pick-up in demand from institutional investors.

Evidence from company accounts suggests that, in aggregate, the capital gearing of large property companies (measured as total debt to assets) was higher in 2002 than in 1999 (around 46% against some 41%).¹⁷ But overall, the rise in debt also reflects growth in both the size of property companies and their number. It is very difficult to assess the gearing of the high-net-worth individuals and syndicates that account for an estimated 9% of all bank lending to the UK commercial property sector.¹⁸

In part, too, the rise in commercial property borrowing has been used to fund the purchase of property assets from some industrial and commercial companies, which have subsequently leased back the property (acquiring debt-like obligations in the process). Many companies are likely to use property assets as collateral for bank finance, particularly smaller companies whose financing sources are not as diverse as those used by larger ones. So future developments in the commercial property market may affect not only the financial position of property companies, but also the access to finance of non-property companies.

Strong investment demand has put upward pressure on aggregate property values despite continued weak rents; though the increase in prices has been moderate relative both to recent house price rises and to movements in earlier cycles. Aggregate property yields have fallen to historically low levels. The proposed establishment of Property Investment Funds¹⁹ may encourage investment, on the expectation of a rise in liquidity

Chart 25:
Indicators of corporate liquidity



Sources: ONS and Bank of England.

(a) All currency deposits, money market instruments (MMIs) and bond assets held, divided by all short-term borrowing and MMIs issued.

(b) As (a) excluding holdings of MMIs and bonds.

(c) As (a) but also dividing by bonds issued.

(d) As (b) but also dividing by bonds issued.

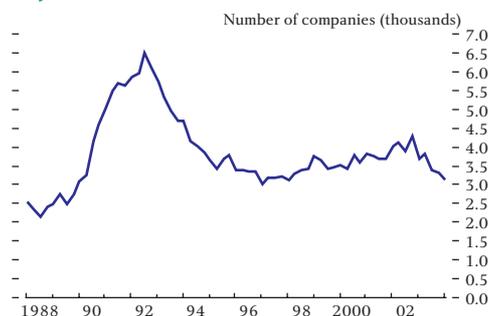
16: For background on the Property Forum, see the Box on page 72 of the November 1999 Bank of England *Financial Stability Review*.

17: The sample of 2003 accounts available for property companies is small and likely to be unrepresentative of the sector as a whole; for those companies that have reported, gearing fell in 2003.

18: See Maxted, W and Porter, T (2004) 'The UK commercial property lending market', De Montfort University, June.

19: See 'Promoting more flexible investment in property: a consultation', HM Treasury (March 2004).

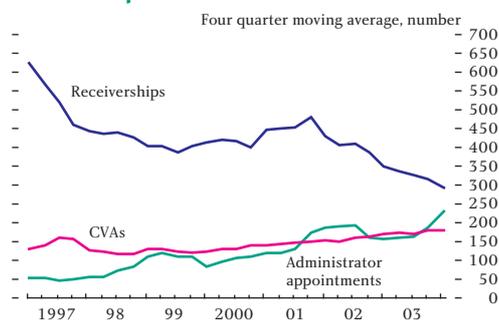
Chart 26:
Corporate insolvencies^(a)



Source: DTI.

(a) Seasonally adjusted. Latest observation is for 2004 Q1 and is provisional.

Chart 27:
Administrator appointments, company voluntary arrangements (CVAs) and receiverships



Source: DTI.

Chart 28:
Index of the mean implied probability of default for all quoted companies^{(a)(b)}



Sources: Thomson Financial Datastream and Bank calculations.

(a) The mean probability of a company defaulting in the coming year.

(b) 1997 = 100.

and transparency in the market. Nonetheless, the extent of the fall in yields points to vulnerabilities.

Risks to banks

Lending to UK non-financial companies has accounted for around 40% of total domestic write-offs since 1994, despite representing only 25% of total lending to UK households and non-financial companies. However, the past ten years may not have been an entirely representative period. Over the past five years, corporate write-off rates have been moderate, at below 1% per annum, compared with around 2.5% in 1994.

Corporate financial stress

The number of corporate insolvencies has fallen further since the December *Review* (Chart 26). The rate of corporate insolvency has fallen to the lowest level on record. However, this partly reflects the rapid growth in company numbers in the past two years or so. That may not continue at the same pace given the removal of tax incentives to incorporate in the March 2004 Budget. The number of receiverships has also fallen. In contrast, administrations have risen (Chart 27), perhaps as a result of measures introduced by the Enterprise Act of 2002, which made it easier for companies in financial difficulties to enter administration. The rise is small, however, compared with the decline in insolvencies in recent years. It is not clear whether the rise in administrations will in due course lead to a rise in insolvencies: the primary objective of an administration is to maintain the company as a going concern where that would provide the best result for the company's creditors as a whole. This process could nevertheless lead to write-offs and write-downs of debt, even where insolvency is avoided.

Market indicators of corporate prospects have remained benign overall. Credit spreads have stabilised since March, but remain lower than at the time of the previous *Review*. Equity prices have in general risen. Further, the number of ratings upgrades relative to downgrades has increased since the start of the year. Models of corporate default probability based on financial prices²⁰ (Chart 28) and on company accounts imply a decline in the likelihood of default since the December *Review*.

Commercial property exposures

Lending by large UK-owned banks to the commercial property sector has risen rapidly in recent years, to account for around a third of their total lending to non-financial companies. That raises the question of whether this concentration of banks' corporate credit exposures poses particular risk management problems, although lenders report resisting pressure from borrowers to lower margins and ease terms and conditions.

20: See Tudela, M and Young, G (2003) 'Predicting default among UK companies: a Merton approach, Bank of England *Financial Stability Review* (June).

If there were a marked downward correction in commercial property values, that could lead to breaches of loan-to-value covenants. And with some 50% of all property loans due for refinancing over the next five years (Chart 29), that could increase the risks to lenders and borrowers associated with refinancing loans, particularly if interest rates rise more than expected. In such a scenario, the continuation of finance could require an additional injection of equity from the borrower. But banks would have an incentive to renegotiate to avoid losses, particularly if forced sales risked lowering capital values further.

Some City office sector loans are already likely to be in breach of LTV covenants, following falls in capital values of over 15% in the past two years, reflecting weak occupational demand. But few signs of problems have crystallised so far. Survey and anecdotal evidence suggests that write-offs and arrears on loans have remained very low, as interest cover has been maintained; and City rental values may be starting to recover. Given the economic outlook, lenders view the likelihood of a significant increase in write-offs on commercial property lending as low in the short term.

1.3 The United States

The USA accounts for the largest single country exposure of UK-owned banks' consolidated foreign exposures, some 31% of the total (see Box 2). Local currency claims of US offices of UK-owned banks have increased by 36% over the past year, emphasising the relevance of conditions in the US domestic economy for UK banks' earnings. With a further large acquisition by Royal Bank of Scotland (RBS) in progress, the importance of US conditions is set to increase further.

The ability of US borrowers to service their loans has been helped by the robust US recovery, reflected in continuing strong growth in 2004 Q1. At the same time, however, long-term interest rates have risen, and there have been upward revisions to the expected path of official interest rates (some of the implications of which are explored further in Chapter 2).

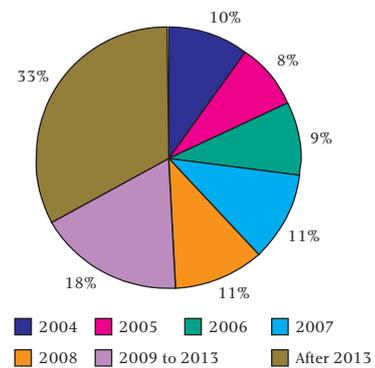
The private non-financial sector

The household sector

Household debt continues to increase rapidly, raising the debt-to-income ratio (Chart 30). In 2004 Q1, mortgage refinancing activity increased and the growth in mortgage borrowing picked up, but refinancing has since slowed sharply.

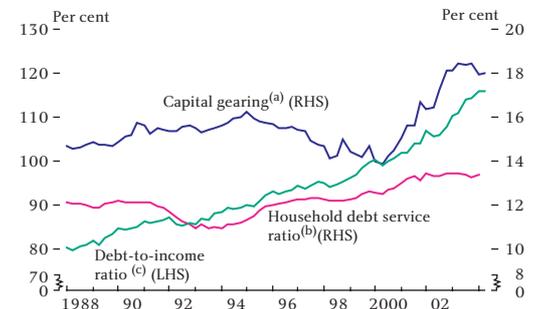
Households' capital gearing has risen sharply since end-2000, accompanied by a steep increase in the debt-to-income ratio. The debt-service ratio has, however, risen only modestly: interest rates have fallen and mortgage borrowers have had successive opportunities to refinance their debt at lower rates.

Chart 29:
Proportion of commercial property debt due for repayment (all lenders)



Source: Maxted, W and Porter, T (May 2004), 'The UK commercial property lending market', De Montfort University.

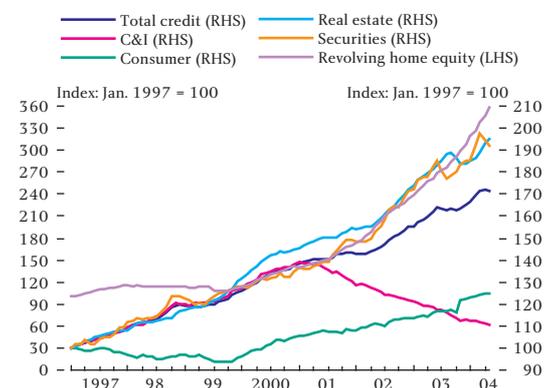
Chart 30:
US household sector gearing ratios



Source: Board of Governors of the Federal Reserve System: 'Flow of Funds Accounts of the United States', 2004 Q1.

- (a) Liabilities as a proportion of total assets.
- (b) Interest and minimum principal repayments on secured and unsecured debt, as a proportion of personal disposable income.
- (c) Liabilities as a proportion of personal disposable income.

Chart 31:
US bank credit^(a)



Source: Board of Governors of the Federal Reserve System.
(a) Data seasonally adjusted.

Box 2: UK-owned banks' international exposures

Data published by the Bank of England and the BIS¹ can be used to build up a picture of UK-owned banks' on-balance-sheet exposures to other countries.² These exposures are illustrated in Figure 1. 'Consolidated international claims' include all cross-border claims and all foreign currency claims of local offices of UK-owned banks. To measure total exposure, we add the local currency claims of local offices and risk transfers.³

A partial breakdown of these claims by sector (bank, public, and other) and maturity can also be obtained. However, this breakdown is currently only available for international claims. Figure 1 also includes data on the assets of banking sectors in other countries, to give some indication of the credit risk exposures of the banking sectors to which UK-owned banks are themselves exposed.

Worldwide sectoral exposures

Total foreign claims of UK-owned banks (in sterling terms) increased by almost 14% between June 2001 and December 2003,⁴ to £956 billion. Half of these are local currency claims of local offices, which will usually be claims on the non-bank private sector. A further 20% represents international claims on the non-bank private sector. 18% are claims on banks and 6% claims on other countries' public sectors. The remaining 6% is due to risk transfers out of the UK being larger than risk transfers inwards to the UK, probably due to the many foreign financial institutions which operate in London. Portfolio claims (shares and other securities) make up 38% of total international claims. The composition of claims varies considerably between countries.

Europe

The developed nations of Europe collectively account for the largest share of UK-owned banks' foreign claims. Claims on banks form the largest share of these, particularly of claims on Germany. In addition,

an especially high share of exposure to Germany (36%) is due to risk transfer, much of which is likely to be related to the London activities of German banks. 18% of the assets of banks resident in Germany are claims on countries outside the Euro area, and 55% on the German non-bank private sector. Local currency claims of local offices form a large share of claims on France, Ireland and Spain, where UK-owned banks have retail banking activities. International claims on Ireland have doubled since June 2001, which may reflect Dublin's growth as a financial centre.

The United States

The United States is by far the largest single country exposure. Foreign claims on the United States, which have grown by 34% since June 2001, account for 31% of the total. The increase is due to local currency claims of local offices, as UK-owned banks have expanded their US subsidiaries by acquisition and organic growth. These now account for 75% of UK foreign claims on the USA. International claims are heavily weighted towards the non-bank private sector.

Other developed countries

Claims on Japan are relatively low, reflecting both the absence of retail banking activities and UK-owned banks' reduction of exposure to the London branches of Japanese banks in recent years.⁵ The public sector accounts for a relatively high share of claims. Claims on Japan are slightly smaller than those on Australia. However, potential exposures to Japanese counterparties via derivatives positions could be significant (Section 1.5).

Emerging market economies

Hong Kong is the second largest exposure for UK-owned banks, and claims on Hong Kong are overwhelmingly local currency claims of local offices. Claims on non-Japan Asia account for 73% of total foreign claims on emerging markets.

1: www.bis.org/statistics/constats.htm or Bankstats table C4.1, available from www.bankofengland.co.uk.

2: Box 10 in the December 2001 Bank of England *Financial Stability Review* describes the data as of end-June 2001.

3: Claims on entities in country X which are guaranteed by an entity in country Y are reported as inward risk transfers to country Y (eg a claim on a New York branch of a Japanese bank is reported as an international claim on the USA, but a risk transfer is recorded out of the USA and into Japan. Risk transferred by credit derivatives is not included.

4: Currency movements over this period mean that the sterling value of a US dollar claim has fallen by 21% while the value of a euro claim has increased by 17%.

5: December 2003 Bank of England *Financial Stability Review* Box 4.

Figure 1: UK-owned banks' international exposures

Total UK foreign claims ¹ on country at end-December 2003			Consolidated international claims £ billion	accounted for by:			Local currency local claims £ billion	Net risk transfers £ billion	
£ billion		% of total		Banking sector	Public sector	Non-bank private sector			
956		100%	World ³ UK claims	423	175	59	189	478	54
325		34%	Developed Europe ⁴ UK claims	199	104	37	58	74	52
64		7%	Germany UK claims	34	23	6	5	7	23
61		6%	France UK claims	28	17	2	10	27	6
34		4%	Netherlands UK claims	25	12	1	11	4	6
33		3%	Ireland UK claims	19	9	0	10	13	0
29		3%	Italy UK claims	21	6	12	4	5	3
300		31%	United States UK claims	76	14	4	58	226	-2
178		19%	Emerging markets ⁶ UK claims	62	20	9	33	125	-9
72		8%	Hong Kong UK claims	12	4	0	8	62	-3
35		4%	Australia UK claims	13	8	0	5	20	2
34		4%	Offshore Financial Centres ⁷ UK claims	31	4	0	27	2	1
31		3%	Japan UK claims	13	4	7	2	15	3

Source: Bank of England.

Source: Bank of England.

Resident banking sector ² claims end 2003	Abroad	Domestic government	Domestic non-bank private
N/A			
Developed Europe ⁵ banking sector £ billion	2,231	1,517	6,372
% of total	22	15	63
German banking sector £ billion	1,008	413	1,762
% of total	32	13	55
French banking sector £ billion	678	215	991
% of total	36	11	53
Dutch banking sector £ billion	311	42	492
% of total	37	5	58
Irish banking sector £ billion	314	4	113
% of total	73	1	26
Italian banking sector £ billion	169	155	783
% of total	15	14	71
US commercial banks £ billion	370	1,358	3,925
% of total	7	24	69
N/A			
Hong Kong deposit banks £ billion	246	16	132
% of total	62	4	34
Australian deposit banks £ billion (end 2001)	21	8	225
% of total	8	3	88
N/A			
Japanese deposit banks £ billion (end 2002)	470	725	2,641
% of total	12	19	69

Source: IMF International Financial Statistics.

1: Consolidated international claims + local currency local claims + net risk transfers.

2: MFIs for euro-area countries. National definitions elsewhere.

3: Excluding Jersey, Guernsey and the Isle of Man.

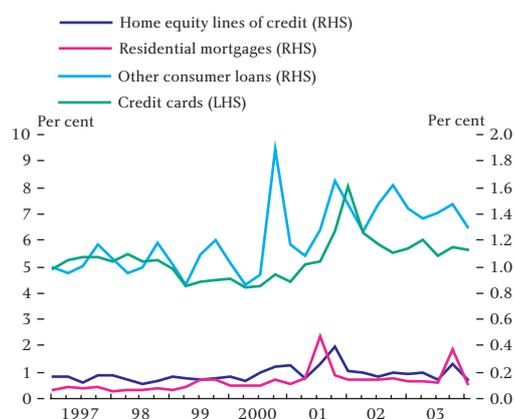
4: Euro area plus Denmark, Iceland, Liechtenstein, Norway, Sweden and Switzerland.

5: Euro area plus Denmark, Norway and Switzerland. 'Abroad' excludes intra-euro-area claims.

6: Includes Hong Kong and Singapore.

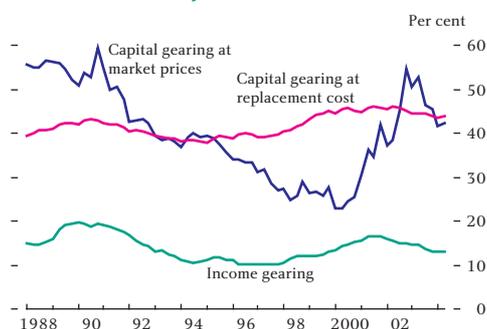
7: Excludes Hong Kong, Singapore, Jersey, Guernsey and the Isle of Man.

Chart 32:
US banks: charge-off rates on consumer loans^(a)



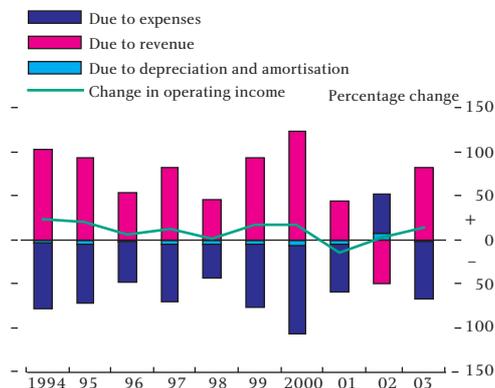
Source: Federal Deposit Insurance Corporation.
 (a) Data are quarterly annualised.

Chart 33:
Capital and income gearing of US non-financial corporate sector



Sources: Board of Governors of the Federal Reserve System: 'Flow of Funds Accounts of the United States', 2004 Q1 and Bureau of Economic Analysis, Department of Commerce.

Chart 34:
Changes in US non-financial corporate operating income^(a)



Sources: Standard and Poor's Compustat and Bank calculations.
 (a) Data are as at beginning May 2004.

The preponderance of fixed-rate mortgages (about 60% of total household debt) is likely to limit the impact on debt service of rising rates (although when people move they will have to refinance at the prevailing higher rate).

Some of the areas of fastest debt growth have been flexible-rate home equity (Chart 31) and credit card borrowing, extended in some cases to borrowers of lower credit quality. A rise in income gearing associated with increasing market rates could lead to higher defaults. Between early 2000 and mid-2002, charge-off rates on consumer debt other than first mortgages rose erratically, but appear since to have levelled off (Chart 32). Specialist credit card banks have seen some deterioration in loan quality indicators, but their return on equity, which slipped somewhat in 2001, has been strong since.

The non-financial corporate sector

Profits grew strongly in 2003, generating a financial surplus, and remained robust in 2004 Q1.²¹ Accordingly, since 2003 Q3 debt growth has been moderate: capital gearing at replacement cost has remained broadly flat, albeit at a high level (Chart 33); net bond issuance has been sluggish; and outstanding commercial and industrial (C&I) loans from banks has continued to fall. The strong profit growth last year was driven by increased revenue rather than reduced costs, the reverse of 2002 (Chart 34). The mean Consensus forecast for corporate profit growth in 2004 is 19%, slightly higher than in 2003.

Largely because of strong profits, income gearing fell rapidly in 2003 H2; and it was approximately unchanged in 2004 Q1. Much of the debt of non-financial firms is at long-term fixed rates (58% of debt is in bonds). While this will tend to moderate the impact on income gearing of any monetary tightening, in the past changes in policy rates have had an impact on the effective interest rate paid by companies (Chart 35). In anticipation of changes in policy rates, companies may well use swaps and other derivatives to manage their interest costs. The extent to which companies may have recently attempted to offset prospective higher borrowing costs, resulting from any rise – or expected rise – in policy rates, by swapping floating-rate debt into fixed-rate, is unclear, however.

Balance sheet data for listed firms show a slight improvement in aggregate capital gearing (at book value) in 2003 (Chart 36). The improvement was broad-based: the gearing in the most highly geared quintile of firms fell; as did that in the telecom services and energy sectors – partly because of cost-cutting and asset sales.

The gearing of the auto sector increased slightly, partly due to a General Motors refinancing of pension fund liabilities with

21: The financial surplus is defined as internal funds less capital expenditure.

bonded debt. The 2003 earnings of the large auto companies were mainly generated by their finance subsidiaries. Through continuing high securitisation volumes they have maintained a strong liquidity position, despite higher costs of commercial paper and other unsecured debt. The airline and the chemical sectors have yet to recover and rising energy prices are placing pressure on 2004 earnings. But overall corporate bankruptcies have fallen sharply: the value of assets of companies filing for Chapter 11 was less than US\$10 billion (0.09% of GDP) in both 2003 Q4 and 2004 Q1, the lowest levels for five years (Chart 37).

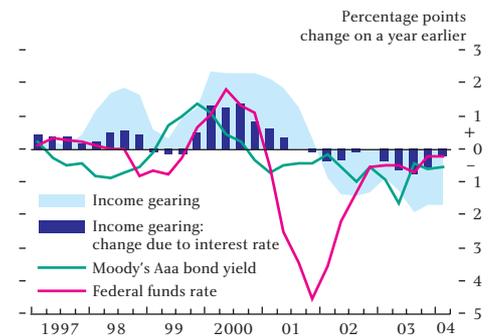
Banking

Despite losses on exposures to some corporate borrowers, which revealed some significant sectoral concentrations and also triggered operational risk and governance issues, large US banks emerged from the most recent recession well capitalised and profitable. Over the past two years, the Tier 1 capital ratio of large US banks has remained about three percentage points above the 'well-capitalized' criterion, and bank equity prices relative to the S&P 1500 equity index have been approximately flat. These conditions, and an improving economic outlook, have encouraged a resumption of consolidation in the industry. In recent months, several significant deals have been announced. The merger of JP Morgan Chase and Bank One will create the second largest banking group in terms of assets. Recent or prospective acquisitions by UK banks are raising their size ranking (by total assets) in the US market. HSBC, following the acquisition of Household, is now ranked seventh²² and, on completion, the merger of RBS's Citizens Financial with Charter One will create a banking group ranked twelfth.

Despite narrowing net interest margins (lending rates having fallen more than average funding costs), banks' profitability has generally strengthened since 2002 Q4, mainly reflecting a decline in loan loss provisions (Chart 38). The benefit of declining provisions on the growth in earnings seems likely to diminish, however, as the stock of loan loss allowances relative to loans has been falling.

Previous *Reviews* have highlighted the efforts of companies to reduce their gearing and extend the maturity of their debt, partly by tapping bond markets. One consequence has been that outstanding bank loans to companies have declined 20% since early 2001 (Chart 31). Recent Senior Loan Officer surveys suggest, however, that – consistent with an improving outlook for growth and corporate earnings – banks have begun to ease lending standards after several years of tightening, while demand for credit has become somewhat stronger (Chart 39). The Federal Reserve's quarterly survey of lending terms on new

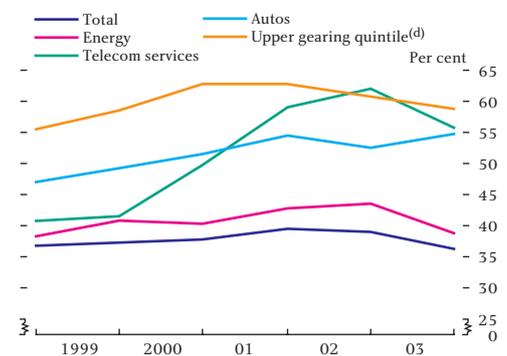
Chart 35:
Changes in interest rates and changes in income gearing of US non-financial companies^(a)



Sources: Bureau of Economic Analysis, Board of Governors of the Federal Reserve System and Bank calculations.

(a) Income gearing is net interest payments divided by pre-tax profits.

Chart 36:
US non-financial corporate capital gearing^{(a)(b)(c)}



Sources: Standard and Poor's Compustat and Bank calculations.

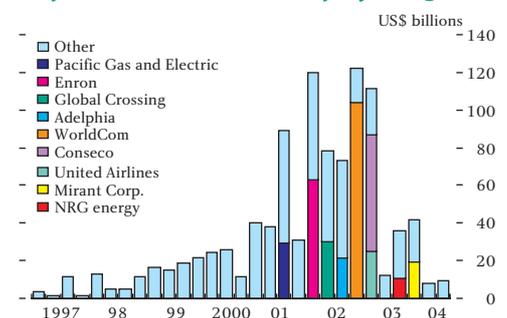
(a) Gearing = (debt – short-term investments)/(tangible assets – short-term investment).

(b) Debt = bonds + loans + commercial paper.

(c) Data as at beginning of May 2004.

(d) The upper gearing quintile in 2000.

Chart 37:
Chapter 11 business bankruptcy filings^(a)

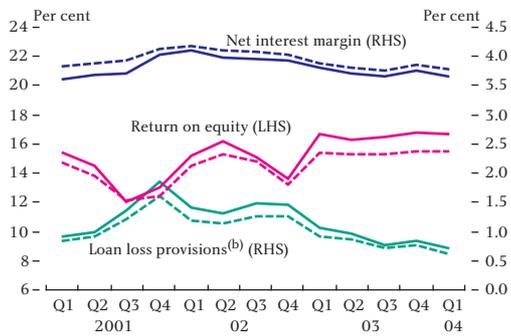


Source: Thomson SDC.

(a) Total assets of company filing for bankruptcy.

22: HSBC North America Inc is the tenth largest US bank holding company by assets. But if the assets of Household Financial are added, it becomes the seventh largest banking organisation.

Chart 38:
US banks: profitability indicators^(a)

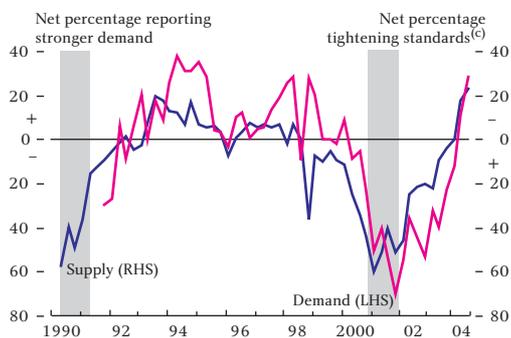


Source: Federal Deposit Insurance Corporation.

(a) Solid line is banks with assets greater than US\$10 billion, dashed line is all commercial banks.

(b) Loan loss provisions as a percentage of total loans.

Chart 39:
US bank lending conditions for commercial and industrial loans^{(a)(b)}



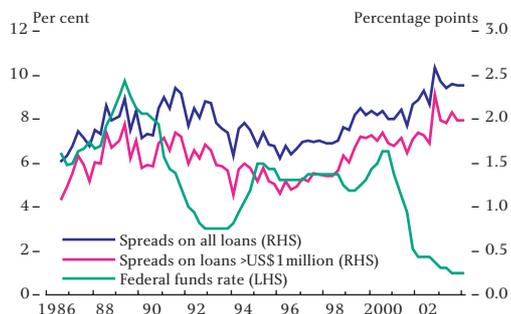
Sources: Board of Governors of the Federal Reserve System: Senior Loan Officer Survey and National Bureau of Economic Research.

(a) To large and medium-sized firms.

(b) Shaded areas denote periods of recession.

(c) Inverted scale.

Chart 40:
US banks: spreads on new commercial and industrial lending^(a)



Source: Board of Governors of the Federal Reserve System, 'Survey of Terms of Business Lending'.

(a) Spreads over intended Federal funds rate.

domestic C&I credits, last conducted in February, indicated that easier lending standards had not at that point been manifested in lower margins. While new lending spreads had fallen back since a rise in credit concerns in late 2002, they remained higher than at the beginning of the most recent recession (Chart 40). However, some easing of covenants had taken place. While greater demand and easier supply conditions have not yet been reflected in available lending aggregates, 2004 Q1 data for large commercial banks in aggregate (and for some individual large investment banks) show some increase in off-balance-sheet lending commitments.

Since 1999, the share of US banks' lending related to real estate has increased by 8 percentage points, while the share of C&I lending has fallen by a similar amount (Chart 41). A small rise in the share of lending to individuals has matched a fall in that of leasing receivables. Large banks (those with total assets of \$10 billion or more) have increased their share of all banks' residential mortgage lending by 14 percentage points and of other unsecured lending to individuals by 18 percentage points, while their share of lending to companies has fallen slightly. This appears to reflect a sharper decline of credit demand by large companies than by small and medium-sized enterprises (SMEs), which were relatively less affected by the recession but also find access to the bond market more difficult. Smaller banks, by contrast, in losing share in residential mortgage lending and other, unsecured, consumer lending, have raised the proportion of commercial real estate and construction in their loan portfolios.

The systemic implications of these trends are ambiguous. Larger banks are now likely to have more diversified and less concentrated US loan books than before the recent recession. The secured component of their lending to households has also risen relative to credit card and other unsecured lending. Smaller banks, however, could have more concentrated exposures in commercial real estate and construction, activities which have been a source of stress in the past – most recently in the early 90s – but which, because of this experience, have also been subject to strengthened supervisory oversight and internal risk management.

Given strong deposit inflows and the weakness of corporate bank borrowing, large US banks have increased their holdings of fixed-rate pass-through mortgage-backed securities and mortgage loans,²³ while smaller US banks have increased their holdings of structured notes (typically those with features making them similar to callable mortgages). These instruments carry a higher coupon than equivalent debt without a borrower's

23: At end-Q1, holdings of residential mortgage pass-through securities and fixed-term mortgages were 27% of the total assets of Citizens Financial, RBS's US bank holding company subsidiary, and 24% of HSBC North America.

pre-payment option. While higher coupons will tend to raise banks' interest margins, the switch in the composition of assets from variable-rate lending to fixed-rate securities and other assets with embedded options potentially exposes banks to greater interest rate risk. Issues of market risk are explored further in Chapter 2.

1.4 Europe

UK-owned banks' exposures to borrowers in the rest of Europe²⁴ have increased significantly since mid-2001 (Box 2). Although the largest exposures are still to Germany (mainly to banks) and France (mainly local retail customers), the growth of exposures to Spain, Ireland and the Netherlands has been particularly rapid. More than half of UK-owned banks' international claims on Europe are on banks, compared with less than a fifth for claims on the United States. This may reflect the greater relative importance in Europe of bank intermediation and the participation in London's international wholesale markets of (non-UK) European banks; at end-April they accounted for 40% of UK-resident bank assets.²⁵ Hence the impact of European household and corporate credit risk on the large UK-owned banks is relatively more indirect than with US credit risk.

Europe's economies reported generally stronger-than-expected GDP growth for 2004 Q1, mainly reflecting stronger external demand. The European Central Bank (ECB) has kept its main interest rate unchanged at 2%, and market interest rates have been lower than market expectations at the time of the previous *Review*, reaching a trough in late March.

The private non-financial sector

The household sector

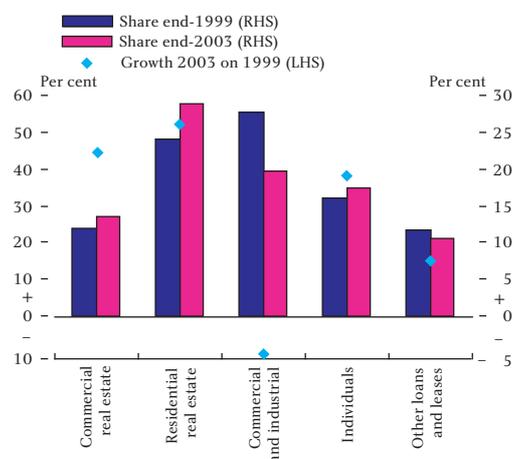
Euro-area banks' loans to euro-area households account for only 17% of their total assets,²⁶ significantly lower than the analogue for US and UK banks. But such exposure has been increasing; lending by euro-area banks to households for house purchase grew 8.5% in April 2004 on a year earlier, while growth in consumer credit rose to 5% (Chart 42), in line with ECB euro-area bank lending survey perceptions of increased demand for consumer credit.

24: 'Europe' is used here as shorthand for developed countries in Europe, excluding the UK, as defined in the footnote to Box 2.

25: For further analysis, see Box 5: UK banking sector links with the rest of Europe, June 2002 *Review*, page 41.

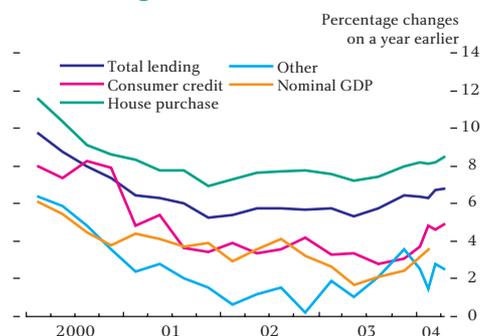
26: Analysis of euro-area banks is based on ECB data for the aggregated balance sheet of euro-area monetary and financial institutions.

Chart 41:
US banks: sectoral shares of net loans and leases



Source: Federal Deposit Insurance Corporation.

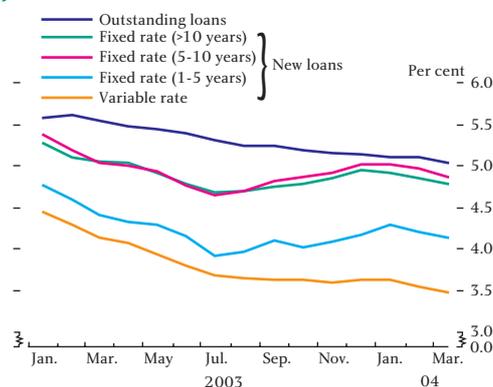
Chart 42:
Bank lending to euro-area households^(a)



Sources: European Central Bank, Eurostat and Bank calculations.

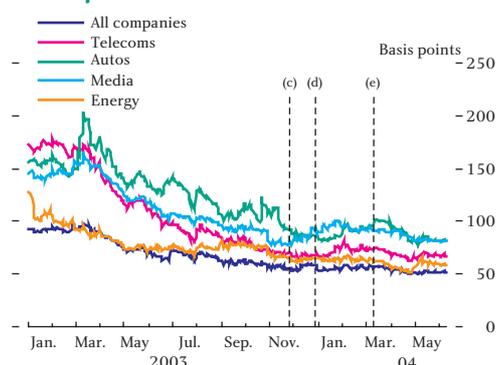
(a) Quarterly data to end-2003. Monthly data from Jan. 2004.

Chart 43:
Average interest rates on loans for house purchase



Sources: European Central Bank and Bank calculations.

Chart 44:
Euro-denominated^(a) investment-grade credit spreads^(b)



Source: Merrill Lynch.

- (a) Mainly by European companies.
- (b) Weighted average option-adjusted spread of corporate bonds over government bonds.
- (c) Dec. 2003 *Review*.
- (d) Parmalat declared insolvent.
- (e) Madrid bombing.

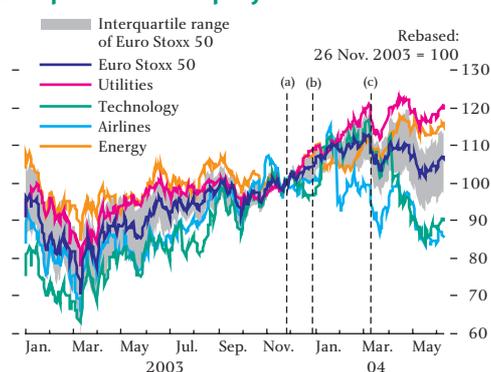
Table 1:
Major rating^(a) changes since December 2003 *Review*

Company Name	Debt ^(b) (€ billions)	Change (notches)	Current rating
Vivendi Universal	38.1	+2	BBB-
KPN	16.8	+1	A-
France Telecom	81.8	+1	BBB+
Repsol	20.3	+1	BBB+
Ahold	18.5	+1	BB
Alcatel	17.7	+1	BB-
Shell	43.7	-1	AA+
Lufthansa	14.0	-1	BBB
Rhodia	6.3	-2	B
Adecco	4.8	-3	BB+
Parmalat ^(c)	8.0	-12	D

Source: Bloomberg.

- (a) Standard & Poor's.
- (b) Total on-balance-sheet non-equity liabilities of parent company for end-2003. Group debt may be higher.
- (c) Parmalat debt is for end-2002. It is now no longer rated so the last available rating has been used.

Chart 45:
European sector equity indices



Sources: Thomson Financial Datastream and Bank calculations.

Note: (a), (b) and (c) are the same dates as (c), (d) and (e) in Chart 44.

Several factors have aided households' ability to service their increased indebtedness. Low nominal interest rates on new loans have reduced the average interest rates on housing loans (Chart 43), although growth in the stock of variable-rate housing loans could leave such borrowers more vulnerable to any future increase in interest rates. Household incomes have continued to grow, and the euro-area unemployment rate has remained virtually unchanged since early 2003. House price inflation remains high in Ireland and Spain, but has slowed in the Netherlands and continues to be low in Germany.

The private non-financial corporate (PNFC) sector

Direct exposure to euro-area PNFC borrowers accounts for 20% of euro-area banks' total assets, and probably around 3-4% of UK-owned banks' total assets. Market-based indicators provide mixed evidence of recent credit risk developments among European PNFCs. Movements in credit spreads have varied by sector, but are generally little changed since the December *Review* (Chart 44). Credit rating downgrades have continued to outnumber upgrades, but by a narrower margin; and several of the sectors and companies with problems flagged in previous *Reviews* have been upgraded (Table 1), typically reflecting successful balance-sheet restructuring, based on cost-cutting efforts and disposal of non-core assets. Share prices generally rose until the Madrid bombings on 11 March, but have subsequently fallen back, and are now little changed since the previous *Review*; the airline and technology sector indices have fallen (Chart 45). Options-implied Euro Stoxx index volatility has declined, implying (other things being equal) some lowering of perceived overall default risk.

The number of business failures has increased in some countries (such as France), but appears to have been concentrated among small and medium-sized enterprises, with limited impact on banks' reported credit losses. This may reflect the small size of affected borrowers, and past efforts by banks (evident for some time in the ECB's euro-area bank lending survey) to tighten credit risk management for such borrowers. The deceleration in PNFC long-term bond issuance and borrowing from banks (Chart 46) appears, however, mainly to reflect sluggish loan demand rather than greater caution on the part of lenders. Like households, PNFCs have continued to benefit from past falls in interest rates on loans, as old loans have been refinanced at lower rates. Business confidence indicators seem to have improved and business investment has started to increase, probably financed increasingly from internal funds.

At the sector level, the competitive and financial pressures in the airline industry,²⁷ widely attributed to excess capacity, have been further exacerbated by higher oil prices. Air France has acquired

27: Discussed in previous *Reviews*, eg in box on airline financing in December 2001 Bank of England *Financial Stability Review*.

KLM Royal Dutch Airlines, while discussions continue on a (possibly state-supported) rescue plan for Alitalia.

At the company-specific level, the default at end-2003 of Parmalat, an Italian dairy group with worldwide interests and debts of €13-14 billion, was probably Europe's largest ever corporate default, but is generally regarded as an isolated case of prolonged financial fraud. Although the case involved losses to retail investors and triggered some policy debate in Italy and at the EU level, the direct impact on Italian and international financial stability was limited. Parmalat had accounts with 120 banks worldwide, and its debts were well dispersed. Some tranches of a few collateralised debt obligations (CDOs) that held Parmalat debt were downgraded, but Parmalat did not appear to affect European credit spreads or credit ratings more widely.

The financial sector

Non-bank financial institutions (NBFIs)

On-balance-sheet claims on NBFIs account for only 3% of euro-area banks' total assets, but this may understate the potential for contagion from NBFIs to banks, eg via counterparty risk and capital market contagion risk, as they increasingly operate in the same financial markets. Some European life insurers and pension funds have undertaken additional hedging of their asset-liability duration mismatches,²⁸ increasing the demand for long-term fixed-income securities and derivatives. Their solvency should (compared with a year earlier) have benefited from equity gains and, in some countries, further reductions to guaranteed rates of return. General and re-insurers have benefited from premium rates remaining high and disaster claims remaining low.

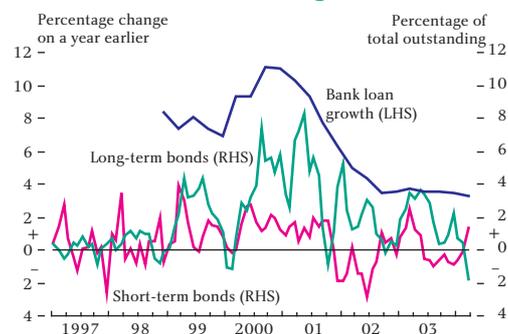
Banking sectors²⁹

Claims on other euro-area banks account for 29% of euro-area banks' on-balance-sheet assets (Chart 47), with off-balance-sheet activities potentially giving rise to further exposures. Market-based indicators generally suggest that the default risk for European banks has remained low since the December Review. Credit spreads have changed little, except for the CDS premium for Capitalia (the Italian bank with greatest Parmalat exposure), which rose above those for HVB and Commerzbank (Chart 48). Share prices (both absolutely and relative to broader European stock market indices) are also broadly unchanged, although several German and Italian bank share prices declined. Some are valued at less than the accounting book-value of the underlying equity (Chart 49).

28: As discussed in previous Reviews, eg in the December 2002 Bank of England *Financial Stability Review*, pages 34-35, many life insurers have policy liabilities with longer duration than their assets.

29: 'Banking sectors' are used here and in the charts as shorthand for the national banking sectors of Germany, France, Italy, Switzerland and Spain and the increasingly integrated regional banking sectors of the, respectively, Benelux and Nordic regions.

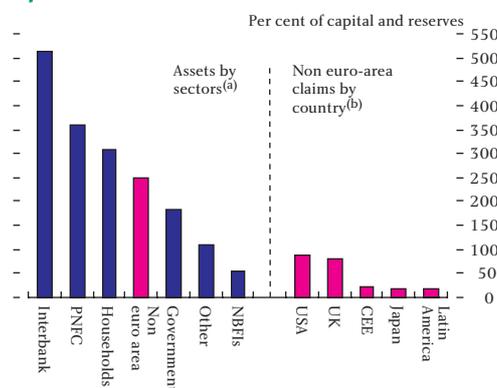
Chart 46:
Euro-area PNFC debt funding^(a)



Sources: European Central Bank and Bank calculations.

(a) Bank loan growth and three-month net issuance of securities other than shares. Maturities are one year or less for short-term bonds and more than one year for long-term bonds.

Chart 47:
Euro-area banks' on-balance-sheet exposures

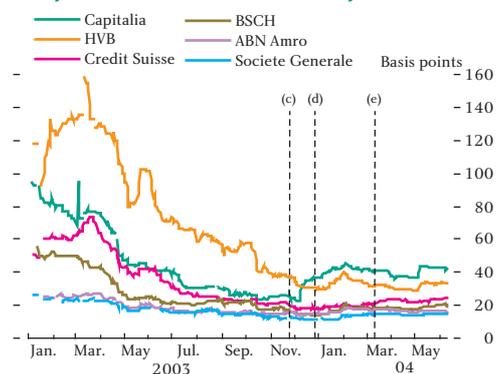


Sources: European Central Bank, Bank for International Settlements and Bank calculations.

(a) Balance sheets of euro-area monetary and financial institutions for Apr. 2004.

(b) Consolidated total foreign claims of euro-area (excluding Luxembourg) banks for 2003 Q4.

Chart 48:
CDS premia^(a) for selected European banks^(b)



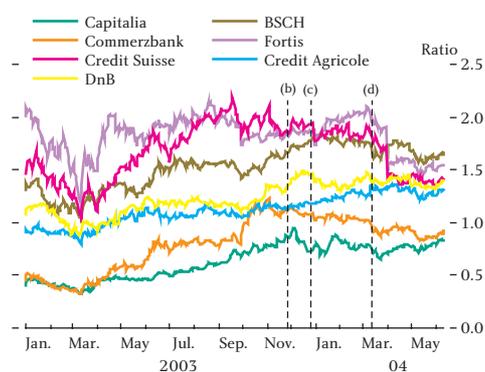
Source: Mark-it Partners.

(a) Daily closing prices of five-year senior CDS contracts gaps represent days for which there are no data.

(b) The banks with the highest current CDS price from each banking sector.

Note: (c), (d) and (e) are the same dates as in Chart 44.

Chart 49:
Price-to-book ratios for selected European banks^(a)

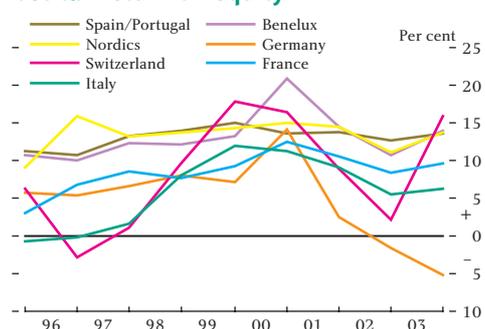


Source: Bloomberg.

(a) Large banks with the lowest price-to-book ratio from each banking sector.

Note: (b), (c) and (d) are the same dates as (c), (d) and (e) in Chart 44.

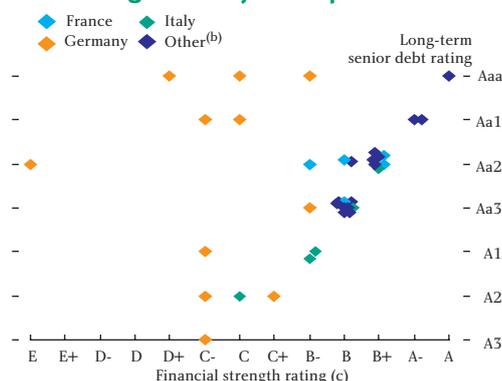
Chart 50:
Post-tax return on equity^(a)



Sources: Bureau van Dijk Bankscope and Bank calculations.

(a) Top 100 European banks by assets in each year. 2003 sample consists of the 65 banks from the 2002 sample which had reported to date.

Chart 51:
Credit ratings^(a) of major European banks



Source: Moody's Investors Service.

(a) Overlapping/clustered points represent banks with identical ratings.

(b) Includes major banks from Benelux, Spain, Switzerland and the Nordic region.

(c) Financial strength ratings exclude consideration of government support.

Most large European banks reported higher profits in 2003 (Box 3) and 2004 Q1, based mainly on stronger non-interest income, lower provisioning charges and continued cost reductions (Chart 50). Growth in net interest income has generally been sluggish. German banks managed to improve their underlying operating profitability, albeit from low levels, but several large German banks still posted a second consecutive year of net losses for 2003, generally because such improvements were more than offset by large investment and loan-loss write-downs.

Credit ratings have been upgraded for some European banks, but a comparison of long-term credit ratings (which take account of likely external support) and financial strength ratings (which do not) highlights a 'ratings gap' for some banks, which continue to be underpinned by expectations of public support in the event of pressures on liquidity or solvency (Chart 51). This includes several German landesbanks, some of which have started making limited preparations ahead of the removal of explicit state guarantees scheduled from July 2005, including raising capital from savings banks. No ratings agency has yet assigned ratings to hypothetical unguaranteed landesbank liabilities.³⁰

The euro-area bank lending survey suggests that banks are paying increased attention to managing credit risk exposures, probably encouraged in part by preparations for Basel II. The failure of Parmalat revealed,³¹ at least in that case, that risks had been widely dispersed among European and other banks, and outside the banking sector. If credit risk exposures to PNFCs (and to households) are well diversified, they would pose significant risks to euro-area financial stability only in the event of a broad-based deterioration in credit quality.

Euro-area banks' external assets (14% of total assets) are primarily claims on UK and US entities, and recent US acquisitions by BNP Paribas will have further increased the French banking system's exposure to US domestic credit risks. Elsewhere, Spanish banks have sizeable exposures to Latin America; Austrian, Belgian, German and Italian banks have expanded into Central and Eastern Europe (CEE); and French banks have large claims on Japan.

30: Guarantees are grandfathered for all landesbank liabilities issued before 18 July 2001 and for those liabilities issued between 19 July 2001 and 18 July 2005 which mature before end 2015.

31: Data on banks' exposures to vulnerable companies often only become public after a 'credit event', making *ex-ante* analysis difficult.

Box 3: An international comparison of banks' return on equity

Return on equity (RoE), the ratio of net profits to the book value of equity, is widely used to compare banks' profitability. However, a bank with a higher RoE than its peers is not necessarily in a better position to withstand an adverse shock. For example, a higher RoE may reflect a more leveraged bank. This box analyses the profitability of the largest European, US and UK banks¹ over the past seven years, paying particular attention to developments during the recent economic slowdown.²

Post-tax RoE can be seen as the product of four ratios measuring tax impact, pre-tax profit margin, asset turnover and balance-sheet leverage.³ In turn, the profit margin can be decomposed into the sum of three ratios capturing the impact of costs, provisions and one-off items (Table A). There are two important qualifications: first, differences in accounting standards across regions may have a significant impact on measured RoE;⁴ second, this box does not consider the impact of off-balance-sheet exposures on banks' risk profiles and profitability.

The RoE for European banks in aggregate was generally lower than those of US and UK banks; it also exhibited greater cyclical volatility (Chart A). US banks' RoE displayed greater stability than that of UK banks. These outcomes do not appear to have been driven solely by differences in the cyclical volatility of the underlying operating environments, as proxied by GDP growth rates.

European banks' relatively lower RoE was mainly due to a lower profit margin (Chart B), which itself was mainly driven by a consistently higher cost-income ratio (Chart C). At the same time, European banks also displayed relatively high balance-sheet leverage. Both outcomes suggest that, in aggregate, they exhibited the weakest financial performance over the period. US and UK banks achieved similar levels of RoE, but the latter had higher balance-sheet leverage, which compensated for a lower asset turnover. Thus, US banks appear to have had the strongest performance after allowing for such leverage.

1: Large European and UK-owned banks are defined in section 1.4 (Chart 50) and 3 respectively. Large US banks are defined as all commercial banks with assets over \$10 billion.

2: This Box expands the RoE breakdown presented in the December 2003 *Review* by introducing key variables such as provisions, costs and one-off items. Furthermore, the previous sample is enlarged by including all major US and European banks and by describing how their profitability evolved over time, for a total of about 1200 observations.

3: The decompositions of post-tax RoE and pre-tax profit margin are obtained as follows:

$$\text{RoE} = \left(1 - \frac{\text{Tax}}{\text{Pre-tax profit}}\right) \times \left(\frac{\text{Pre-tax profit}}{\text{Operating income}}\right) \times \left(\frac{\text{Op. income}}{\text{Assets}}\right) \times \left(\frac{\text{Assets}}{\text{Equity}}\right)$$

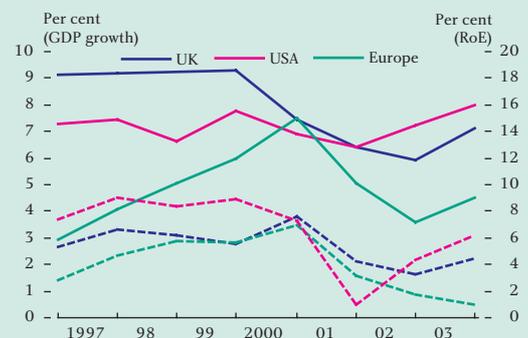
$$\text{Pre-tax profit margin} = 1 - \left(\frac{\text{Operating expense}}{\text{Op.income}}\right) - \left(\frac{\text{Provisions}}{\text{Op.income}}\right) + \left(\frac{\text{Residual income}}{\text{Op.income}}\right)$$

4: This issue is addressed in Box 1 in Ian Michael's article in this *Review*.

Table A:
RoE and pre-tax profit margin decomposition ratios

Ratio	Description	Effect of rise on financial stability
RoE		
Pre-tax profit margin	Measures impact of costs, bad debts and one-off items	Positive
Asset turnover	Measures revenue generation per unit of asset	Positive
Leverage	Measures balance-sheet gearing ie off-balance-sheet risks are not captured	Negative
Pre-tax profit margin		
Cost-income ratio	Measures cost efficiency	Negative
Provisions	Measures impact of bad debts	Negative
Residual	Captures one-off items	Ambiguous

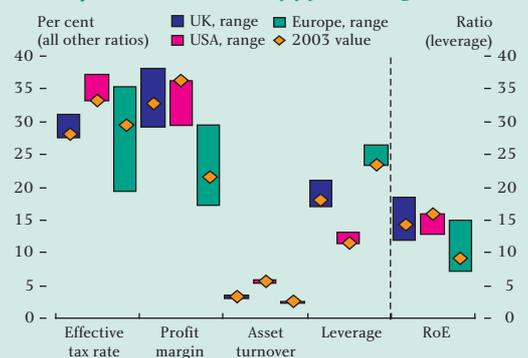
Chart A:
Aggregate banking sector RoE and real GDP growth rates^(a)



Sources: Federal Deposit Insurance Corporation, BvD Bankscope, Thomson Financial Datstream, Published accounts and Bank calculations.

(a) Dotted lines represent GDP growth, solid lines RoE.

Chart B:
Decomposition of RoE, 1997 to 2003^{(a)(b)}

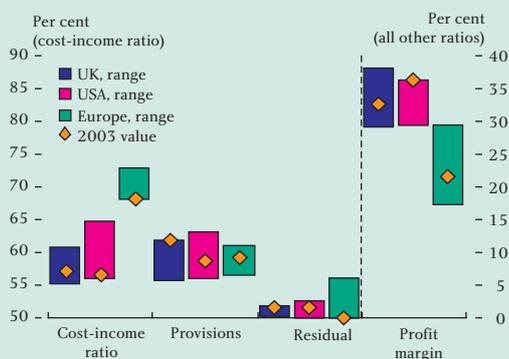


Sources: Federal Deposit Insurance Corporation, BvD Bankscope, Thomson Financial Datstream, Published accounts and Bank calculations.

(a) Effective tax rate = 1 - retention ratio.

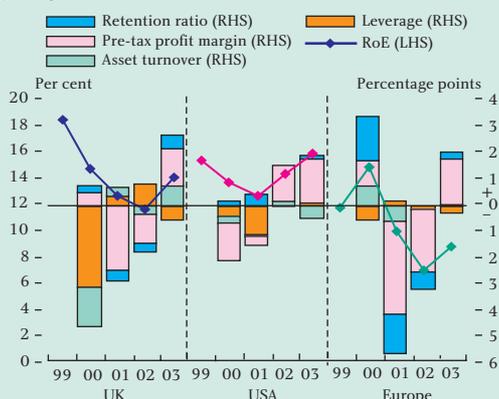
(b) Bars represent the min-max range of ratio values from 1997 to 2003.

Chart C:
Decomposition of profit margin, 1997 to 2003^(a)



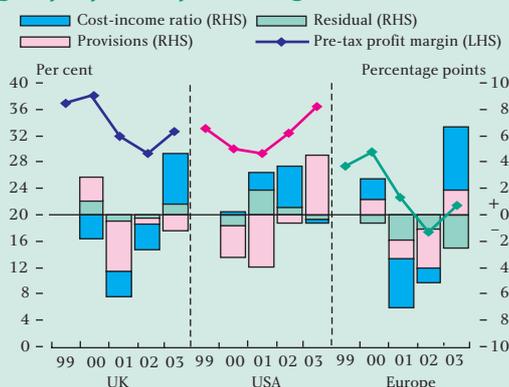
Sources: Federal Deposit Insurance Corporation, BvD Bankscope, Published accounts and Bank calculations.
 (a) Bars represent the min-max range of ratio values from 1997 to 2003.

Chart D:
Contributions to changes in banking groups' RoE^(a)



Sources: Federal Deposit Insurance Corporation, BvD Bankscope, Published accounts and Bank calculations.
 (a) Individual contributions obtained using a linear approximation. Approximation error is negligible in each year.

Chart E:
Contributions to changes in banking groups' pre-tax profit margin



Sources: Federal Deposit Insurance Corporation, BvD Bankscope, Published accounts and Bank calculations.

In the initial stages of a slowdown, banks' revenue growth is likely to slow, thus raising cost-income and provision ratios and, as a result, adversely affecting RoE. As a slowdown continues, provisions tend to increase, adding further pressure on banks' profitability. Banks' management may seek one-off gains from non-operating activities to smooth RoE. Finally, if a slowdown results in negative RoE, banks' capital is dented and balance-sheet leverage rises. However, the performance of European, US and UK major banks differed markedly during the economic slowdowns between 1999 and 2003 in their respective regions.

UK banks' RoE fell in 2000, mainly because balance-sheet leverage decreased, while the profit margin was increasing (Chart D). This suggests that UK banks may have been building up buffers in advance of the slowdown. Profitability actually fell in 2001 as the profit margin was hit by a decline in cost efficiency and higher provisions (Chart E). In the subsequent year, profitability decreased further as cost efficiency continued to decline, before RoE and profit margins improved in 2003.

US banks' RoE also fell in 2000 (Chart D), mainly because of a decline in credit quality, reflected in higher provisions (Chart E). However, cost efficiency was maintained. In 2001, RoE was cushioned from a further deterioration in credit quality by an improvement in cost efficiency. In addition, a rise in the residual ratio helped to smooth the decline in RoE. Profitability improved in 2002 and 2003.

European banks' RoE began to fall in 2001, driven mainly by a decline in the profit margin (Chart D) as credit quality, cost efficiency and residual income all deteriorated (Chart E). In the subsequent year, RoE decreased further as the profit margin fell again, largely because of a sharp rise in provisions, before recovering in 2003.

In conclusion, during the slowdown, all three regions major banks' aggregate provisions rose relative to revenues, as expected. However, US banks improved their cost-income ratio, leaving them the only group with a higher RoE in 2003 than in 2000. UK banks may have acted pre-emptively by decreasing balance-sheet leverage but, in contrast to US banks, their cost efficiency deteriorated during the slowdown. European banks were both slower to react and less able to maintain cost efficiency, and thus suffered a larger decline in profitability during the slowdown.

1.5 Japan

Direct links between the UK banking system and Japan are relatively limited.³² At end-December 2003, claims on Japan, around half of which are on the public sector, accounted for 3% of UK-owned banks' foreign claims (Box 2), little changed since the previous *Review*. But Japan remains important for UK financial stability via the involvement of global financial firms in its financial markets. For example, at end-December 2003, over-the-counter (OTC) derivatives contracts involving the yen accounted³³ for 22.5% of all foreign exchange OTC contracts and for almost 14% of all single currency interest rate contracts.

Japan's economy has shown further signs of improvement since the previous *Review*. Real GDP grew by 2.5% in 2003 and 5.6% year-on-year in 2004 Q1 (Chart 52), and deflationary pressures have eased. Consensus forecasts for real GDP growth in 2004 have been revised up sharply and the recovery is expected to continue next year, albeit at a slower pace.

Japan's non-financial sectors

The public sector

In March, S&P upgraded the outlook for Japan's local and foreign currency sovereign credit ratings from negative to neutral, on the basis that corporate restructuring and changing price expectations are raising Japan's growth prospects. However, Japan's fiscal deficit remains very high, at around 8% of GDP, and the government's debt-to-GDP ratio is high and rising. The IMF forecast that Japan's gross debt will reach 176% of GDP by the end of 2005, and its net debt 92% of GDP.

The household sector

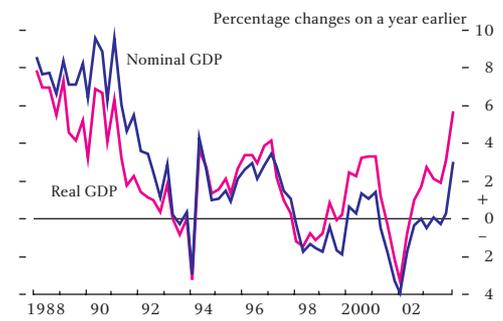
There are growing signs that the macroeconomic recovery is feeding through to the household sector. The unemployment rate has fallen, employment has expanded and consumer confidence has increased substantially. Personal bankruptcies have also fallen, suggesting a decline in household sector credit risk since the previous *Review* (Chart 53).

The private non-financial corporate (PNFC) sector

The number of business failures and the value of their gross liabilities have both fallen since the December *Review*, which – consistent with the narrowing of corporate bond spreads – suggests a further reduction in credit risk (Chart 54).

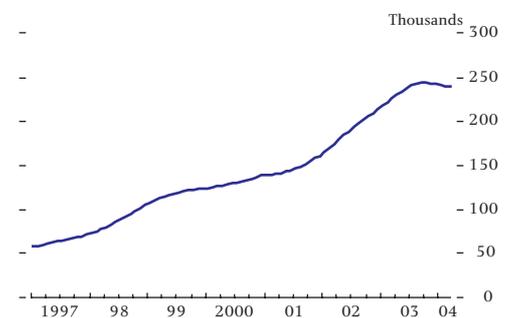
The economic recovery helped companies to deliver increased sales and strong profits growth in the year to March 2004. Revenues of non-financial listed companies rose by over 2% and

Chart 52:
Real and nominal GDP growth



Source: Thomson Financial Datastream.

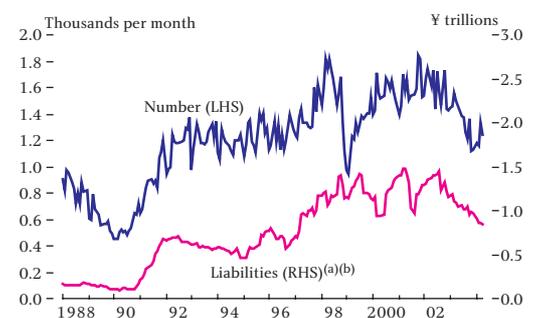
Chart 53:
Personal bankruptcies^(a)



Source: Japanese Supreme Court.

(a) Twelve-month total.

Chart 54:
Business failures



Sources: Bloomberg and Thomson Financial Datastream.

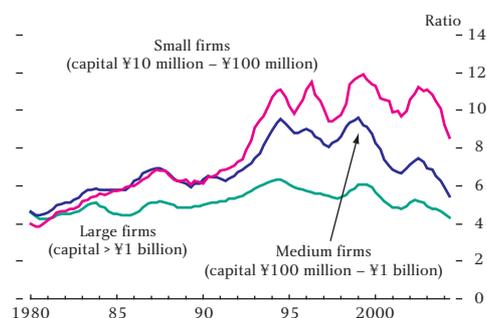
(a) Excluding debt of collapsed life insurers.

(b) Twelve-month moving average.

³²: See Box 4 of December 2003 Bank of England *Financial Stability Review* for a more detailed description.

³³: In terms of notional amounts outstanding.

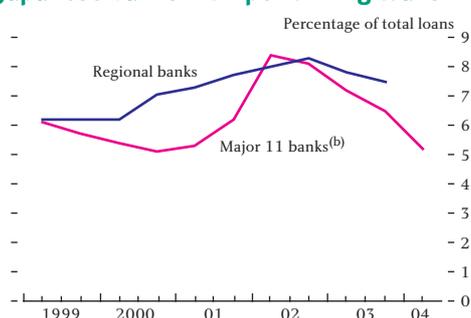
Chart 55:
Ratio of corporate debt to operating cashflow^(a)



Sources: Ministry of Finance corporate survey and Bank calculations.

(a) Four-quarter moving average of gross debt divided by four-quarter sum of operating profits plus depreciation.

Chart 56:
Japanese banks' non-performing loans^(a)

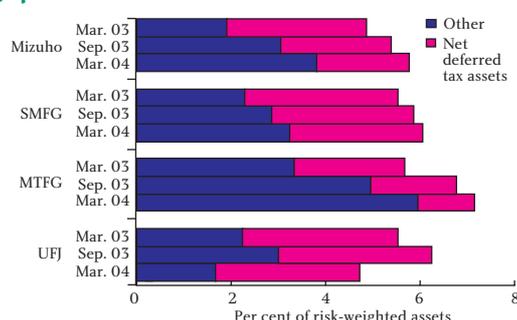


Sources: Japanese Financial Services Agency and Bank calculations.

(a) Financial Reconstruction Law basis.

(b) Constituent banks of major banking groups plus Resona Bank, Sumitomo Trust and Chuo Mitsui Trust.

Chart 57:
Composition of Tier 1 capital of major Japanese banks^(a)



Sources: Published accounts and Bank calculations.

(a) Consolidated.

recurring profits³⁴ increased by 24%, slightly faster than expected; the firms expect recurring profits to rise by a further 14% in the year to March 2005. These factors have been reflected in the rise in equity prices.

Preliminary flow-of-funds data indicate that the PNFC sector recorded another large financial surplus in 2003 and continued to reduce debt, repaying bank and other loans while issuing commercial paper. The ratio of debt to operating cash flow fell particularly sharply amongst small firms, but remained much higher than its average during the 1980s (Chart 55). The drop in debt-to-income ratios, combined with continued low nominal interest rates, meant that income gearing fell at firms of all sizes.

Japan's banking system

The improvement in corporate profits and decline in business failures over the past year, together with disposals of existing non-performing loans (NPLs), have led to further falls in reported NPLs at most major banks, which in aggregate were 5.2% of total loans at end-March 2004, not far off the Japanese Financial Services Agency (JFSA)'s target of below 4% by end-March 2005 (Chart 56).

The JFSA's latest round of special inspections of major banks' loans to large troubled borrowers revealed a further narrowing of the gap between the major banks' own assessments and those of the JFSA. The inspections resulted in ¥0.4 trillion in additional credit costs, most of which were accounted for by UFJ, compared with ¥0.9 trillion in the previous round of special inspections. The official NPL numbers are now fairly close to private sector estimates.

In aggregate, the major Japanese banking groups³⁵ reported a return to profitability in the year to end-March, recording a net profit of ¥0.3 trillion, a sharp improvement from the net loss of ¥8.2 trillion the previous year. The improvement was largely accounted for by lower valuation losses on equity holdings,³⁶ together with lower loan loss charges. Core operating profits³⁷ fell slightly, as a decline in net interest income and bond-trading profits was only partly offset by strong fee income growth and a further reduction in operating costs.

The published aggregate Tier 1 capital ratio of the four major internationally active banking groups fell marginally from 6% at end-September 2003 to 5.9% at end-March; the sharp decline in UFJ's ratio offset small increases at the other groups (Chart 57).

34: Excludes exceptional items.

35: Mizuho Holdings, SMFG, MTFG, UFJ Holdings, Sumitomo Trust, Resona Holdings and Mitsui Holdings.

36: In the year to end-March 2004, the Topix index increased by almost 50%.

37: Net operating profits before net transfer to general provision for loan loss charges.

The major banks further reduced their reliance on deferred tax assets, which fell from the equivalent of 43% of Tier 1 capital at end-September to 37% at end-March.

The share prices of the major Japanese banks have risen significantly since the previous *Review* and the fall in CDS (Credit Default Swaps) premia noted in the previous *Review* has been sustained, suggesting market perceptions of continued improvements in their financial position (Chart 58). In April, FitchRatings upgraded the individual³⁸ rating of the Bank of Tokyo Mitsubishi to C/D³⁹ and changed the ratings outlook for the SMFG, Mizuho and UFJ groups from negative to stable. The long-term credit ratings of the major banks remain underpinned by expectations of strong government support. For example, all the major banks are rated investment grade by Fitch even though several are rated E⁴⁰ on an individual basis.

The major Japanese banks have made substantial progress restructuring their balance sheets over the past two or three years: they have reduced their exposure to the equity market; reduced their NPL ratios; increased the level of provisions against NPLs and increased their capital ratios. However, the major banks' profitability remains weak, with core operating profits around 0.8% of assets (Chart 59). Net interest margins in their core corporate lending business are narrow and volumes are falling. The major banks have tried, with some success, to offset the decline in their corporate lending by expanding their mortgage and consumer lending business.

1.6 Emerging market economies

UK-owned banks' lending to emerging market economies (EMEs) increased by 10% last year. Although lending to emerging Europe rose by one third, their exposures to EMEs remain concentrated in (non-Japan) Asia.⁴¹ After a period of decline in the wake of the Asian crisis, lending to EMEs by banks in BIS countries⁴² generally has risen strongly since 2002, particularly by western European banks in emerging Europe.

38: Individual ratings assess how a bank would be viewed if it were entirely independent and could not rely on external support.

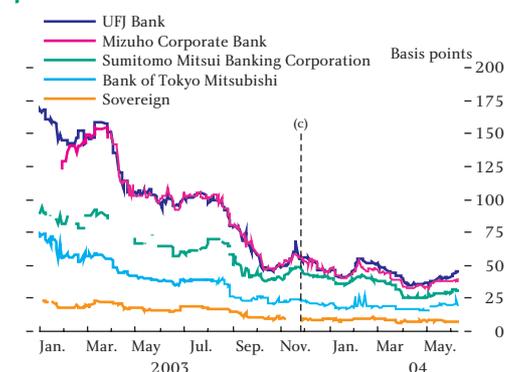
39: A 'C' rating denotes an adequate bank, which, however, possesses one or more troublesome aspects. There may be some concerns regarding its profitability and balance sheet integrity, franchise, management, operating environment or prospects.

40: An 'E' rating denotes a bank with very serious problems, which either requires or is likely to require external support.

41: At the end of 2003, UK banks' claims on non-Japan Asia were \$246 billion (including \$133 billion on Hong Kong alone) compared with \$39 billion on Latin America and \$14 billion on emerging Europe.

42: These include the following developed countries that report banking data to the BIS on a consolidated basis: Australia, Austria, Belgium, Canada, Denmark, France, Germany, Ireland, Italy, Japan, Netherlands, Portugal, Spain, Sweden, Switzerland, UK and USA.

Chart 58:
Japanese bank and sovereign CDS premia^{(a)(b)}



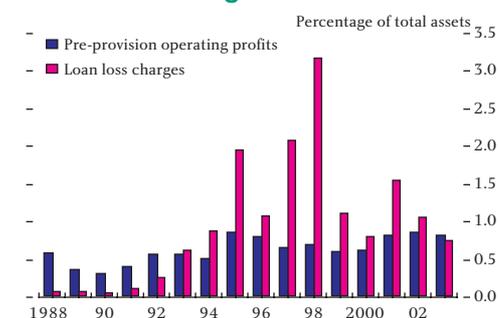
Source: Mark-it Partners.

(a) Daily closing prices of five-year senior CDS contracts.

(b) Gaps represent days for which there are no data.

(c) Dec. 2003 *Review*.

Chart 59:
Major Japanese banks' operating profits and loan-loss charges^{(a)(b)}

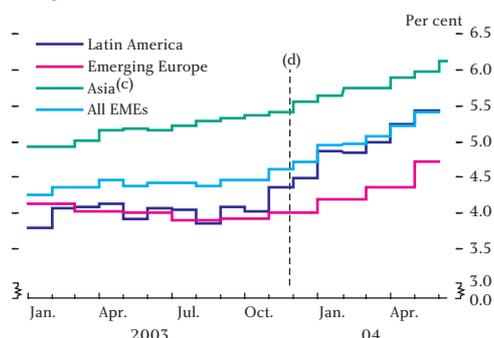


Sources: Bank of Japan, published accounts and Bank calculations.

(a) Unconsolidated.

(b) Financial years, to end-March of the following calendar year.

Chart 60:
Regional consensus GDP forecasts for 2004^{(a)(b)}



Source: Consensus Economics Inc.

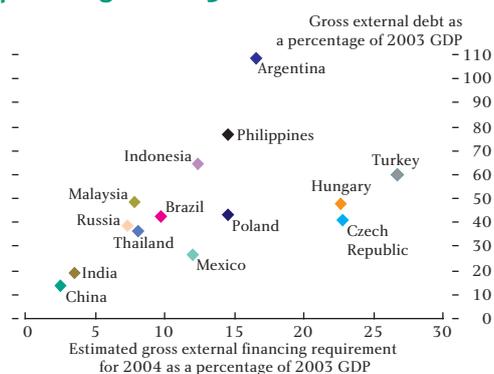
(a) A simple arithmetic average of monthly 2004 GDP forecasts. Bi-monthly forecasts for emerging Europe.

(b) Latin America comprises: Argentina, Brazil, Chile, Mexico, Uruguay and Venezuela. Emerging Europe comprises: Czech Republic, Hungary, Poland, Russia and Turkey. Asia comprises: China, Hong Kong, India, Indonesia, the Philippines and South Korea.

(c) Asia includes India from Apr. 2003, as 2004 estimates were not available until then. Includes data up to 18 Jun. 2004.

(d) Dec. 2003 Review.

Chart 61:
Gross external financing requirements^(a) and external debt in selected EMEs as a percentage of 2003 GDP



Sources: IMF and Institute of International Finance 2004 forecasts.

(a) Defined as forecasted 2004 short-term debt, plus amortisation, plus current account deficit. The dates of the forecasts for EMEs vary, as each is derived from data listed in that country's most recently available Institute of International Finance report.

EME debt management

Buoyed by a strong recovery in world trade and low world interest rates, output is growing briskly in many EMEs, and private sector forecasters have revised upwards their growth projections for 2004 as a whole (Chart 60). In its latest forecasts, the IMF expects that output will grow robustly this year in all emerging-market regions – Latin America 4%, central and eastern Europe 4½% and Asia 7½%. Also, as discussed in the *December Review*, some heavily indebted borrowers, such as Brazil and Turkey, took the opportunity of low world interest rates and compressed EME spreads last year to lengthen maturities and reduce the share of debt linked to short-term interest rates or the exchange rate. This continued early this year.

Consequently, there have again been significantly more sovereign credit rating upgrades than downgrades during the past six months, with the average EME credit rating having risen to BB, compared with BB- two years ago (and B in 1994).⁴⁵

Nonetheless, as discussed further in Chapter 2, since April, as expectations of a rise in US interest rates have intensified, EME spreads have increased sharply. A tightening in US monetary policy might result in a further widening in spreads, adversely affecting EME debt dynamics, and possibly resulting in a reversal of financial inflows.

A sharp reduction of inflows would increase liquidity risk in EMEs, especially for countries with large external financial requirements due either to debt servicing and/or current account imbalances (Chart 61). However, the immediate impact is likely to be cushioned, since EME governments had already financed two thirds of their estimated external financing needs for 2004 in the first five months of the year (Table 2). Moreover, since the Asian crisis, many EMEs have built up significant foreign exchange reserves.⁴⁴ In fact, some Asian economies seem to have more than adequately insured themselves against liquidity risk. But reserve cover of short-term external debt seems to be lower in some emerging European countries and in the Philippines, as well as in recent crisis countries in Latin America (Chart 62).

Current account positions are likely to deteriorate in EMEs that rely heavily on imported oil if prices remain at recent elevated levels. These countries tend to be concentrated in Asia and emerging Europe (aside from Russia). Although most countries in Asia have current account surpluses, a number in emerging Europe have large deficits and so start in a more exposed

43: IMF estimates based on the weighted average credit rating of countries in JP Morgan's EMBI global index. The weights are based on the value of bonds in each country and the credit ratings used are from Moody's and Standard and Poor's.

44: The Financial Stability Forum Working Group on Capital Flows report (2000) stressed the importance of foreign exchange cover for short-term debt. A rule of thumb suggested in the aftermath of the Asian crisis was that foreign currency reserves should be at least equal to short-term external debt. See 'Economic crises: evidence and insights from Asia' (1998) by J Furman and J Stiglitz, Brookings Paper on Economic Activity: 2.

position. These are not countries to which UK banks have large direct exposures, although exposures of BIS banks as a whole to emerging Europe were \$395 billion at end-2003 (one-fifth of their total exposures to EMEs).

A rise in interest rates will also have a negative impact on the external debt dynamics of EMEs with high levels of (floating-rate) external debt. This is likely to affect the same countries that are vulnerable to liquidity risk (Chart 61).⁴⁵ However, since almost two thirds of EME (long-term) external debt is denominated in US dollars, an important consideration in assessing this risk is the strength of currencies against the US dollar. For countries with high levels of US dollar denominated or linked debt, such as Brazil, depreciation (appreciation) against the US dollar would accentuate (attenuate) the impact of a tightening in US monetary policy on the value of debt.⁴⁶ Since the December 2003 Review, a number of EME currencies have depreciated against the US dollar, including the Brazilian *real* (Chart 63). Bilateral financial and trade relationships between the United Kingdom and Brazil are modest so the *direct* links to the UK financial system are small. But the *indirect* links could be more significant; BIS banks' exposures to Brazil were \$108 billion at end-2003 – more than to any EME aside from Mexico.⁴⁷

Any general increase in world interest rates could also have an indirect impact in tightening domestic monetary conditions in EMEs, particularly where exchange rates are not freely floating. This could be a concern, as public sector debt has risen in a number of EMEs in recent years, and a number of countries with high domestic government debt have a large share at floating interest rates – almost half of domestic public debt in Brazil is at floating rates and around 40% in Turkey, Mexico, Hungary and the Philippines. But private sector (non-bank) indebtedness to banks is relatively low in Latin America and emerging Europe. In east Asia, in contrast, it is at a higher level than in developed countries (Chart 64).

China and Hong Kong

If domestic interest rates remain low in emerging market economies, there is a risk in some countries that continued very rapid credit growth will be followed by a sharp reversal.⁴⁸ In particular, in China, a very strong expansion in bank credit has fuelled a rapid growth in domestic investment. Much of this

45: An increase in interest payments on external debt would also directly worsen a country's current account balance and thus increase its financing requirement.

46: 70% of Brazil's external debt and 15% of its domestic government debt are linked to the US dollar.

47: This excludes offshore centres such as Hong Kong and Singapore.

48: There is substantial evidence that financial crises have been associated with a previous rapid build-up in government or private sector debt. See, for example, Bell and Pain (2000) 'Leading indicator models of banking crises – a critical review', Bank of England *Financial Stability Review*, December.

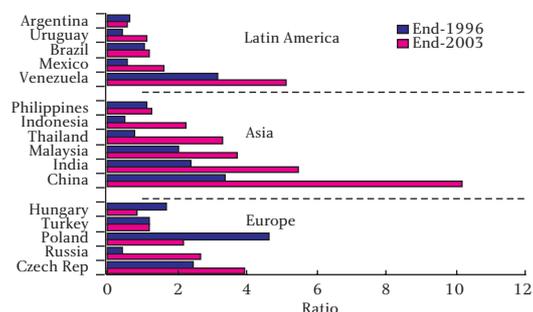
Table 2:
Debt issuance in selected EMEs
(US\$ billions)

	2005 Actual	04		Percentage of forecast
		Forecast annual requirement ^(a)	Actual as of end-May	
Brazil	4.5	4.0	3.0	75
Hungary	2.2	3.7	2.2	58
Mexico	7.4	3.5	2.9	83
Poland	4.3	6.2	3.1	50
Turkey	5.3	6.0	2.8	46
Asia	6.1	5.1	4.3	85
Emerging Europe	15.6	21.3	11.7	55
Latin America	20.9	14.4	11.5	80
Middle East and Africa	3.7	4.1	3.0	74
Total of regions	46.3	44.9	30.5	68

Sources: Dealogic and JP Morgan Chase & Co.

(a) End-February forecast.

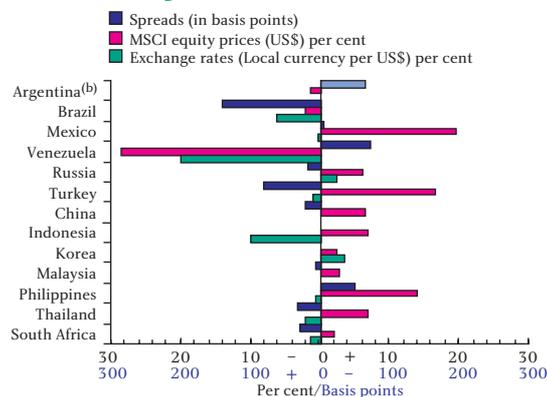
Chart 62:
Ratio of EME reserves to short-term debt^(a)



Sources: Bank for International Settlements, IMF and OECD.

(a) Short-term debt comprises bank lending, bond finance and trade credit with less than one year residual maturity. Reserves are measured in gross terms.

Chart 63:
**EME asset price change since
December 2003 Review^(a)**

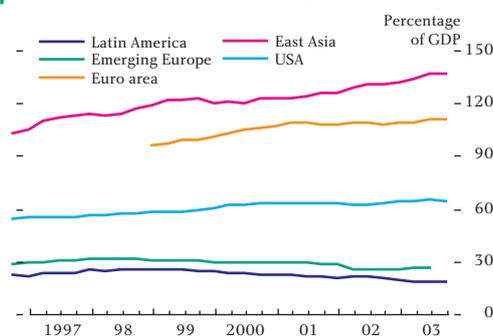


Sources: JP Morgan Chase & Co and Bloomberg.

(a) Bars to the left of the axis denote rises in spreads, falls in equity prices and depreciation of the exchange rate.

(b) The change in total return from JP Morgan Index levels, rather than spread, is plotted for Argentina.

Chart 64:
Resident banking institutions' claims on private sector relative to GDP^{(a)(b)}

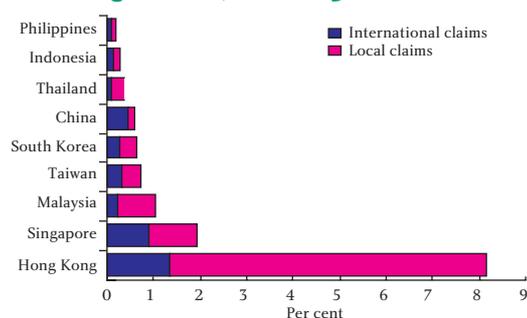


Sources: IMF and Bank calculations.

(a) Latin America comprises: Argentina, Brazil and Mexico. East Asia comprises: China, Hong Kong and South Korea. Emerging Europe comprises: Czech Republic, Hungary, Poland, Russia and Turkey.

(b) Simple arithmetic averages of individual country data.

Chart 65:
UK banks' consolidated international and local claims^(a) on EMEs as a percentage of total foreign claims, end-2003



Source: Bank for International Settlements.

(a) International claims: cross-border claims plus claims locally in foreign currency. Local claims: claims locally in local currency.

credit is directed from state-owned banks to state-owned enterprises. There are also now incipient signs of inflationary pressure adding to the policy challenge of delivering high but sustainable growth: there remains a risk of a sharp slowdown and a deterioration of banks' already fragile balance sheets.⁴⁹ Since China is only just beginning to liberalise its capital account, the direct financial links to the United Kingdom are still small at the moment. But the indirect impact of a downturn in China could be important, especially if the Hong Kong economy were significantly affected – UK banks have larger exposures to Hong Kong resident borrowers than to borrowers in any other single jurisdiction aside from the United States (Chart 65).

For the time being, however, the Hong Kong economy has continued to recover strongly, boosted by closer links with China. GDP grew by 6.8% in the year to 2004 Q1, and consensus forecasts are for GDP growth of around 6% for 2004 as a whole. The improving economic backdrop and the prospects provided by increasing links with the mainland economy have helped revive property prices, which have increased by almost 40% since their trough in mid-2003. The recovery of property valuations has benefited the banking sector in particular, which, at end-March 2004, held almost 60% of its assets in the form of property lending, either on residential mortgages (35%) or for the construction and commercial property sector (22%). The mortgage delinquency rate fell to 0.7% in 2004 Q1, down from 1.1% a year earlier, and negative equity fell to HK\$13 billion, from HK\$23 billion at end-2003. More generally, credit conditions have improved: the credit card delinquency rate fell to 0.8% by March 2004, from 1.3% a year earlier, and the rate of non-performing loans eased to 2.9%, from a peak of 7.6% in 1999 Q4. Reported bank capital ratios remained strong, at 16.2% at end-2004 Q1.

In May, Fitch IBCA upgraded Hong Kong's foreign currency and long-term local currency debt outlook to stable from negative. However, Hong Kong's recovery is vulnerable to both external and internal developments. On the external side, while benefiting from close links with China, Hong Kong is exposed to risks from a hard landing there. Also, Hong Kong's recent recovery has been underpinned by low domestic interest rates, necessary to relieve pressure from the currency peg in a low global interest rate environment. This could be reversed in the event of a sharp rise in global interest rates, but the impact on Hong Kong would be tempered if, as expected, such a policy tightening was in the context of stronger-than-expected global output growth. In terms of domestic vulnerabilities, Hong Kong's goal of a balanced

49: Non-performing loans of the banking system were estimated by the China Banking Regulatory Commission at \$290 billion (21% of GDP) at end-2003. Since then, however, two of the largest state-owned banks – Bank of China and China Construction Bank – have written off significant amounts of loans after each received \$22.5 billion from the government's foreign exchange reserves for recapitalisation.

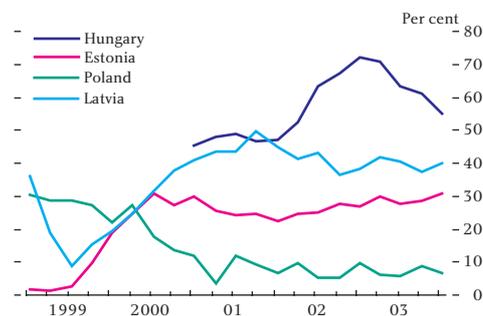
budget by 2008/2009 is challenging, given a current budget deficit of around 5% of GDP.

Notwithstanding these risks, banks in Hong Kong, including UK-owned ones, have in the recent past proved robust despite a volatile economic environment – for example, they remained profitable in the aftermath of the Asian crisis, despite property prices falling by 67% from a peak in 1997 to a trough in mid-2003. The resilience of the Hong Kong banking system in the face of potential shocks was reaffirmed in a recent IMF FSAP.⁵⁰

Other countries

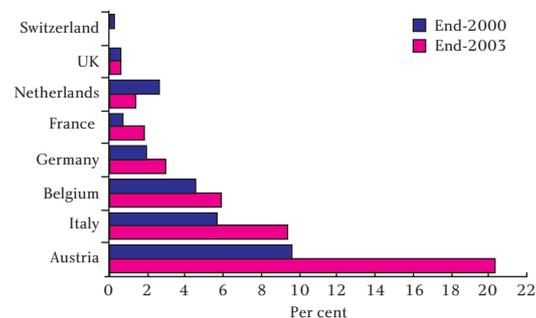
Elsewhere, in a number of new EU countries, credit to households has recently grown very rapidly (Chart 66), reflecting the recent development of domestic mortgage and consumer credit markets.⁵¹ This has, in part, been due to the increase in exposures of many western European banks, mainly through local operations (Chart 67). However, the recent rapid growth and then crisis last year in the Korean consumer credit market – resulting in a government rescue of the largest credit card company, LG Card – are a reminder that cautious risk assessments need to be maintained when markets are expanding rapidly.

Chart 66:
Annual growth in credit to households in selected new EU countries



Sources: National central banks.

Chart 67:
Selected European BIS-reporting banks' consolidated foreign claims on new EU countries^(a), as a percentage of total foreign claims



Source: Bank for International Settlements.

(a) Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia and Slovenia.

50: IMF Financial System Stability Assessment for Hong Kong, SAR (June, 2003).

51: See 'Early birds, late risers and sleeping beauties: bank credit growth to the private sector in central and eastern Europe and the Balkans' (2003), by C Cottarelli, G Dell' Ariccia and I Vladkova-Hollar, IMF Working Paper no. 213.

2 Risks in the international financial system

As the near-term outlook for credit risks from households and non-financial firms is broadly reassuring, current assessments of threats to financial stability focus to a greater extent on the market, liquidity and other risks arising within the international financial system. UK banks have large exposures, on- and off-balance sheet, to a number of the foreign financial firms active in global markets. And those markets now play a significant part in major banks' risk management strategies. This chapter considers some of the challenges in the current market environment and the implications for major market participants.

2.1 International financial markets

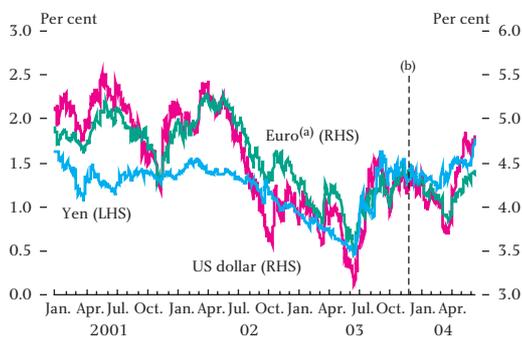
The market environment

Asset markets have been dominated by fluctuating views on the macroeconomic outlook, particularly in the United States. After edging down until late March, US government bond yields have since risen sharply (Chart 68), principally reflecting upward revisions to the expected path of official interest rates. Initially, this was accompanied by an appreciation of the US dollar; a rise in some credit spreads; and modest falls in equity markets. For the most part, the adjustment has been orderly, especially in the most liquid markets. But conditions were briefly more difficult in some emerging market economy (EME) bond and equity markets.

The other significant market development has been the fluctuations in industrial commodity prices, reflecting global demand pressures and supply uncertainties as well as more speculative investment (Chart 69). Spot and five-year forward oil prices are higher than for many years, and options imply a sharp increase in the perceived probability of prices rising to over \$50 per barrel.

This has added to uncertainty in bond markets, which are focused on the US FOMC's (Federal Open Market Committee) so-called 'exit strategy' (from very low towards more neutral official interest rates). Given that, and the prospective recovery in Japan, the key issue facing risk managers has been how financial intermediaries should manage their own exit strategies from a variety of 'carry trades' – borrowing short-term in currencies bearing low interest rates to invest in higher-yielding assets – which have been one widespread manifestation of the 'search for yield' highlighted in the June 2003 *Review* and, more prominently, in the December 2003 *Review*.

Chart 68:
Ten-year nominal government bond yields

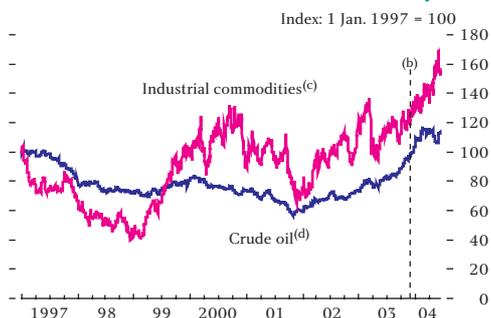


Source: Bloomberg.

(a) German government bonds.

(b) Dec. 2003 *Review*.

Chart 69:
Industrial commodities and crude oil price^(a)



Sources: The Economist, International Petroleum Exchange, Bloomberg and Bank calculations.

(a) Converted into special drawing rights (SDR).

(b) Dec. 2003 *Review*.

(c) The Economist industrial commodities index is a US dollar-denominated basket of seven metals created in 1995.

(d) Brent crude oil front month future.

The 'search for yield'

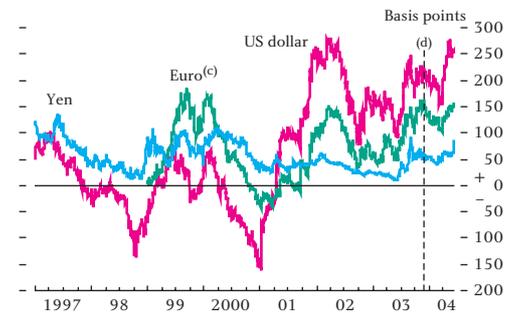
In addition to a protracted period of low official interest rates and steep yield curves in most developed economies (Chart 70), the background to the search for yield has included weak corporate sector demand for credit; apparently revised expectations of equity returns and risk, bringing some further diversification away from equities; and, possibly, recent high returns from a number of other asset classes attracting significant portfolio allocations to them.

Most types of financial institution have been involved – many no doubt disciplined by effective risk management. Taken as a whole, commercial banks in the United States, Europe and Japan acquired large bond portfolios against a background of stable or growing deposits but weak corporate loan demand (Chart 71). Amongst others, investment banks seem to have been taking greater proprietary trading risk. Insurance companies in various countries are reported to have moved down the credit spectrum to maintain nominal returns, sometimes via structured credit products in order to comply with portfolio limits expressed in terms of rating agency ratings. Flows into hedge funds have increased rapidly. And the issuance of structured notes⁵² – through which investors expect to receive enhanced returns by taking extra risk via writing embedded options – has remained robust, especially in Europe and Asia.

For some long-term savings institutions, revised asset allocations might reflect more integrated asset-liability management and/or a greater emphasis on diversification, both of which could be positive for financial system stability. For some – those partly matching fixed income-like liabilities with low-yielding bonds – there has been an accompanying focus on generating excess risk-adjusted returns (widely referred to in financial markets as 'alpha') relative to benchmarks. In practical terms, this seems to involve asset managers, and defined-benefit pension funds in particular, allocating away from mature-economy equities towards a wide range of 'alternative investments', including hedge funds, EME assets, private equity, real estate and commodities. Some of these asset classes happened to yield unusually high returns during 2003 and into 2004.

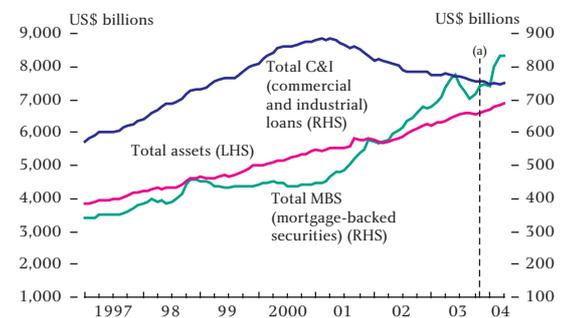
Commentators have for some time aired questions about the sustainability and longer-run implications of the 'search for yield'. In terms of the stability of the financial system as a whole, problems could in principle manifest themselves in two broad ways. One would be a gradual over-accumulation of debt based on mis-pricing of credit risk, potentially threatening credit problems at some point in the future. This poses the question of how the current conjuncture compares with the early-to-mid

Chart 70:
Spread between five-year^(a) and three-month^(b) interest rates



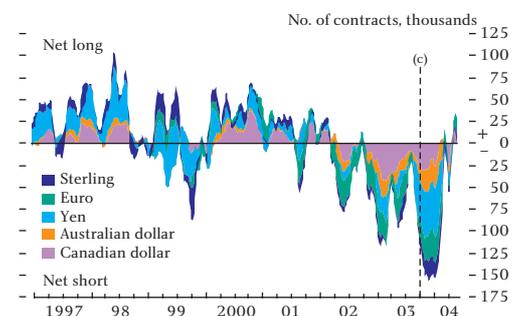
Sources: Bloomberg and Bank calculations.
(a) Five-year government bond yields.
(b) Three-month LIBOR rate.
(c) German government bonds.
(d) Dec. 2003 Review.

Chart 71:
Asset holdings of US banks



Source: Board of Governors of Federal Reserve System.
(a) Dec. 2003 Review.

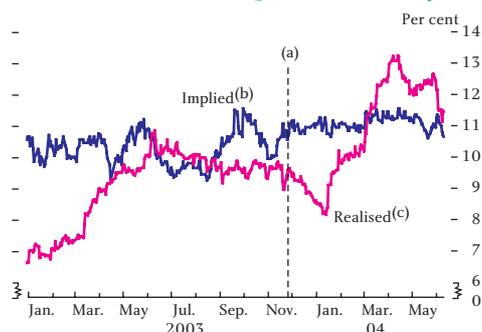
Chart 72:
Cumulative speculative positions^(a) in the US dollar^(b)



Sources: Commodity Futures Trading Commission and Bank calculations.
(a) Positions unrelated to commercial hedging activities.
(b) Using a four-week moving average of net positions (ie number of long contracts minus number of short contracts).
(c) Dec. 2003 Review.

52:Rule, D., Garratt, A., and Rummel, O., (2004) 'Structured note market: products, participants and links to wholesale derivatives markets', Bank of England *Financial Stability Review*, June.

Chart 73:
US dollar-euro exchange rate volatility



Sources: Thomson Financial Datastream, Reuters and Bank calculations.

(a) Dec. 2003 *Review*.

(b) Calculated from three-month option prices.

(c) Calculated as standard deviation of daily returns over a sixty three-day rolling window (individual observations equally weighted).

Table 3:
US capital flows

US\$ billions	2001	2002	2003
Direct investment:			
Inward	152	40	82
Outward	-120	-138	-155
Net	32	-98	-73
Portfolio investment by private sector:			
Inward	399	388	379
Outward	-85	16	-64
Net	315	404	314
Foreign official sector's assets in the US^(a)	5	95	208
Net foreign liabilities of US banks^(b)	-17	70	70
All other flows, net	81	58	60
Total flows, net	416	528	579
Statistical discrepancy plus net capital transfers	-22	-47	-37
Current account balance (deficit)	-394	-481	-542

Source: Bureau of Economic Analysis.

(a) Includes lending to US-resident banks.

(b) Other than transactions with foreign official institutions.

1990s, when, for example, EME borrowers and some large US and European companies were able to borrow excessively. The other, and perhaps more current, issue has been whether there could be an abrupt asset price correction, possibly with more general spillovers. In particular, it is unclear whether there might be further substantial adjustments to portfolios as and when official interest rates rise and, if so, how smooth they might be. In part that will depend on the extent of leverage in the system and on the particular circumstances in individual markets.

Market adjustment

Foreign exchange markets

Since the December 2003 *Review*, there have been exceptionally large fluctuations in speculative positions against the US dollar (Chart 72). Some have been associated with carry trade positions, where the other side principally comprised long positions in Australian and Canadian dollars, the euro and sterling.⁵³ Others – notably US dollar/yen positions – have been driven by views about official exchange rate policy. In consequence, realised exchange rate volatility increased this year (Chart 73). This has led some contacts to comment that the widely increased use of electronic trading platforms may have created a misleading impression of the depth of liquidity that could be assured in stressed conditions.

In the course of resisting appreciation against the US dollar, the Japanese, Chinese and other Asian authorities have accumulated large dollar bond portfolios. In 2004 Q1, the associated flows remained a material element in the financing of the US current account deficit which, as previous *Reviews* have discussed, requires the United States to attract a disproportionate share of world saving (Table 3). For some, whose intervention has been sterilised via borrowing at very low domestic-currency interest rates, the resulting positions have some of the characteristics of a carry trade – but with a different motivation and probably subject to a different holding period for assessing financial risks and returns. The longer-term policies and investment management strategies of these authorities will be relevant to developments not only in currency markets but also in bond markets.

Interest rate markets

The months leading up to the December 2003 *Review* were characterised by episodes of extreme volatility in interest rate markets, even though policy rates in the three major economic areas remained unchanged. As the Bank underlined, 'market participants will need to manage the risk of future yield curve movements, whether triggered by macroeconomic developments or as and when policy changes – or expectations of them – materialise'.⁵⁴

53: See the Box 'Carry trades in the foreign exchange market', in 'Markets and operations', 2003 Bank of England *Quarterly Bulletin*, Winter.

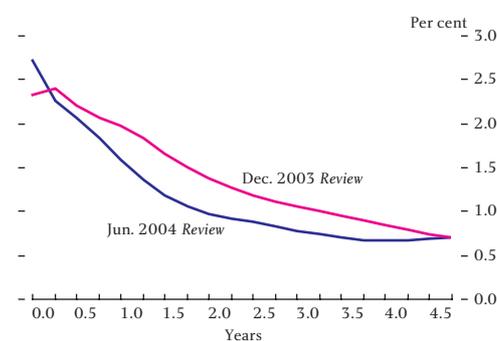
54: See Section 1.1, 'International financial markets' (2003) Bank of England *Financial Stability Review*, December.

There are suggestions that recent market movements have resulted in some unwinding of US dollar yield curve carry trades by hedge funds and other short-term traders. But short-term nominal interest rates remain low and yield curves remain fairly steep (Chart 74), which may encourage some intermediaries to retain carry positions. For example, yen-financed positions may persist given that a policy tightening is not perceived as imminent. Separately, amongst the commercial banks, bond portfolios tend to be held in the Treasury areas and so, while they might well be marked to market for internal control purposes, they can be accounted for on an 'available for sale' basis.⁵⁵ This means that fluctuations in value affect accounting measures of capital but not reported earnings. Instead, as official rates rise, the accompanying rise in financing costs tends gradually to reduce accounting measures of earnings. Similarly, in some jurisdictions unrealised losses on bond portfolios held outside the 'trading book' do not affect measures of regulatory capital. In consequence, it is possible that there may be less immediate pressure on banks to sell, or otherwise hedge duration exposure, in response to rising yields. Public filings suggest that, up to end-March, banks varied in the extent to which they had reduced this exposure.

In contrast to the episode in July-August 2003, the recent US yield curve shift was not exacerbated by mortgage-backed securities (MBS) convexity hedging or accompanied by associated strains on liquidity. Various possible explanations of this may be relevant looking ahead. First, it seems that convexity hedging on quite the scale of summer 2003 may be less likely because, with US mortgage rates having remained well above mid-2003 levels, the options households have to pre-pay their mortgages may generally be some way out of the money. Second, the US housing market agencies (Fannie Mae and Freddie Mac) seem to have adjusted their balance sheets and risk management in various ways. They have reduced their mortgage portfolios, both relative to the size of the market and absolutely (Chart 75); and published data suggest that they are maintaining smaller gaps between the duration of their assets and that of their liabilities (Chart 76). Taken together, these apparent changes might reduce *ex post* dynamic hedging flows, and so make it less likely that convexity hedging would materially amplify any large movements in US yields in the period ahead. If so, that would tend to reduce some of the potential hazards from the financial sector's adjustment to a higher interest rate environment.

However, it seems unlikely that the hedges are perfect. They may, for example, be affected by basis risk (ie incomplete correlation) between the pre-payment options embedded in MBS and the

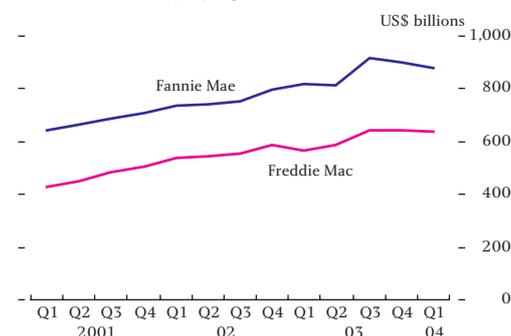
Chart 74:
Forward spread curve^(a)



Source: Bank calculations.

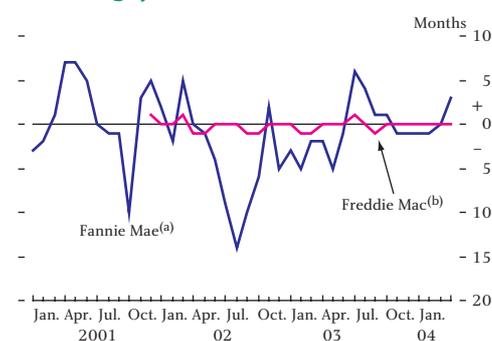
(a) The spread between five-year and three-month forward rates derived from the Bank's government liability curves.

Chart 75:
Retained mortgage portfolio of US GSEs



Source: Company accounts.

Chart 76:
Duration gaps of US GSEs



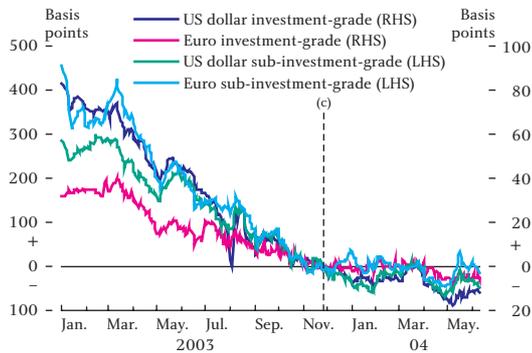
Source: Company accounts.

(a) Fannie Mae data are weighted averages for the month. Prior to 2003, the duration gap was calculated on the last day of the month.

(b) Freddie Mac data are monthly averages, rounded to the next month.

55: The distinction between 'trading' and 'available for sale' instruments is set out in the US accounting standard FAS 155 and the international standard IAS 39.

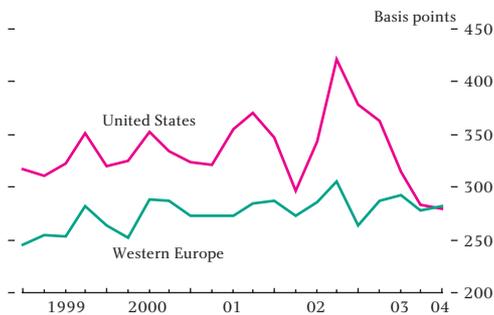
Chart 77:
Cumulative changes in corporate bond spreads^{(a)(b)}



Sources: Merrill Lynch Global Index System and Bank calculations.

- (a) Spread over swaps.
- (b) Change indexed to 26 Nov. 2003 = 0.
- (c) Dec. 2003 *Review*.

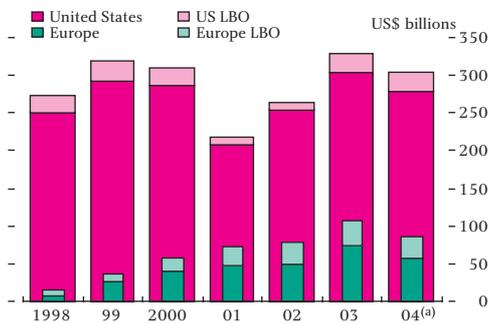
Chart 78:
Spreads on leveraged loans^(a)



Source: Loan Pricing Corporation.

- (a) Spread over LIBOR.

Chart 79:
Leveraged loan issuance



Sources: Loan Pricing Corporation and Bank calculations.

- (a) 2004 data are annualised based on 2004 Q1 data.

options in callable bonds and swaptions, as well as by any basis risk arising from fluctuations in the agencies' own credit spreads.

Basis risk may also be a feature of strategies adopted by parts of the European long-term savings industry to hedge interest rate risk arising from their having guaranteed minimum nominal returns on savings or annuity products. Insurance companies from some countries – reportedly the United Kingdom and Denmark – have over recent years employed long-maturity swaptions⁵⁶ as hedges. If, however, basis risk meant that these transactions were not eligible for hedge accounting under the new international accounting standard IAS 39,⁵⁷ volatility of accounting earnings would result. It is unclear whether companies (and their shareholders) will focus on the economics of hedges, or on the potentially volatile contribution to reported earnings. If firms choose to negotiate more precise, bespoke hedges, dealer counterparts may carry *de facto* exotic options for which there are not especially liquid markets. Perhaps more important, though, is the extent to which the large life insurance industries in other countries have hedged similar liabilities and whether or not in future a combination of accounting regimes and an equity-investor focus on headline returns might affect incentives to hedge.

Credit markets

With large corporations on both sides of the Atlantic focused on balance-sheet adjustment for much of the past year or so, demand for new funding – whether via bond issuance or bank lending – has been low (see Chapter 1). At the same time, partly because of improved credit fundamentals, demand for credit exposure – from banks, hedge funds and others – has increased. This may have resulted in an 'imbalance' of supply and demand, manifested in credit spreads continuing to narrow during the early months of 2004 (Chart 77).

Reflecting similar forces, in the primary loan market, syndicated loan maturities have lengthened somewhat and there has been some weakening of terms and conditions. This is said to have been particularly marked in the leveraged loan market, described as 'hot' by a number of bankers in recent months. Spreads have narrowed sharply in the United States (Chart 78). Amongst other things, the market is used to finance intermediate 'slices' of the capital structure for leveraged buy-outs (LBOs) and recapitalisations of troubled firms. The terms are often driven by private equity fund managers, who have taken advantage of market conditions to refinance existing deals on better terms. The LBO market grew steadily in Europe through the recent economic slowdown and has picked up again in the United States

56: See Box 1 'Swaptions', June 2002 Bank of England *Financial Stability Review*, page 24.

57: For more details of the requirements of IAS 39, including accounting for hedges, see Michael, I., (2004), pages 118–128 in this *Review*.

in the past year or so (Chart 79). High demand has allowed arrangers to place more aggressive deal structures, for example, with higher ratios of debt to free cash flows;⁵⁸ higher debt-to-equity ratios; weaker loan covenants; and second-lien loans.

Similarly, high yield bond issuance was, until recently, very active. For some months, deals were frequently heavily oversubscribed, including issues by corporates from EMEs such as Russia, Brazil and Taiwan.

In the structured credit markets⁵⁹, the compression of corporate bond spreads over the past year or so spurred innovation to extract return for investors via new structures, some involving high leverage. These have included collateralised debt obligations (CDOs) of asset-backed securities (ABS) – often commercial mortgage-backed securities (CMBS) and collateralised mortgage obligations (CMOs); and so-called ‘CDO-squared’, synthetic CDOs of mezzanine tranches of bespoke synthetic CDOs created by dealers for this purpose (Chart 80). Other structures have sought to exploit an upward-sloping spread term structure by packaging tranches of CDOs in a way that enables them to be sold to money market investors, who typically buy only short-term instruments; some may have been searching for yield given low nominal returns on more traditional money market instruments. This may, for example, take the form of issuance of commercial paper by a conduit that holds the underlying CDOs. A bank or insurance company typically guarantees the refinancing risks by providing a committed credit line. Alternatively, it may comprise issuance of ‘auction-rate’ securities – a longer-dated instrument on which the yield is re-priced periodically at auctions managed by the dealer, and where the dealer may need to manage the risk of having to take securities onto its own balance sheet in the event of a ‘failed’ auction.

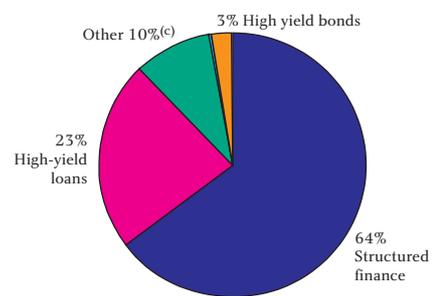
Towards the end of the period, as government bond yields rose, some of the developments identified here began reverse. Credit spreads tended to widen, and some high yield bond issues were postponed, although apparently investment banks providing bridging loans to issuers were not seriously affected.

On the whole, the adjustment has been orderly so far. But it was especially sharp in some EME bond and equity markets (Chart 81), with selling apparently concentrated at times in relatively liquid sovereign bonds (eg larger Russian and Brazilian issues). Perhaps reflecting that, in some EMEs there seems to have been selling not only by local investors but also by

58: Typically expressed as debt/EBITDA (earnings before interest, taxes, depreciation and amortisation).

59: For an overview of the structured credit market, see Rule, D., (2001), ‘Risk transfer between bank, insurance companies and capital markets: an overview’ Bank of England *Financial Stability Review*, December, page 137.

Chart 80:
Funded issuance by collateral^{(a)(b)}



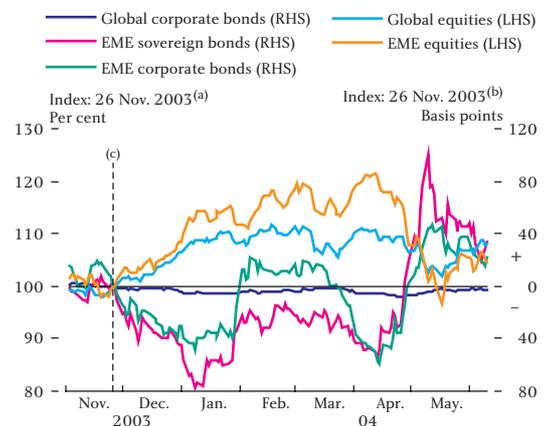
Sources: JP Morgan Chase & Co and Bank calculations.

(a) Funded issuance includes all cash issuance and the funded portion of synthetic issuance for fully distributed (ie excluding single-tranche) CDOs.

(b) Data for 2004 Q1.

(c) Other includes deals backed by private equity, hedge funds and trust preferred securities.

Chart 81:
Changes in EME asset prices against a global peer group



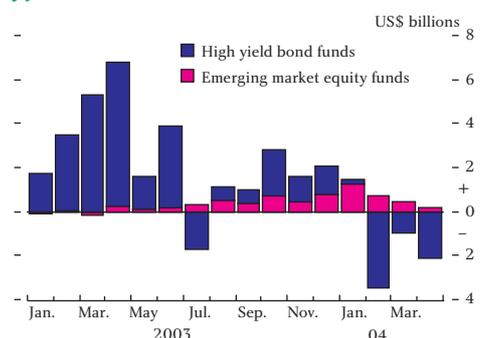
Sources: Morgan Stanley Capital International, Merrill Lynch Global Index System and Bank calculations.

(a) Equity index calculated as a percentage change.

(b) Bond index calculated as a cumulative basis point change.

(c) Dec. 2003 Review.

Chart 82:
Monthly net asset flows^(a) into selected types of US mutual funds



Source: Investment Companies Institute.

(a) Net new cash flow including net exchanges.

Table 4:
Hedge fund performance by strategy^(a)

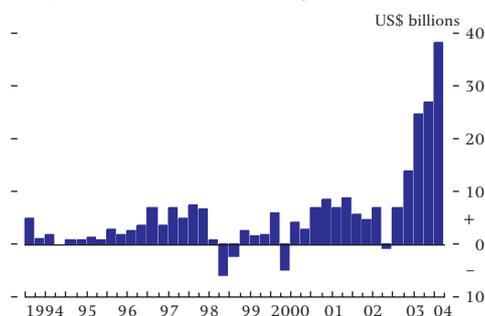
Strategy	Current April 2004	Average since previous Review	Average since 1994 ^(b)
Aggregate index	-0.58	0.95	0.90
Convertible arbitrage	0.46	0.66	0.84
Dedicated short bias	4.23	-0.74	-0.13
Distressed	0.66	1.26	1.08
Emerging markets	-3.31	1.20	0.70
Equity market neutral	-0.34	0.42	0.83
Event driven	0.51	1.11	0.92
Fixed income arbitrage	1.34	0.75	0.56
Global macro	0.14	1.12	1.19
Long/short equity	-1.40	0.99	1.00
Managed futures	-6.46	1.21	0.62

Sources: CSFB/Tremont and Bank calculations.

(a) Percentage monthly returns, calculated as the change in net asset value (NAV).

(b) The CSFB/Tremont index began in 1994.

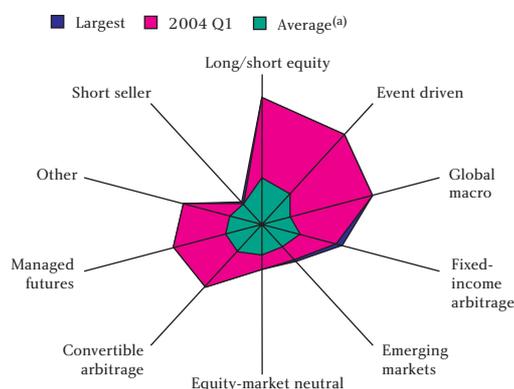
Chart 83:
Hedge funds: inflows of capital^(a)



Source: TASS Research.

(a) Figures are based on the TASS hedge fund database, which currently contains 2,802 live and 1,967 dead funds. The total number of live funds is estimated to be around 5,000.

Chart 84:
Quarterly flows into hedge funds by investment strategy



Sources: TASS Research and Bank calculations.

(a) Mean of net inflows since 1994 Q1.

long-term savings institutions. The volatility in EME markets underlined earlier questions about whether spreads had become compressed beyond the point warranted by economic fundamentals, as suggested by some recent research, including by the Bank.⁶⁰

The reconfiguration of asset prices is echoed in the pattern of flows into US mutual funds. There have, for example, been net outflows from high yield bond funds, and flows into EME equity funds have fallen away sharply from recent peaks (Chart 82).

2.2 Hedge funds and leverage

Similarly, amongst hedge funds, many investment strategies fared badly recently, notably 'emerging markets' and 'managed futures' (Table 4). But casualties appear to be limited and of no significance to the overall system.

What may be more significant in future is the record scale of capital flows into funds during 2003 and into 2004 (Chart 83), spread over most of the main strategy types (Chart 84). The number of hedge funds is also widely reported to have increased sharply; and issuance of structured notes linked to fund performance has grown.

This has prompted questions about whether returns on capital might be lower in future on account of greater fund activity making financial markets more efficient or the average quality of fund managers eventually being eroded. If investor expectations were to prove unrealistic, there could be some risk of sizeable withdrawals. Whether that, in turn, required hedge funds to try to liquidate positions quickly would depend on investor lock-in periods and degrees of leverage.

Most contacts suggest that leverage is a more important part of the business model of fixed income funds and, perhaps, macro funds than of, say, long short equity funds. These strategies also occasionally entail 'crowded trades' to the extent that funds, and bank/dealer proprietary trading desks, use similar ideas or models to identify what may be, at any particular time, a relatively narrow range of 'relative value' trading opportunities. For credit-oriented funds, such as 'distressed', a combination of leverage, relatively illiquid products and a model-based approach to valuation and trading may, in the event of material asset price shifts, exacerbate stressed conditions.

60: See Ferrucci, G., Herzberg, V., Soussa, F., and Taylor, A., 2004, in this *Review*. IMF analysis (IMF Global Financial Stability Report (2004)) suggests that the increase in global liquidity caused by the easing in US monetary policy has been an important factor, while research at the (McGuire and Schrijvers (2003), BIS Quarterly Review) points to the role played by an increase in investor risk appetite.

Box 4: Hedge fund industry leverage

Market instability has in the past sometimes resulted from a combination of high leverage with crowded trades in markets that proved materially less liquid than usual when under strain. There are no directly observable measures of either leverage or crowded trades. In the case of hedge funds, this is compounded by the many different forms that leverage can take:

- Investors (indirectly via funds of hedge funds or directly in hedge funds) may be leveraged, borrowing for example from private banks.
- Funds of hedge funds may be leveraged.
- Hedge funds may be leveraged.
- And hedge funds may have 'economic' leverage – via derivatives or via assets that themselves embody leverage – as well as familiar financial leverage via borrowing money.

Funds of hedge funds have become an important channel for long-term institutions wishing to allocate part of their portfolios to hedge funds. They invest in

a number of individual hedge funds with the aim of diversifying risk across different managers and strategy types. Although they vary considerably, taken as a whole they are said increasingly to use leverage, typically by borrowing from investment banks against collateral in the form of their claims on the underlying hedge funds.

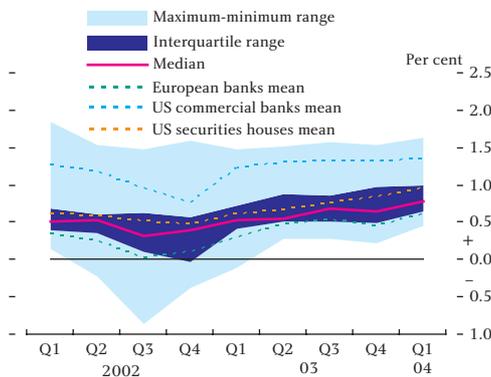
In times of stress, hedge funds enjoy a degree of protection against having to make fire sales in the face of withdrawals if investors are subject to lock-in periods. Perhaps reflecting a need to meet 'portfolio balance' criteria, funds of hedge funds are reported to be unwilling to accept lock-ins. If well-established hedge funds either do not accept, or impose aggregate limits on, investments by funds of funds, short lock-in periods may be a form of adverse selection, applying to newer funds or those with poorer track records. Conceivably, weak performance might in stressed market conditions trigger large-scale withdrawals. The consequent liquidation of positions by the underlying hedge funds to meet such calls could exacerbate the market stresses, potentially with broader spillovers for markets more generally.

Compared with 1998, contacts typically suggest that there is now greater risk of stress from many funds tending occasionally to be similarly positioned ('herding') than from a single large fund failure. Perhaps particularly in Europe, many start-up funds are believed to be concentrated in fixed income, currency and commodity markets. Established fixed income funds have grown rapidly in an environment of falling yields and steep yield curves. And, compared with even a year ago, funds appear to be more involved in credit markets, including leveraged loans, distressed debt, and credit arbitrage.

Nevertheless, market intelligence suggests that, overall, hedge fund leverage has not increased markedly, and continues to be moderate compared with 1997-98 – although that may not be a sensible benchmark. But it is difficult to gauge underlying risks given the variety of ways in which the industry can be leveraged, including apparently increased use of leverage amongst funds of hedge funds (Box 4). This underlines the importance of the risk management role played by the prime brokerage operations of investment banks (see the next section).

Chart 85:

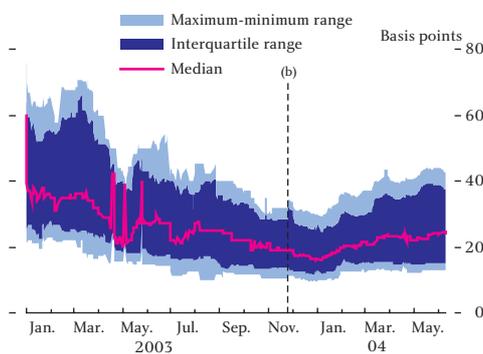
Return on assets for non-UK LCFIs^(a)



Sources: Earnings releases and Bank calculations.
(a) Net income divided by average assets, annualised.

Chart 86:

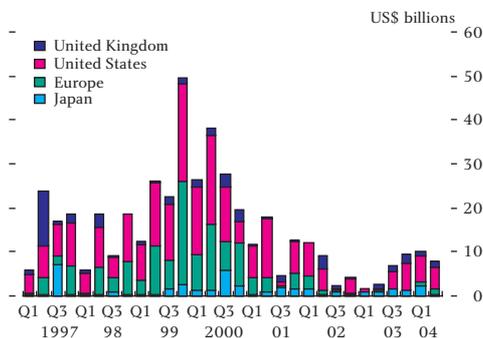
CDS premia for LCFIs^(a)



Sources: CreditTrade, JP Morgan Chase & Co., Mark-it Partners and Bank calculations.
(a) Annual premia for credit protection on issuers using ISDA documentation, measured as mid-point between last bid and ask quotes.
(b) Dec. 2003 *Review*.

Chart 87:

IPO activity in industrial countries^(a)



Sources: Thomson SDC and Bank calculations.
(a) 2004 Q2 data to 10 Jun. 2004.

2.3 Major financial institutions

Large complex financial institutions

Large complex financial institutions (LCFIs)⁶¹ have again generally reported strong profits (Chart 85). While credit default swap premia on LCFIs edged up as part of the recent asset market adjustments, they generally remain low (Chart 86).

Revenues have been uneven across business lines. Net interest income has tended to fall as a proportion of total operating income. Underwriting of fixed income securities – particularly high yield bonds and leveraged loans – has remained important, although it is uncertain whether this will persist in an environment of rising interest rates. Meanwhile, there has not yet been a broad-based pickup in IPO (Initial Public Offering) or M&A activity (Chart 87). Dealers continue to compete intensely for equity block trades, often bidding at little or no margin below the secondary market price. As the December *Review* noted, there is some risk of unusual losses from this source.

According to published financial statements, trading was an important source of revenue in 2003, and fixed income trading continued to generate strong – in a few cases, record – revenues into 2004 Q1. A number of LCFIs seem to have increased proprietary trading activity. Perhaps as a consequence, published trading book values-at-risk (VaRs)⁶² continued to rise strongly in 2004 Q1 – by as much as 25% quarter-on-quarter in some cases (Chart 88). Since implied volatilities remained low on several asset classes, underlying risk positions may have increased by more. But, with robust earnings, capital has on average generally increased by at least as much as VaR.

In fact, relative to the substantial capital resources of most LCFIs, VaR-based measures of market risk are modest. But there are two caveats. First, VaR numbers are not comprehensive measures of risk: they provide no information on the nature of potential losses beyond the reported 99% confidence threshold; and they assume that relatively recent correlations between asset prices will persist, which might not be the case if markets were to become illiquid or disorderly – for example, if significant dealers were to withdraw from them. LCFIs seek to address these issues via stress tests or scenario analysis. Second, another relevant metric might be VaR relative to average quarterly earnings (Chart 89). Bearing in mind various episodes over the past few years, significant hits to earnings may conceivably threaten the confidence – including via

61: The December 2001 Bank of England *Financial Stability Review* (page 81) described the criteria used to determine an LCFI peer group. It comprises: ABN Amro, Bank of America, Barclays, BNP Paribas, Citigroup, Credit Suisse, Deutsche Bank, Goldman Sachs, HSBC, JP Morgan Chase & Co., Lehman Brothers, Merrill Lynch, Morgan Stanley, Societe Generale and UBS.

62: VaR is an aggregate measure of downside risk, defined as the maximum loss over a target horizon such that there is a low, pre-specified probability that the actual loss will be larger. See Jorion, P., 2002. Bank of England *Financial Stability Review*, December.

rating agency ratings – necessary to sustain complex and/or large operations in wholesale financial markets, especially when they entail counterparty credit exposures.

The derivative markets that generate those exposures have continued to grow strongly in terms of notional amounts outstanding. Gross market values fell to \$7 trillion at end-2003, largely because of a revaluation of interest-rate derivatives. But actual credit exposures – gross market values adjusted for netting agreements and collateral arrangements – increased to \$2 trillion (Chart 90).

Typically, counterparty exposures amongst LCFIs and other financial firms are collateralised⁶³ beyond an unsecured threshold set according to counterparty creditworthiness.⁶⁴ A recent study by ISDA⁶⁵ found that, for the largest dealers, collateral typically reduces interdealer counterparty exposures to less than 10% of the original exposure. On average, taking account of netting and collateral, a major dealer's five largest interdealer exposures accounted for only about 2% of the dealer's entire derivatives-related credit exposure at market value. These findings offer some reassurance about the various measures taken to mitigate counterparty credit risks amongst LCFIs. Wider use of CSAs with active non-dealer counterparties would be welcome.

Effective credit risk management has also been aided by the significant growth, since the December Review, in turnover and liquidity in credit indices, and by the somewhat increased activity in single-name credit default swaps at maturities shorter and longer than five years. Banks and investment managers are increasingly using the indices, their sub-indices and tranches of the indices to gain or lay off credit exposure. Dealers are also using the index tranches to hedge correlation risks where they are delta-hedging bespoke CDOs.

LCFIs do, nonetheless, face a number of challenges. First and most obviously, LCFIs face the transition, described above, to a higher global interest rate environment. As well as some rotation of business lines, this will require continued careful management of interest rate, foreign exchange and commodity market risk.

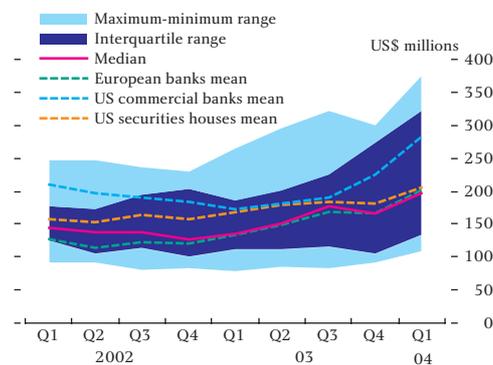
Second, the rapid growth of hedge funds and their importance in markets have led to strong competition among major banks and securities houses for *prime brokerage* mandates (Box 5). Given the vital role prime brokers play in monitoring funds and setting the terms on leverage, it is important that risk managers (and

63: Under an International Swaps and Derivatives Association (ISDA) Master Agreement, including a credit support annex (CSA).

64: A CSA may incorporate a 'ratings trigger', ie a provision to reduce the threshold, possibly by demanding more collateral, if a counterparty suffers a ratings downgrade.

65: Counterparty Credit Exposure among Major Derivatives Dealers, March 2004, ISDA, www.isda.org.

Chart 88:
Value-at-risk for non-UK LCFIs^{(a)(b)}

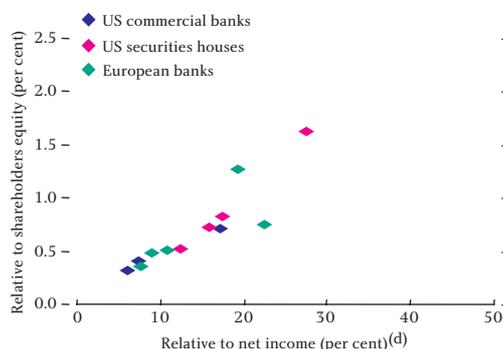


Sources: Earnings releases and Bank calculations.

(a) Value-at-risk adjusted to a ten-day holding period and 99% confidence interval.

(b) For non-UK LCFIs reporting quarterly value-at-risk.

Chart 89:
Value-at-risk for non-UK LCFIs^{(a)(b)(c)}



Sources: Earnings releases and Bank calculations.

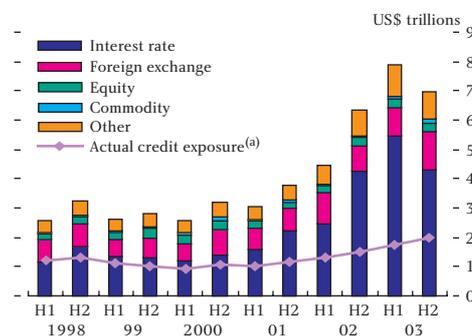
(a) Value-at-risk adjusted to a ten-day holding period and 99% confidence interval.

(b) For non-UK LCFIs reporting quarterly value-at-risk.

(c) Using 2004 Q1 value-at-risk data.

(d) The average net income over the previous four quarters.

Chart 90:
Gross market values of over-the-counter derivatives by broad risk category

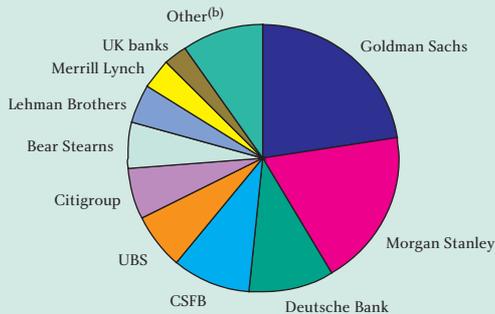


Source: Bank for International Settlements.

(a) Actual credit exposure is the gross market value after taking into account legally enforceable bilateral netting agreements and other collateral arrangements.

Box 5: Prime brokerage

Chart A:
Prime brokerage mandates for new European hedge funds in 2003^(a)



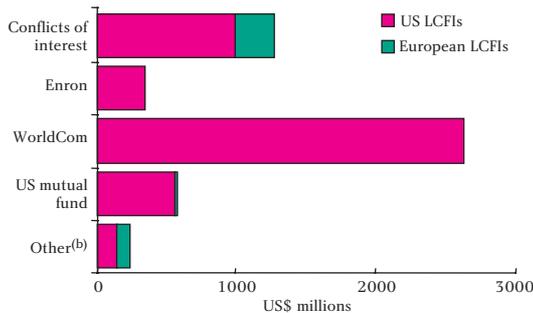
Source: EuroHedge and Bank calculations.

(a) Totals for sole and shared mandates won.

(b) Represents eleven financial institutions winning fewer than ten mandates each.

Prime brokerage encompasses a bundle of services: extension of credit (partially secured), securities lending, leveraged trade executions, cash management, clearing and settlement and, not least, technology platforms (including innovative trading products and sophisticated margining arrangements) and capital introductions (ie introducing potential investors to hedge fund managers). In the United States, the business is mostly equity related and a few securities houses have an established franchise and reputation. In Europe, where the business developed later, there is more of a balance between equity and fixed income (Chart A), and there is perhaps more scope for competition between banks.

Chart 91:
Cost of regulatory investigations and litigation against LCFIs^(a)



Sources: Regulatory filings and press releases.

(a) For the period 2002 present.

(b) 'Other' includes minor settlements.

regulators) keep track of whether standards are maintained. This might include considering whether the picture of a fund's liquidity and risk becomes fragmented if it has a number of prime brokers.

Third, substantial provisions made by some banks have underlined *potential litigation* costs as a source of risk. The likelihood of class action lawsuits has been increased by regulatory fines which have been levied, most recently, for alleged improprieties in the US mutual fund industry. Such lawsuits tend to be more costly than the fines, illustrated by the recent settlement over WorldCom-related litigation by one LCFI (Chart 91). Investigations into Parmalat continue (Chapter 1), and in May the US Senate Banking Committee asked the SEC to investigate mutual fund firms affiliated with investment banks in connection with alleged conflicts of interest with underwriting clients.

In response to various regulatory initiatives, LCFIs have been putting in place procedures designed to prevent conflicts of interest and to avoid transactions that could be characterised as entailing accounting improprieties.⁶⁶ That may bring important gains to transparency by helping to reduce complexity. Care may be needed to guard against regulatory initiatives also impairing innovation in designing cost-effective hedges for complex economic risks.

66: Draft Statement Concerning Complex Structured Finance Activities, Federal Reserve, FDIC, OCC, OTS and the SEC, May 2004.

Other internationally active banks

Most other internationally active banks – a much wider group than the LCFIs – have also reported improved and generally strong profitability. A major contributory factor has been diminished concerns over corporate credit risk (discussed in Chapter 1), apparent in reduced levels of loan-loss provisioning, notably in Japan and Germany. That, against an improved macroeconomic outlook, is reflected in credit default swap premia having generally remained low (Chart 92).

It is probably also part of the background to the apparent increase in banks' appetite for credit risk. Although the US lead-arranger league tables have continued to be dominated by a handful of the largest US banks, the share of European banks in new syndicated lending has increased markedly this year (Chart 93). Market intelligence suggests that Japanese banks are also returning to the syndicated loan markets, but this is not as yet apparent from the aggregate numbers.

2.4 UK-owned banks and international capital markets

Most of the issues discussed above are, to a greater or lesser extent, relevant to the large UK-owned banks given their participation in global capital markets – as lenders, traders and underwriters. Risks to the UK banking system work through three main channels: direct credit exposures to foreign borrowers; links to financial institutions via lending and counterparty credit exposures; and exposures to market risk.

International credit exposures

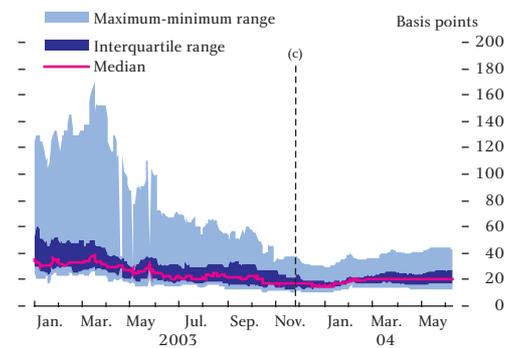
As noted in Chapter 1, foreign claims represent around 40% of large UK-owned banks' total on-balance-sheet exposures. This is up from around 32% five years ago, reflecting acquisitions and growth of local overseas operations. Such claims fell by around 4% in sterling terms in the six months to December 2003. This was attributable in part to sterling's appreciation during that period; in US dollar terms, foreign claims rose by 4%.

In aggregate, the largest foreign exposure to any region is to developed Europe. The largest exposure to an individual country is to the United States. On-balance-sheet exposures to Japan have shrunk in recent years to only around 3% of UK banks' foreign claims, partly reflecting a reduction in exposures to the London branches of Japanese banks.

International banking system links

Around 20% of UK banks' foreign on-balance-sheet claims are cross-border exposures to foreign banking sectors, notably those of Germany, Switzerland and the United States. But current data sources do not provide a comprehensive map of the exposures of

Chart 92:
CDS premia for internationally active banks, excluding LCFIs^{(a)(b)}



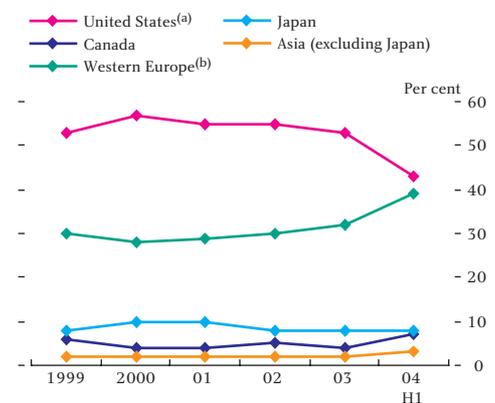
Sources: CreditTrade, JP Morgan Chase & Co., Mark-it Partners and Bank calculations.

(a) Annual premia for credit protection on issuers using ISDA documentation, measured as mid-point between last bid and ask quotes of five-year senior debt CDS contracts.

(b) Japanese banks excluded.

(c) Dec. 2003 Review.

Chart 93:
Share of new issues in the syndicated loan market, by country of domicile

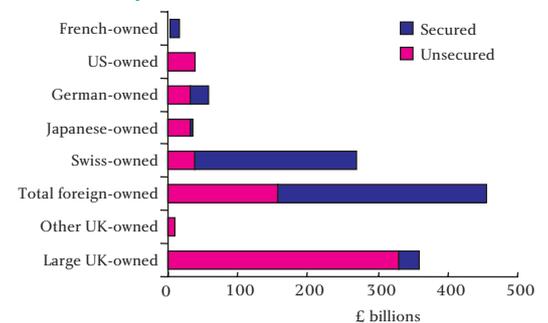


Source: Loan Pricing Corporation.

(a) United States includes regional, money centre and investment banks.

(b) Western Europe includes the United Kingdom.

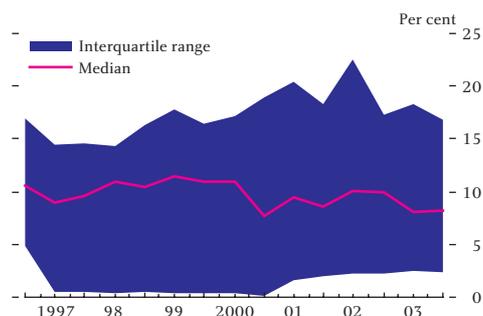
Chart 94:
UK-resident banks' participation in the all-currency interbank lending market, March 2004^(a)



Source: Bank of England.

(a) Lending includes unsecured loans, reverse repo and holdings of CD and CP issued by other UK-resident banks.

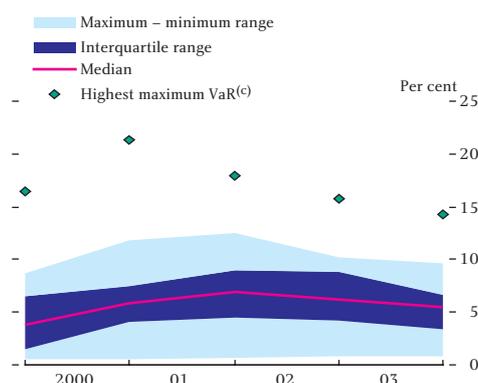
Chart 95:
Large UK-owned banks' trading book assets
relative to total assets^(a)



Sources: FSA regulatory returns and Bank calculations.

(a) Includes data for banking groups' subsidiaries prior to merger or acquisition.

Chart 96:
Large UK-owned banks' trading VaR as a
proportion of average quarterly operating
income^{(a)(b)}



Sources: Published accounts and Bank calculations.

(a) Published Value at Risks have been adjusted to a ten-day holding period and a 99% confidence interval. This assumes independent and normally distributed returns.

(b) Average quarterly income is calculated from annual income. The average quarterly operating income data for Abbey in 2002 and 2003 years were replaced by 2001 data, because of annual losses in the former.

(c) The highest maximum VaR represents the maximum VaR of any individual large UK-owned bank on any day during the year.

banking systems to each other, nor of the global consolidated exposures of individual banks (including large UK-owned banks and LCFIs) to each other. FSA regulatory information does, however, cover 'large exposures' of large UK-owned banks – both on- and off-balance-sheet.⁶⁷ This confirms that, as part of their involvement in global capital markets, large UK-owned banks have large counterparty exposures to LCFIs and other internationally active banks – of the same order of magnitude as their exposures to other individual large UK-owned banks.

Additional information is available, from the Bank's monetary and banking statistics, on the London interbank deposit market, in which foreign-owned banks are significant participants (Chart 94). Although the large UK-owned banking sector has become a *net* borrower in the UK interbank market (see Chapter 3), UK-owned banks still have large gross interbank exposures to foreign-owned institutions. UK banks also have counterparty exposures through their activities in OTC derivative markets, in which foreign-owned LCFIs are large participants. But, due to the use of netting agreements and collateral arrangements, these exposures are significantly smaller than gross exposures in the unsecured interbank deposit market.

Market risk

Market risks typically reside in both the 'trading' or 'banking' books, a distinction used by banking regulators. Trading book positions are in principle marked to market frequently (although it is sometimes necessary to 'mark to model' in the absence of liquid markets). By contrast, market risk in the banking book is not accounted for on a mark-to-market basis. In practice, when interpreting banks' disclosures it can be unclear whether some financial instruments are located in the trading book or elsewhere. Proposed changes in accounting standards may resolve this, which would be welcome.⁶⁸

Trading book assets of most large UK-owned banks account for around 10% of total assets (Chart 95). As measured by average value-at-risk (VaR), in most cases market risk in these portfolios decreased marginally during 2003 (Chart 96). Trading book VaRs were also relatively small as a percentage of capital and of average quarterly earnings. Interest rate risk makes up around two thirds of large UK-owned banks' VaR. Foreign exchange, equity and credit risk make up the majority of the rest.

Large UK-owned banks may also take market risk in their much larger *banking books* to the extent that they run mismatches between the maturities and interest-rate terms of their deposits and lending. UK-incorporated banks are required to disclose net

67: See the Box on 'Large exposures between banks' December 2003 Bank of England *Financial Stability Review*, page 77.

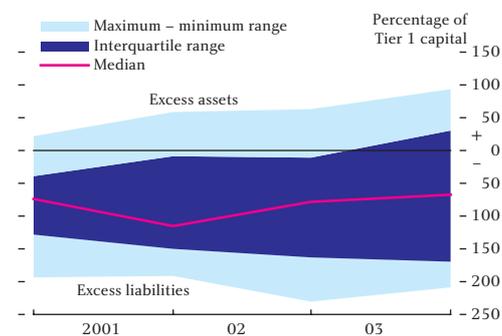
68: See Michael, I., 2004. 'Accounting and financial stability', Bank of England *Financial Stability Review*, June.

liabilities open to re-pricing at different maturities under UK accounting standard FRS13 (Chart 97). But those disclosures are an imperfect indicator of market risk. First, it is not always clear whether interest rate options are incorporated into the measure. Second, FRS13 separates assets and liabilities by contractual maturity, not behavioural maturity. UK fixed-rate mortgages, for example, contain an option to be repaid before the contracted maturity (as discussed in Box 6). And, on the liabilities side of the balance sheet, the behavioural maturity of current account deposits tends to be longer than the contracted maturity, as in normal circumstances most short-term deposits are not withdrawn or repriced regularly. This also underlines the importance of stress tests, as the interest-rate exposure would be different if, for example, deposit outflows were greater than normal.

An alternative approach to measuring market risk in the banking book is to apply a VaR method, similar to that used for the trading book. Not all UK banks disclose such information, or in a way that enables easy comparisons. What data are available suggest that market risk in the banking book might at times be materially greater than in the trading book.

Finally, banks may face market risk through non-bank subsidiaries in ways that are not always captured in traditional market risk disclosures. For some of the large UK-owned banks, the most significant such exposures relate to life insurance subsidiaries (Chart 98). In autumn 2002 and spring 2003, some were affected by declining equity prices, ultimately prompting capital injections by some large UK-owned banks. Since the *December Review*, the net change in UK equity prices has been relatively small and rising bond yields have reduced the discounted value of liabilities.

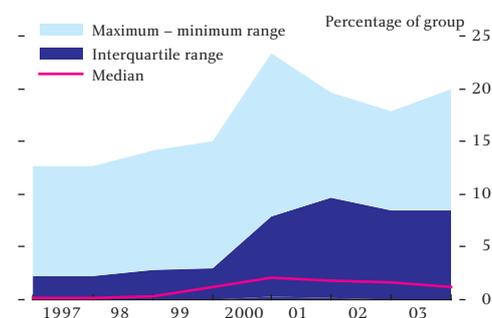
Chart 97:
Large UK-owned banks' interest sensitivity mismatch^(a)



Sources: Published accounts and Bank calculations.

(a) Figures derived using banks' disclosures under FRS13. Excess of assets over liabilities open to re-pricing over next three months, net of off-balance-sheet items.

Chart 98:
Large UK-owned banks' life assurance assets^(a)



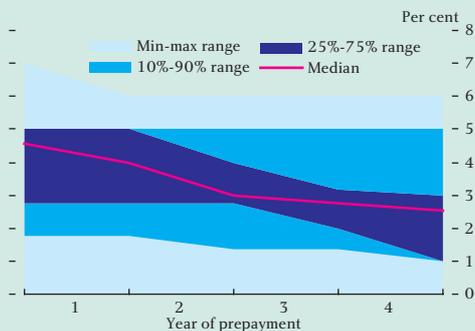
Sources: Published accounts and Bank calculations.

(a) Life assurance assets are those long-term assurance assets attributable to policyholders, as valued in published accounts.

Box 6: UK mortgage prepayment risk

FRS13 disclosures do not fully capture the market risk facing large UK-owned banks from the optionality built into UK fixed-interest mortgages. When interest rates fall, existing UK mortgage holders have the option to remortgage at the lower prevailing interest rate. If banks match the maturity of their liabilities with the maturity of their fixed-rate mortgage assets (and so cannot also lower the interest rate paid on liabilities), prepayment will result in narrower interest rate margins. Banks also incur administration costs when a mortgage holder prepays.

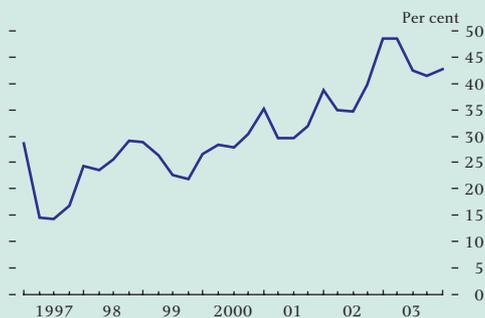
Chart A:
Prepayment penalties of five-year fixed-rate UK mortgages^(a)



Sources: Defaqto and Bank calculations.

(a) Penalty is a percentage of mortgage outstanding.

Chart B:
Remortgaging as a share of total mortgage issuance



Source: Council of Mortgage Lenders.

The embedded prepayment risk in US mortgages, and the way that this is typically hedged by holders of US mortgage-backed securities (MBS), have been discussed in previous *Reviews*.¹ In contrast to US banks, most UK banks manage prepayment risk by charging mortgage holders penalties when they prepay. According to data provided by Defaqto, for five-year mortgages, in the first year, median mortgage prepayment penalties are around 4.5% of the outstanding mortgage, with penalties falling each year to around 2.5% in the final year of the mortgage (Chart A). These penalties appear large enough to offset the adverse effects of prepayment on operating profits, in the context of the interest rate falls that have occurred in the United Kingdom over the past decade. In fact, since the *December Review*, one bank noted in an official trading statement that a reduction in prepayment, and the associated reduction in prepayment penalty income, was one factor reducing its profitability. Furthermore, fixed-interest rate mortgages currently only make up around 25% of the outstanding UK mortgage stock, compared with the vast majority of the mortgage stock in the United States. The term of fixed-interest rate mortgages in the UK is also shorter than in the USA, and that lessens the impact on banks of prepayment.

As interest rates have increased from their lows in mid-2003, the incidence of remortgaging – one proxy for prepayment – has fallen, but it remains relatively high at around 40% of total mortgage lending (Chart B). Continued high levels of remortgaging could be due to a lagged response to past falls in interest rates or to interest rates still being low by recent standards. Mortgage holders whose term of fixed-interest payments have come to an end may also be taking the opportunity to shop around and refix, rather than going to the standard variable rate (SVR). However, it also illustrates that prepayment could be driven by some factors other than interest rates. Increasing house prices, for example, may have prompted remortgaging as a device to facilitate mortgage equity withdrawal.

1: See the Box 'Negative convexity and mortgage prepayment risk', June 2002 Bank of England *Financial Stability Review*, page 72; and the Box 'The dynamics of US dollar interest rate adjustment', December 2002 *Financial Stability Review*, page 22.

3 The robustness of the UK financial system

In the event of any of the threats discussed above materialising, the robustness of the UK financial system depends not only on the nature of its exposures to those threats, but also on the buffers that it has in place to absorb them, and the extent of links between financial institutions within the system. These aspects are reviewed below.

3.1 Market assessment

Market indicators of perceived risk continue to suggest few concerns about the robustness of large UK-owned banks. Chart 99 summarises four indicators (indexed to 100 in the chart) derived from a range of financial market prices: credit default swap (CDS) premia; implied probabilities of default (IPD) derived from a structural model⁶⁹; implied equity volatilities from option prices; and implied equity risk premia derived from a dividend discount model (DDM).⁷⁰ Although some of these indicators have increased marginally from the December Review, they remain low compared with the average since 2001. CDS premia for UK banks also remain low compared with those for US and European banks and UK non-bank companies (Chart 100). Rating agencies' Financial Strength Ratings for large UK-owned banks remain high compared with those for other large internationally active banks (Chart 101).

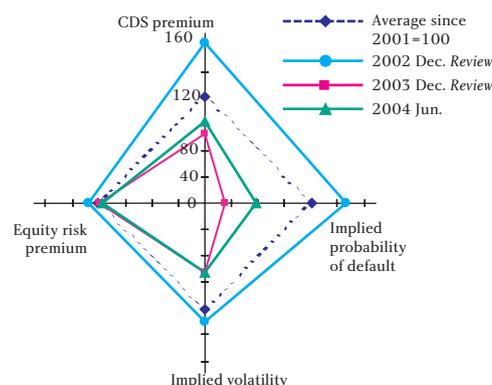
3.2 Profitability and capitalisation

There are a number of factors that enable a bank to cope with adverse shocks. Profits are the first buffer. The more credit and market risks a bank takes on, the higher a bank's average expected profits need to be for actual profits to absorb those risks should they crystallise. Diversification of income sources is also important: profits generated from a range of activities can cushion losses in a specific area. If losses cannot be absorbed by a bank's profits, capital provides an essential second line of defence.

69: This refers to a Merton-style model where the underlying value of a bank's assets is assumed to follow a stochastic process estimated from the market value of the bank's equity price and other outstanding liabilities. Non-equity liabilities are observed from annual accounts and, for the purpose of the model, are assumed to comprise only customer deposits. In equilibrium, the bank's balance sheet is assumed to grow in line with the observed growth rate of deposits.

70: A three-stage DDM was employed. The dividend growth rate in the first stage is determined by using a geometric weighted average of IBES earnings growth forecasts and assuming a constant payout ratio. In the second stage of the model, dividend growth converges to the long-term growth rate of dividends assumed to prevail in the third stage.

Chart 99:
Perceived riskiness of large UK-owned banks^{(a)(b)}

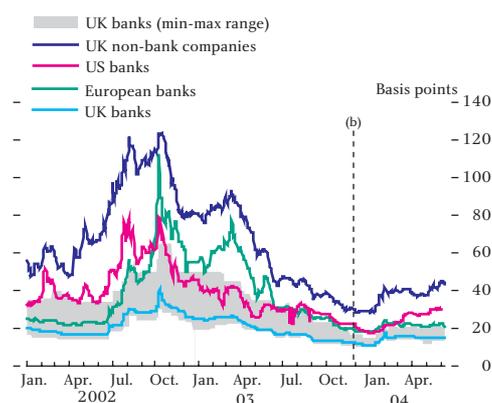


Sources: Thomson Financial Datastream, Bloomberg, JP Morgan Chase & Co, published accounts and Bank calculations.

(a) CDS premium calculated as an average weighted by total assets. Other indicators measured as the median.

(b) Equity risk premium deriving using a three stage DDM model. Implied probability of default derived using a Merton model.

Chart 100:
Credit default swap premia for large UK-owned banks and other firms^(a)

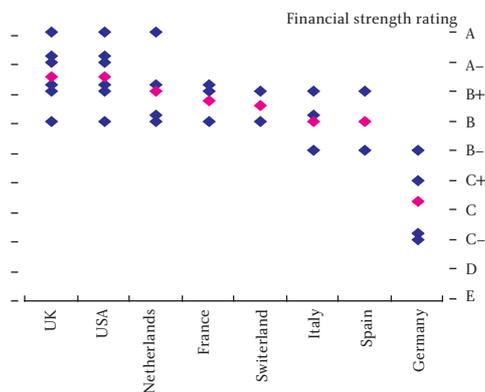


Sources: JP Morgan Chase & Co, CreditTrade, published accounts, Mark-it Partners, Bloomberg and Thomson Financial Datastream.

(a) Data are available for seven large UK-owned banks, 37 other FTSE-100 companies, 27 continental European and seven US banks.

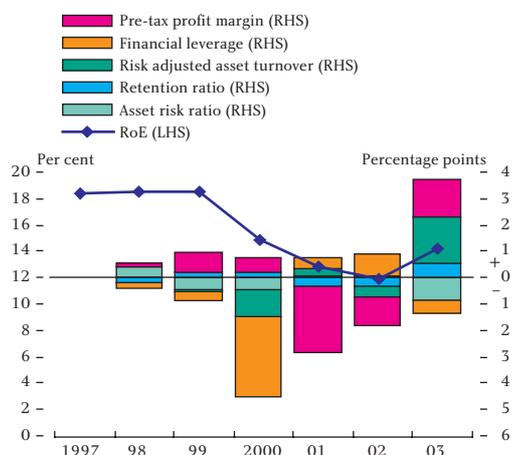
(b) Dec. 2003 Review.

Chart 101:
Financial strength ratings of selected large internationally active banks^{(a)(b)}



Sources: Moody's Investors Service and Bank calculations.
(a) Ratings exclude consideration of government support.
(b) Blue dots represent individual banks, while pink dots represent country averages.

Chart 102:
Contributions to changes in large UK-owned banks' aggregate post-tax RoE^(a)



Sources: Published accounts and Bank calculations.
(a) Individual contributions are obtained using a linear approximation; the approximation error is negligible in each year.

Profitability

Taken as whole, large UK-owned banks have remained highly profitable. Their average post-tax return on equity (RoE) increased to 14% in 2003, because of wider profit margins and higher operating income per unit of 'risk-weighted' on-balance-sheet assets (Chart 102).⁷¹ There was no evidence that the composition of the banks' on-balance-sheet assets, at the level of broad asset classes, had become more risky or that the banks had been seeking higher returns, at the cost of greater downside risks, by increasing balance-sheet leverage.⁷² However, these decompositions of RoE cannot reveal the extent to which profits reflected greater risks taken off-balance-sheet, for example by leverage obtained via derivatives. The wider profit margin in 2003 largely reflected an improvement in cost-income ratios (Chart 103), with the median ratio for large UK-owned banks falling from 57.4% to 54.0%.

Net interest income remains the largest income component (Chart 104). Median net interest margins for large UK-owned banks fell to around 2.2% in 2003, and have fallen gradually from around 2.9% in 1997. But the fall in margins in 2003 was offset by robust growth in lending volumes (discussed in Chapter 1), leaving net interest income little changed. The outlook for the large UK-owned banking sector's net interest income depends on future lending growth and net interest margins. If house price inflation were to slow, this might be associated with a slowdown in the growth of secured household borrowing – albeit with a lag. The degree of competition is one factor determining net interest margins, and market contacts report that competition is strong, especially in the unsecured lending market.

In recent years, UK banks have derived a growing proportion of income from sources other than net interest.⁷³ Large UK-owned banks' non-interest income rose over 2003, with dealing profits, fees and commissions increasing for many banks (Chart 104). However, some sources of non-interest income – such as dealing profits and other income – experienced rapid growth in 2003 that may not be sustained.

Capitalisation

Large UK-owned banks' published total and Tier 1 capital ratios were little changed over 2003, and remain well above regulatory

71: Given the broader data set available for large UK-owned banks, the decomposition of RoE in this chapter provides a further breakdown compared with Box 3 in this Review on the RoEs of UK, US and European banks. 'Asset turnover' (operating income divided by total assets) from Box 3 is split further in this chapter into an 'asset risk ratio' (risk-weighted assets divided by total assets) and 'risk-adjusted asset turnover' (operating income divided by risk-weighted assets). Note that this decomposition does not capture off-balance-sheet risks or off-balance-sheet leverage.

72: As discussed in box 7 on page 74 of the December 2003 Review.

73: Smith, Staikouras and Wood (2003), 'Non-interest income and total income stability', Bank of England Working Paper 198.

minima. Previous *Reviews* have argued that some forms of capital are more effective than others in helping banks absorb potential losses.⁷⁴ So-called 'prime Tier 1' capital excludes components of Tier 1 capital that carry debt-servicing obligations – in other words, it is restricted to ordinary shares, associated reserves and retained earnings. Prime Tier 1 capital ratios also remain high at all large UK-owned banks (Chart 105).

Stress tests provide a method of assessing the ability of banks to absorb shocks, incorporating information both on banks' profits and capital. A first attempt at carrying out a macro stress test, undertaken 18 months ago as part of the IMF's Financial System Stability Assessment, suggested that the UK banking sector had a sufficient buffer of profits and capital to absorb certain plausible shocks to the banking system.⁷⁵ Since these stress tests were carried out, UK banks have maintained similar levels of capital buffers and profitability has increased.

3.3 Liquidity

Banks also need a sufficient stock of liquid assets to fulfil both expected and unexpected financial commitments as they arise. The structure of a bank's liabilities influences its potential vulnerability to a liquidity shock – the need to repay liabilities or meet calls on committed lines or for collateral at short notice. Banks use a variety of funding sources (such as customer deposits, interbank borrowing and securities issuance) in varying currencies and maturities. Each has different characteristics, which give rise to different liquidity risks.

For most large UK-owned banks, growth in lending to households and companies (discussed in Chapter 1) continued to outpace the growth of funding from household and corporate deposits in 2003.⁷⁶ The resulting gap in funding has been filled by borrowing in the interbank market and issuing debt securities (Chart 106). Certificates of deposit (CDs) are an important source of funding for some large UK-owned banks. However, CDs typically have maturities of between one and twelve months when issued and hence need to be refinanced regularly, exposing the issuer to potential liquidity risk.

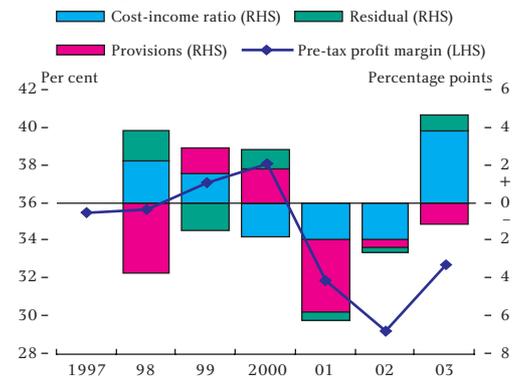
Given their growing funding needs, some large UK-owned banks have continued to develop alternative sources of funds – often

74: Some forms of capital, such as subordinated debt, protect depositors but, from the perspective of system robustness, carry debt-servicing obligations that could prove difficult to defer in times of stress. Other types of capital, such as shareholders' equity, provide the flexibility for banks to use income to augment their capital buffers instead of making payments to stakeholders.

75: Hoggarth and Whitley (2003), 'Assessing the strength of UK banks through macroeconomic stress tests', Bank of England *Financial Stability Review*, June.

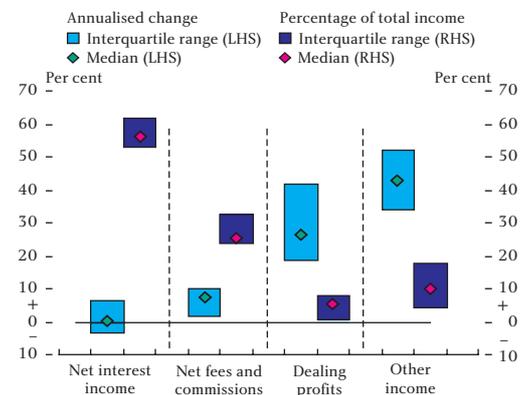
76: Parkinson and Speight (2003), 'Large UK-owned banks' funding patterns: recent changes and implications', Bank of England *Financial Stability Review*, December.

Chart 103:
Contributions to changes in large UK-owned banks' aggregate pre-tax profit margin



Sources: Published accounts and Bank calculations.

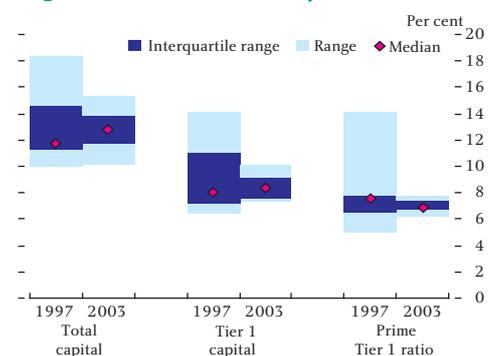
Chart 104:
Large UK-owned banks' components of income, 2003^(a)



Sources: Published accounts and Bank calculations.

(a) Dealing profits comprise net interest income and mark-to-market profits and losses on trading instruments.

Chart 105:
Large UK-owned banks' capital ratios^{(a)(b)}

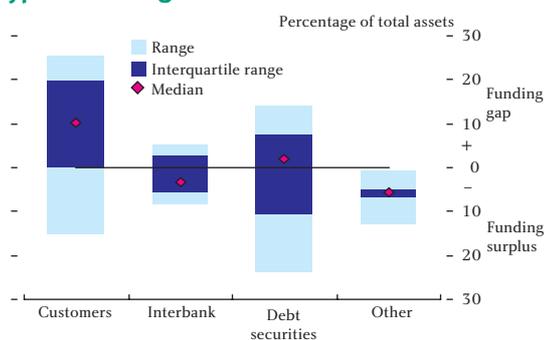


Sources: Published accounts, FSA regulatory returns and Bank calculations.

(a) Percentage of risk-weighted assets.

(b) Prime Tier 1 capital includes ordinary shares, associated reserves and retained earnings.

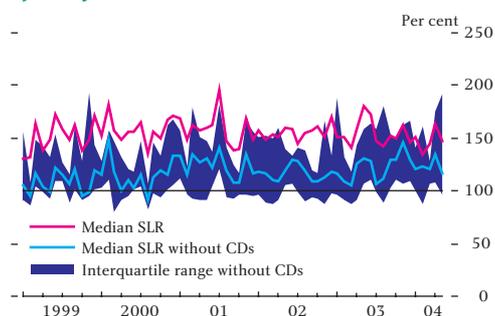
Chart 106:
Large UK-owned banks' funding gaps, by type of funding^(a)



Source: Published accounts.

(a) Measured as assets less liabilities in the balance sheet categories shown, as a percentage of total assets.

Chart 107:
Large UK-owned banks' sterling stock liquidity ratios



Source: FSA regulatory returns.

long-term securities marketed to foreign investors. The recent development of covered bond issuance represents an extension of the UK mortgage-backed securities market. UK covered bonds are structured in a broadly similar way to the well-established German pfandbriefe market – long-term securities (with 5-to-15 year maturities), backed by pools of mortgages, issued in euros (with foreign exchange risk to the bank hedged as a matter of course) and offered to European investors. However, such alternative sources are still a small proportion of the large UK-owned banking sector's overall funding.

To remain robust against the liquidity risk inherent in their liabilities, banks hold a buffer of high-quality liquid assets. The regulatory minimum for large UK-owned banks' holdings of liquid assets is determined by the stock liquidity ratio (SLR). It requires those banks to hold high-quality liquid assets to cover 100% of their estimated net sterling outflows over the next five days. Since the December Review, large UK-owned banks' SLRs have remained broadly stable and above the regulatory minimum. The SLR includes a proportion of banks' holdings of CDs as admissible liquid assets. Although holdings of other banks' CDs may aid a bank facing a liquidity shock, they may not help the banking system as a whole in the case of a system-wide liquidity shock, as CDs are 'inside' rather than 'outside' assets. Excluding holdings of CDs, the median stock liquidity ratio has also remained above 100% (Chart 107).

However, as the SLR is only based on *sterling* outflows, it is not a complete measure of UK banks' multi-currency liquidity needs. An alternative is total liquid assets as a percentage of total liquid liabilities. This measure has fallen in recent years, as large UK-owned banks have obtained a relatively higher proportion of wholesale funding. Although it captures all currencies, this alternative measure has the limitation that it does not weight liabilities by their maturity characteristics.

3.4 Links between financial institutions

One channel for shocks to be transmitted between financial institutions is through participation in financial markets, especially markets displaying a high degree of concentration. As discussed in chapter 2, large UK-owned banks and other financial institutions – such as LCFIs, internationally active banks, and hedge funds – may share exposures to asset price movements and a dependence on the liquidity of certain markets. And although measures of large UK-owned banks' value-at-risk (VaR) are relatively small, as highlighted in chapter 2, VaR is often based on assumptions that could breakdown if markets were to become illiquid or disorderly.

As well as these indirect exposures, large UK-owned banks have direct links with non-bank financial institutions. As discussed in chapter 1, large UK-owned banks have significant ownership and counterparty links with 'other specialised lenders', which are active in markets such as leasing, property and residential mortgages. Large UK-owned banks' ownership of UK life insurers exposes them to risks faced by that sector, including market risk (highlighted in chapter 2.4). Box 7 discusses links with insurance companies more generally.

UK life insurers are in transition to the FSA's new regulatory solvency regime, as discussed in the *December Review* (Chart 108).⁷⁷ If it succeeds in providing a more accurate measure of liabilities, and thus improving transparency, the new regime should enhance financial stability in the long run. In the short run, however, there have been some frictions, with some life insurers possibly having had to adjust their asset portfolios more rapidly than they would have otherwise.

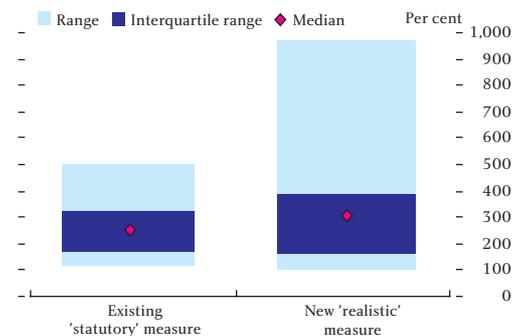
Another channel for shocks to be transmitted through the financial system is via the direct counterparty exposures of banks to each other. Such links create the potential for a shock that hits an individual bank to become important for the stability of the banking sector as a whole. Counterparty links within the banking sector are particularly important given the high degree of interconnection in wholesale banking markets, both through UK activities and overseas operations. These direct connections between banks, discussed below, fall broadly into two categories: funding and trading exposures; and payment and settlement system exposures.

Funding and trading exposures

Large UK-owned banks' total interbank exposures to all UK-resident banks, including to each other, represent a large percentage of their Tier 1 capital (Chart 109). As discussed in chapter 2, large UK-owned banks have significant funding and trading exposures to foreign-owned banks, given both London's role as an international financial centre and UK banks' overseas operations. In general, interbank exposures occur through a number of channels: unsecured, such as interbank deposits and holdings of CDs; and exposures that are often secured, such as reverse repurchase agreements (repos) and counterparty exposures through OTC derivative contracts.

Large UK-owned banks' gross deposits account for more than half of their total interbank exposure, and remained broadly stable over 2003 as a percentage of Tier 1 capital (Chart 109). In the case of OTC derivatives, the smaller scale of exposures can be explained by legal netting agreements and collateral being used to manage any residual counterparty exposure. A recent FSA

Chart 108:
Large UK life insurers' regulatory margin cover, end-2003^{(a)(b)(c)}



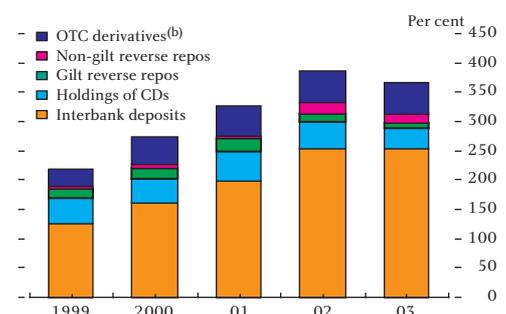
Sources: Standard & Poor's, company reports and Bank calculations.

(a) 'Statutory' measure defined as ratio of total available assets and implicit items (less liabilities) to the required minimum margin.

(b) 'Realistic' measure defined as ratio of net realistic assets plus shareholder capital to risk capital margin. 'Realistic' measure includes policyholders' reasonable expectations.

(c) Peer group selected from those insurers that have published 'realistic' balance sheet measures.

Chart 109:
Large UK-owned banks' interbank exposures to UK-resident banks relative to Tier 1 capital^(a)



Sources: Bank of England and published accounts.

(a) End of year.

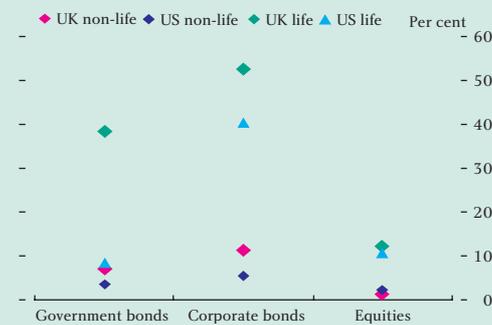
(b) OTC derivative exposures are trading positions net of margining and collateral held.

77: *Strengthening Financial Infrastructure*, Page 83.

Box 7: Links with insurance companies

The potential for systemic links from the insurance sector was described in Box 1 of the June 2003 *Review*. These include the ability to disrupt markets through sales of large asset holdings; counterparty and ownership links with banks; and the potential reliance of bank borrowers on insurance for their industries to function. This box provides some evidence on these links for UK-registered insurance companies and large foreign-owned internationally active insurers in the UK.

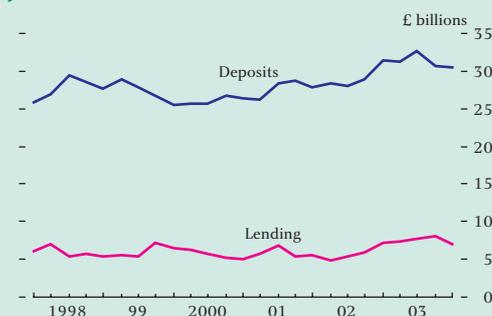
Chart A:
Insurers' invested assets, as a percentage of total market size, December 2002^(a)



Sources: Bloomberg, Bond Market Association, UK Debt Management Office, FSA regulatory filings, Merrill Lynch, Lloyd's of London, and US flow of funds data.

(a) Given the diverse data sources, and potential for measurement discrepancies, this chart should be considered as indicative.

Chart B:
Large UK owned banks' lending to and deposits from UK-registered insurers and pension funds



Source: Bank of England.

UK-registered insurance companies

Life insurers tend to have much larger financial asset holdings than non-life insurers (Chart A). Life insurers accumulate large asset holdings through their role as savings vehicles; whereas non-life insurers tend to set premiums to broadly meet expected claims over the period of cover. Since both life and non-life insurance premiums are paid in advance of the period of cover, insurers do not typically require large amounts of bank financing, beyond back-up liquidity facilities. As such, large UK-owned banks have small counterparty exposures to both UK-registered life and non-life insurers. Indeed, deposits placed by UK insurers and pension funds with large UK-owned banks are considerably higher than their borrowing from UK banks (Chart B). Finally, UK banks have more significant ownership exposures to the UK life insurance sector than the non-life sector, owning around 12% of the UK-registered life insurance industry, and 4% of the non-life industry.

Large foreign-owned internationally active insurers

Looking beyond UK-registered insurers, large foreign-owned internationally active insurers¹ have significant links with the rest of the financial system. These insurers have large financial asset holdings – comparable to some of the largest global banks – due partly to the size and complexity of their businesses, which often include large life insurance, non-life insurance, reinsurance, and financial services operations. Some of these groups have become significant participants in specific financial markets, such as credit risk transfer, and attain a significant proportion of their revenues from providing banking-type financial activities. Counterparty links with large UK-owned banks are also potentially important. The FSA's 'large exposures' database² shows that UK banks' exposures to some of these insurers are comparable to the size of their 'large exposures' to some LCFIs.

1: Such as AIG, Allianz, AXA, Berkshire Hathaway, General Electric, Munich Re, Swiss Re and Zurich.

2: As discussed in Box 8 on page 77 of the December 2003 Bank of England *Financial Stability Review*.

study concluded that UK banks and investment firms have managed credit risk well in the trading environment over the past one to two years, but highlighted some challenges. The FSA expressed concerns that widespread use of collateral could lead to management complacency and reiterated that credit risks are not eliminated by collateralisation but are replaced by legal, liquidity and operational risk.⁷⁸

Payment and settlement system exposures

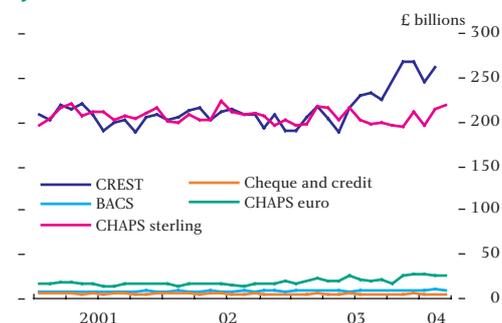
Large UK-owned banks participate in payment and settlement systems both in the UK and overseas. Participation in such systems can expose members, and their wholesale customers such as other banks and securities houses, to intra-day credit exposures to each other, although this can be mitigated to some extent by system design.

The interbank payment system CHAPS and the embedded payment mechanism within CREST (the UK settlement system for securities) are the largest UK payment systems in value terms (Chart 110). Sterling and euro payments between the settlement members of these systems settle in real-time across the Bank of England's accounts, thereby removing the 'settlement exposure' of the receiving to the paying settlement member. However, because of the 'tiered' structure of both CHAPS and CREST, with many banks making and receiving payments indirectly through their settlement member, there are exposures between the settlement members and these 'second-tier' banks that need to be monitored and controlled.⁷⁹

Some US dollar securities are also settled in CREST: the values involved have grown rapidly since October 2003, albeit remaining at far lower levels than for sterling. The US dollar obligations between settlement members are not settled in real-time over Bank of England accounts, with settlement exposures persisting until bilateral settlement takes place over accounts in the US. In liaison with the Bank, the settlement banks and CREST are exploring ways of reducing the credit risk that this entails.

The Continuous Linked Settlement (CLS) system, which was launched in September 2002, helps to reduce foreign exchange settlement risk between system users by settling foreign exchange transactions on a simultaneous payment-versus-payment basis. Values of transactions settled in CLS have increased further (Chart 111), but a significant amount is still settled outside CLS.⁸⁰ As such, foreign exchange settlement risk outside CLS can

Chart 110:
Monthly daily average domestic payments by value^(a)



Sources: APACS and CREST.

(a) Oct. 2003 value for CREST interpolated.

Chart 111:
Daily volumes and values settled in CLS (ten-day moving average)^(a)



Source: CLSB International.

(a) Volume figures report the number of sides before splitting (the process of breaking transactions of high value into smaller parts in order to improve settlement efficiency).

78: Financial Services Authority (2004), 'Management of credit risks within a trading environment – Review of market practices 2003', April. http://www.fsa.gov.uk/pubs/other/credit_risk.pdf

79: As discussed in Box 9 on page 79 of the December Review.

80: As explained in the box on page 91 of the December Review, a lack of comparable data makes it difficult to create a more accurate estimate of the relative size of FX settlement in CLS.

remain a significant component of banks' exposures to financial institutions, as illustrated in the case of Sweden by the Riksbank's recent *Financial Stability Report*.⁸¹

As well as minimising settlement exposures between banks, well functioning payment systems can promote operational efficiency and minimise the threat of system-wide disruptions. The next article in this *Review* describes developments to *strengthen financial infrastructure*. One example covered is the proposed reform of the Bank's operations in the sterling money markets released as a consultative paper in May.⁸² As part of the reforms, more banks may gain access to the Bank's balance sheet, widening their options in the face of system-wide or idiosyncratic liquidity strains.

81: Riksbank (2004), *Financial Stability Report 2004*: 1, page 39.

82: www.bankofengland.co.uk/Internet/markets/money/smmreform040507.pdf

Strengthening financial infrastructure

The continued stability of the financial system relies on robust infrastructure. In particular, effective regulation of financial institutions and strong risk management within payment, clearing and settlement systems reduce both the likelihood and severity of episodes of financial instability. This article describes recent developments on these fronts.

OVER THE PAST SIX MONTHS there has been material progress on a number of initiatives designed to strengthen international standards on risk management. Most notably, the Basel Committee on Banking Supervision (BCBS) has reached agreement on a framework for a new international capital standard (known as Basel II), and should publish the final text at the end of June. Basel II represents an important landmark, as international agreements of this kind are an essential element in effective regulation of financial institutions. The Bank of England is active in a variety of fora to support such initiatives.

Progress has also been made on International Accounting Standards (discussed more fully in the article by Ian Michael in this *Review*) and by the European System of Central Banks (ESCB) and Committee of European Securities Regulators (CESR) on developing standards for clearing and settlement. In addition, and building on these proposed ESCB-CESR standards, the European Commission has released a Communication on clearing and settlement that may form the basis for a future directive in this area.

Challenges remain, however, and recent trends in the organisation of multinational providers of infrastructure have prompted questions about how such entities should be regulated. This article considers the issue of how best to regulate international infrastructure providers, as well as the progress on international banking regulation under Basel II. In addition, Boxes 1 and 2 summarise a range of ongoing infrastructural developments and new initiatives. Finally, recent activities in respect of the Bank of England's oversight of payment systems are discussed in the Annex.

Regulation of multinational providers of infrastructure

Over recent years, there has been a trend towards increased internationalisation of market infrastructure providers. To give three particular examples, the Euroclear Group now comprises the national securities settlement systems in the UK, Ireland, France and the Netherlands, as well as Euroclear Bank, based in Belgium, which settles internationally-traded eurobonds. Similarly, LCH.Clearnet Group – which began operating as a combined entity on 1 January 2004 – clears securities trades on exchanges located in the UK, France, Belgium, the Netherlands and Portugal. Finally, the CLS (Continuous Linked Settlement) system operates as a settlement system for foreign exchange transactions in eleven currencies, with average settled values of over US\$1 trillion per day.

The growing internationalisation of infrastructure providers presents a challenge for the financial authorities. Failures in a national financial infrastructure are likely to pose some degree of systemic risk. But these systemic risks are likely to be greater where infrastructures are international in nature, in which case, they can represent a potential 'single point of failure' for a number of markets in a number of countries.

In such circumstances, there may be a case for regulatory authorities seeking a higher level of assurance about the robustness and risk management practices of these international infrastructures compared with domestic infrastructures. But, it is not immediately obvious which national regulatory authorities should exercise the regulation and under what specific institutional arrangements.

Current arrangements for regulating banks in the European Union are based on the principle of 'home

country control. For financial groups, the relevant home authority is the lead supervisor of the consolidated entity. Host countries have continued, however, to bear the responsibility for prudential regulation of subsidiaries (though not branches), and also for, *inter alia*, liquidity regulations and monetary policy implementation measures, for both subsidiaries and branches.

In broad terms, this 'home country control' model of regulation has been adopted for the main multinational infrastructure providers operating in the UK. For example, the Belgian Banking, Finance and Insurance Commission is responsible for consolidated supervision of the Euroclear Group and the French Commission Bancaire for LCH.Clearnet Group. But the Financial Services Authority maintains national regulatory responsibility for both CREST and LCH on a 'solo' basis (as these are subsidiaries of Euroclear and LCH.Clearnet, respectively).¹ Similarly, CLS is co-operatively overseen by the central banks whose currencies it settles. The Federal Reserve Bank of New York co-ordinates the oversight but each of the central banks involved also has specific oversight responsibilities. These co-operative arrangements appear, in the main, to have worked well.

On 28 April 2004, the European Commission released a Communication on clearing and settlement. Building on the work of the ESCB and CESR to develop standards for clearing and settlement in Europe (reported in the December 2003 Review and discussed in Box 2, below), the Communication suggests that any future Directive on clearing and settlement is likely to establish a supervisory model based on the 'home country control' principle, adapted for the 'specificities in clearing and settlement'.

Re-examining the home-host issue

Is the 'home country control' model of regulation sufficient to ensure systemic risks are mitigated for international infrastructures? Unless there are regulatory arrangements in place that ensure the home regulator takes into account the systemic risk which affects all relevant financial systems, national regulators might fail to recognise fully the negative cross-country externalities associated with international providers of infrastructure. Or put differently, under the 'home country control' model,

there is not necessarily an alignment between those countries bearing the systemic risk and those controlling that risk via regulation and oversight (the home country alone).

In principle, there is a spectrum of models of co-operative regulation, each of which would involve a different balance between the interests of the home and host authorities. At one end of the spectrum is the 'home country control' model that currently guides banking regulation in the European Union. At the opposite end of the spectrum is a model that involves redefining 'home' to be the countries bearing the systemic risk rather than the country of incorporation of the entity: 'host country control'. Between these two corner solutions lie a variety of alternative co-operative arrangements.

One particular type of co-operative arrangement would involve requiring 'proportionate' co-operation between home and host regulators for systemically important providers of market infrastructure. That is, the relevant regulators would agree on the relative importance of the entity in each of their countries and share the regulatory burden accordingly; this solution might involve the establishment of memoranda of understanding between home and host authorities. The disadvantage of such an approach, however, is that there may not necessarily be an alignment between the incentives of different national regulators, especially if they bear systemic risk to differing degrees. In this event, there may be a risk that the extent of regulation is less than optimal.

This type of co-operative arrangement could be strengthened by requiring legally binding contractual arrangements between home and host regulators of systemically important entities, but a disadvantage of this option arises from the difficulty of ensuring such contracts have legal force across different legal jurisdictions. For international infrastructure providers this would probably require legislation, whether at European level (through a directive) or internationally (through a treaty), neither of which is straightforward to bring about.

An alternative model of co-operative arrangements would require home regulators to agree with host regulators in some, or all, of the regulator's decision making in respect of systemically important entities.

1: In addition the Bank has responsibility for overseeing the payment arrangements of CREST and LCH as discussed in the Annex.

This may help bring about a better alignment between those controlling systemic risk and those bearing it. It would, however, come at the cost of potential inaction among regulators in the event of disagreement over necessary measures. It is also possible that such an arrangement could lead to an increase in the regulatory burden on infrastructure providers.

The 'host country control' model does have some precedents in existing co-operative regulatory arrangements. For example, the Lamfalussy principles (published by the Bank for International Settlements in 1990) address the arrangements for oversight of cross-border netting and settling arrangements.² The principles place an obligation on the lead overseer of a settlement system to 'consult with other relevant authorities' on issues such as the design and operation of the system as a whole and the adequacy of its settlement and failure to settle procedures. The implication is that host central banks should be given some control over systemic risk in their countries. In addition, the Lamfalussy principles are cited in both the G10 Committee for Payment and Settlement Systems (CPSS) and International Organisation of Securities Commissions (IOSCO) Recommendations for Securities Settlement Systems (published in 2001) and their consultative report on Recommendations for Central Counterparties (published in March 2004) in respect of the allocation of responsibilities between 'home' and 'host' authorities.

The above models all represent means of reducing the potential for co-ordination failures or unnecessary duplication by setting out the role of each authority and their responsibilities vis-a-vis other relevant authorities within a co-operative framework. Through co-ordination, multiple authorities may be able to match the efficiency and consistency that could in theory be applied by a single regulator, while avoiding the real practical challenges and lack of domestic accountability associated with a single regulator.

Suitable governance arrangements may help to support co-operative regulation and oversight in reducing systemic risk. For example, infrastructure providers could be required to appoint independent directors with a specific remit to act to reduce systemic risk. This approach overcomes the problem of needing

to pass new legislation or impose 'heavy-handed' regulation, but would clearly require a precise definition of these independent directors' remit.

The issue of appropriate regulatory arrangements for international infrastructure providers is already an important one, and is likely to become more so as the internationalisation of infrastructures continues in the future. Further work is therefore needed on how such entities are best overseen and regulated, given the potential systemic risk they bring to the financial systems of many countries.

Basel II

Banking entails, by its nature, moral hazard (distorted incentives) and systemic externalities (negative spillovers between institutions). For these reasons, in most jurisdictions banks are subject to extensive regulation, including capital requirements. International standards, such as the existing 1988 Basel Accord (Basel I), allow capital requirements to be imposed on internationally active banks without distorting competition.

The BCBS has been working on updating Basel I for several years, principally to make capital requirements better reflect the risks in banks' businesses. On 11 May the BCBS announced that it had reached agreement on the framework for a new international capital standard (known as Basel II) and that it expected to publish the text at the end of June 2004.

Basel II is structured as three 'pillars': Pillar 1 (minimum capital requirements), Pillar 2 (supervisory review of capital adequacy) and Pillar 3 (public disclosure). Pillar 1 allows for three approaches to credit risk: a 'standardised approach', which specifies capital charges for different categories of borrower, and two more sophisticated approaches, which base the capital charge on banks' own internal assessment of the credit risk. Pillar 2 sets out principles for banks' assessment of their capital position relative to their overall risks (including risks not measured under Pillar 1) and for supervisors to review and take appropriate action in response to these assessments. Pillar 3 aims to reinforce capital regulation and other supervisory efforts by requiring minimum public disclosures by banks, which are intended to enhance market discipline.³

2: <http://www.bis.org/publ/cpsso4.htm>

3: Further details of the 'three-pillar' approach underlying Basel II can be found in the June 2003 Bank of England *Financial Stability Review*.

Agreement on the framework of Basel II, allows firms and regulators to focus on implementation. Domestic regulatory processes to implement Basel II are already underway, including the incorporation of Basel II into the European Union's capital adequacy regime, with the Commission expected to publish the necessary legislation shortly after Basel II is published. Within firms, investment in the necessary further systems will build on the improvement in banks' risk management that the Basel II process has already encouraged.

The timetable outlined by the BCBS for implementing all but the most advanced Basel II approaches to credit and operational risk remains the end of 2006, with parallel running of Basel II and the current regulatory capital rules during 2006. Those banks wishing to adopt the most advanced approaches will, however, have a further year of parallel running in 2007, in order to allow additional time for impact analysis.

The BCBS will also examine calibration during the period of parallel running, with a view to ensuring that total regulatory capital levels remain broadly the same as at present. Any alterations necessary to achieve this will come through the so-called multiplier – a single scaling factor applied to the results of the framework – and the current 'best estimate' is that a multiplier of 1.06 would be required.

While any re-calibration will not require changes to the framework, the BCBS is pursuing, in a joint review with IOSCO, additional work on regulatory capital rules relating to financial institutions' trading books. This trading book review will address a defined set of issues, many reflecting industry concerns, for example the treatment of counterparty credit risk for derivatives. The tight national timetables for implementing Basel II will require timely completion of this work.

The BCBS believes the effectiveness of Basel II will be promoted by consistency in national approaches to implementation and by co-ordination and communication between national authorities. For example, co-ordination and communication between supervisors with responsibility for different components of international groups minimises the compliance burden on financial groups operating in

several jurisdictions, and uses supervisory resources efficiently. To this end, the BCBS has set out principles for co-ordination and co-operation between supervisors.⁴ The BCBS's Accord Implementation Group has already started work on putting these principles into practice. In addition, the EU Committee of European Banking Supervisors (in which the Bank participates) has started work on strengthening co-ordination between EU authorities.

4: See <http://www.bis.org/publ/bcbsca.htm>.

Annex: Oversight of payment systems

The Bank of England oversees payment systems used in the United Kingdom as part of its work to maintain the stability of the financial system.⁵ This annex describes some of the main areas of oversight focus since the December 2003 *Review*. A fuller account of the Bank's oversight of payment systems will be published towards the end of the year in the first of a new series of annual oversight reports. The account will be included in the December 2004 *Review*.

UK payment systems

One priority has been to complete the liquidity-funding and loss-sharing agreement that will put in place arrangements to complete settlement of the BACS and Cheque and Credit clearings in the unlikely, but not impossible, event of a settlement member failing to pay. The current lack of such arrangements leaves members and users of these clearings vulnerable to potentially serious disruption should such a pay-in failure occur.

A broad consensus appears to have emerged on how the agreement will operate. The model adopted will reduce risks to each settlement member bank, as well as to the system as a whole. Work remains to be done on completing the legal documentation, but members of the clearings intend to have the agreement in place by the end of 2004.

A focus for the oversight of CHAPS has been assessment of the system's resilience to operational disruption. The article *Assessing operational risk in CHAPS Sterling: a simulation approach* later in this *Review* describes one strand of this work. Oversight priorities with regard to other systems have included seeking to ensure that new membership rules for BACS Payment Schemes Limited strike an appropriate balance between fair and open access and risk control; and, in co-operation with S2 Card Services (the UK management company for Switch/Maestro), seeking to confirm the robustness of the new interbank settlement arrangements for debit card payments to be introduced as part of the migration to MasterCard Europe platforms.

One ongoing issue for CHAPS, BACS and the Cheque and Credit Clearing to consider as part of their future

work programmes is the scope for offering faster clearing of retail payments. Clearing cycles for the bulk of retail payments in the UK, whether electronic or by cheque, are slower than in many other developed countries. Reducing the length of current cycles could reduce settlement risk as well as improving banks' offerings to customers. To that end, the Bank is participating in the OFT's Task Force on payments systems, together with the clearing companies. Some initial consideration of options to accelerate the processing of electronic retail payments has already taken place.

CREST and LCH.Clearnet

The Bank oversees the 'embedded' payment system in CREST and also LCH's payment arrangements. As part of a design which helps to minimise credit exposures, CREST's settlement of sterling and euro transactions involves real-time interbank payments over Bank of England accounts. The Bank has liaised with CREST and other central banks overseeing the Euroclear group, of which CREST is a part, to ensure that these arrangements will continue to work effectively when settlement processing moves to a single platform supporting Belgian, Dutch, French as well as Irish and UK markets. In co-operation with the FSA, the Bank has worked with LCH.Clearnet to investigate ways in which LCH's payment arrangements can be strengthened.

International co-operative oversight

The Bank participates in the co-operative oversight of the CLS (Continuous Linked Settlement) system, together with other central banks whose currencies are eligible for settlement in that system. The continued growth in the number of participants and trades settled in CLS has been welcome. Key themes of oversight have been CLS's refinement of its risk management framework in preparation for a larger number of currencies being made eligible, as well as operational risk and business continuity.

The Bank also co-operates in the oversight of SWIFT, which provides secure messaging services for financial institutions and payment systems in many countries. The objective is to seek satisfaction that governance and risk management are such that possible risks to the financial system are effectively

⁵: Under the 1997 Memorandum of Understanding between HM Treasury, the Bank of England and the FSA, the Bank is assigned responsibility for advising on any major problem inherent in payment systems, and a role in developing and strengthening the infrastructure to reduce systemic risk. The Bank's oversight of payment systems aims to ensure sufficient weight is given to risk reduction and management in systems' design and operation. Further detail may be found in 'Oversight of Payment Systems', Bank of England, November 2000.

managed. Overseers have taken a close interest in SWIFT's new network and security designs.

Oversight of the Euroclear group and LCH.Clearnet also involves co-operation with international counterparts. In June 2004, the overseers and regulators of LCH.Clearnet reached agreement on a multilateral memorandum of understanding supporting the efficient sharing of information and a consistent approach across jurisdictions.

Business continuity in payment systems

Business continuity planning has remained a key theme of the Bank's oversight. A number of UK payments systems have taken steps towards fulfilling the recommendations of the Task Force on Major Operational Disruption.

Box 1: Significant new developments in the financial infrastructure

Issue	Significance	Progress
UK money market reform	<p>The Bank's operations in the sterling money markets aim to establish the Monetary Policy Committee's interest rate in the markets while meeting the liquidity needs of the banking system efficiently, safely and flexibly and retaining incentives for banks to manage their own liquidity actively and prudently. As such they contribute to the stability of the banking system as a whole.</p>	<p>The Bank is reviewing the framework for its operations and issued a consultative paper on 7 May 2004.¹ As part of this review, the Bank is considering widening the banking system's choices for liquidity management, including widening the range of banks with direct access to the Bank. This might include banks holding remunerated balances ('reserves') at the Bank; and also more banks having access to standing deposit and lending facilities, and/or settling payments directly across settlement accounts at the Bank.</p> <p>This should strengthen the system's ability to cope with stressed conditions: by widening routine access to the Bank's collateralised lending facility and, if more banks join the RTGS wholesale payments system, by reducing intraday credit exposures in the banking system.</p>
Collateral for UK open market operations in emergency situations	<p>Settlement banks and other counterparties obtain liquidity from the Bank by borrowing against eligible collateral via the Bank's open market operations (OMOs) and, intraday, via the real-time gross payment system.</p> <p>In unusual circumstances – for example, if markets or settlement mechanisms for the collateral routinely used in the Bank's operations were disrupted or if banks were facing more direct problems themselves – banks might not be able to raise liquidity from the Bank against standard eligible collateral, potentially disrupting the financial system. This risk could be reduced by the Bank accepting a wider pool of collateral in such circumstances.</p>	<p>The Bank has announced that, in unusual circumstances, it would be willing, in principle, to accept US government securities as collateral in its routine operations. The Bank plans to use the Federal Reserve Bank of New York as its custodian, and is in the process of agreeing the precise mechanics.</p>
US dollar settlement in CREST	<p>The current arrangements for US dollar settlement in CREST generate bilateral exposures between settlement banks. Daily settlement values and, hence, the size of such exposures, have traditionally been small but have increased significantly following the integration of money market instruments into CREST.²</p>	<p>CREST US dollar settlement members and CRESTCo have launched an initiative to improve dollar settlement and introduce arrangements to ensure that the process can complete in the event of a participant's failure to pay.</p>

1: www.bankofengland.co.uk/Internet/markets/money/smmreform040507.pdf

2: Page 87 of the December 2003 Bank of England *Financial Stability Review*.

Issue	Significance	Progress
Euroclear Group restructuring	<p>The Euroclear Group comprises the national Central Securities Depositories (CSDs) for the UK, Ireland, France and the Netherlands and the international CSD Euroclear Bank.</p> <p>The operational reliability of CSDs is fundamental to both financial stability and the conduct of monetary policy operations. Consolidating systems key to the operations of all group entities in a single location has implications for the supervision and control of systemic risk at a national level.</p>	<p>Euroclear Group proposes a new corporate structure whereby CRESTCo (the UK and Irish CSD) and the other operating entities within the group would become subsidiaries of a newly created holding company (Euroclear SA), incorporated in Belgium. These proposals are subject to regulatory approval, but could, potentially, affect the ability of the UK authorities to regulate and oversee CREST.</p> <p>The new holding company would also be the operator of a proposed single processing system, the Single Settlement Engine (SSE) which is due to go live at end-2006 and would serve all entities within the group. It will be important for supervision and control of systemic risk that the Bank is able to oversee the embedded payment system in the SSE as effectively as it currently oversees that in CREST.</p>
Clearing and settlement communication	<p>Suitable arrangements for the supervision of clearing and settlement systems reduce the likelihood of financial instability and limit the possibility of these systems acting as conduits through which financial distress is transmitted between institutions and markets.</p> <p>A directive on clearing and settlement could influence the supervisory arrangements for systemically important UK clearing and settlement infrastructure and affect the ability of the Bank to apply the level of oversight that it would wish.</p>	<p>On 28 April 2004, the European Commission published a Communication entitled 'Clearing and Settlement in the European Union – The way forward'. This outlines the actions that the Commission intends to undertake in order to improve Clearing and Settlement arrangements (comments are invited from interested parties by 30 July 2004).</p> <p>One of the Commission's intentions is to propose a framework directive on clearing and settlement, which will cover rights of access and choice, a common regulatory framework and appropriate governance arrangements.</p>
EU financial regulatory process	<p>The regulatory process developed by the EU determines, to a great extent, the form of regulations adopted in the United Kingdom. Financial regulation, by affecting the environment in which financial institutions operate, can affect the level of systemic risk in the financial system; hence, changes in regulations, and the system for their development, can have an effect on financial stability.</p>	<p>The Committee of European Banking Supervisors (CEBS), based in London, and the Committee of European Insurance and Operational Pensions Supervisors (CEIOPS), to be based in Frankfurt, were formally established in January 2004 and November 2003 respectively. These committees reflect the extension of the Lamfalussy principles to banking and insurance and, as such, should promote timely, flexible regulation. Moreover, co-operation between European financial supervisors should help to encourage convergence on best practice.</p> <p>Proposals for the future substance of EU financial regulations were published by the Commission's four expert groups in May 2004.³ Following this, the Treasury, the FSA and the Bank jointly published two papers on the EU's Financial Services Action Plan.⁴ The first sets out the UK authorities' views on the priorities that should guide future action and the second addresses the UK's approach to implementing the FSAP.</p>

3: www.europa.eu.int/comm/internal_market/en/finances/actionplan/stocktaking.htm

4: www.bankofengland.co.uk/Internet/publications/fsapstrategic.pdf and www.bankofengland.co.uk/Internet/publications/fsapdelivering.pdf

Box 2: Update on ongoing initiatives in the financial infrastructure

Issue	Significance	Progress
Regulatory requirements for liquidity	The liquidity of the banking system is a key concern for the Bank, given its role in relation to the provision of liquidity to the banking system and so the preservation of financial stability.	<p>The FSA set out in Discussion Paper 24 ideas on a new quantitative liquidity regime for banks, as discussed in the December 2003 <i>Review</i>. It had intended to follow this up with a Consultation Paper and draft rules in 2004; however, this has been delayed to allow more work, including at the international level. Banks will remain operating under the current regime although new rules on systems and controls will come into force at the end of Q4 2004.</p> <p>One strand of the international work in this area is a Joint Forum working group mandated to look at banks' and regulators' liquidity risk management guidelines and whether there is any convergence on methods that might be adopted more generally as best practice.</p>
UK implementation of the EU Credit Institutions Reorganisation and Winding Up Directive	<p>The effective winding up and reorganisation of credit institutions that are in financial difficulty is of key importance to financial stability. It provides confidence in the financial system, particularly for creditors.</p>	The Directive was implemented in the United Kingdom in May 2004. The UK Regulations will reduce uncertainty to creditors from the winding up of institutions by avoiding multiple processes in different Member States.
Foreign Exchange (FX) settlement risk and new CLS currencies	<p>The CLS (Continuous Linked Settlement) system significantly reduces settlement risk in foreign exchange transactions. However, probably as much as half of global FX settlement is still effected outside CLS, despite eleven major currencies currently being eligible for settlement.</p>	CLS has refined its risk management framework to make it possible to accommodate a wider range of currencies in its settlement process. Subject to agreement on remaining details this will prepare the way for the Korean won, Hong Kong dollar, New Zealand dollar and South African rand to become eligible for settlement in CLS. This is currently targeted for the fourth quarter of 2004.
LCH.Clearent merger	The robustness of the newly created LCH.Clearent Group's risk management practices, as well as its operational reliability, are important to all markets which the group serves.	The merger formally completed on 22 December 2003. A Memorandum of Understanding has been agreed between the regulators and overseers of the Group and its subsidiaries. The group's business streams are scheduled to begin migrating to shared technical platforms, starting with the fixed income business.
ESCB-CESR standards for securities clearing and settlement systems	Once finalised, the ESCB-CESR standards will be used by regulators and overseers to ensure that EU clearing and settlement systems are both safe and efficient. The standards may influence the proposed EU Clearing and Settlement Directive.	A second public consultation is taking place with a deadline for responses of 21 June 2004. The final text, amended to reflect comments received, will then have to be approved by CESR and by the ECB Governing Council. A publication date has yet to be decided upon. The ESCB-CESR working group will develop an assessment methodology.

Issue	Significance	Progress
CPSS-IOSCO standards for central counterparties	Central counterparties (CCPs) can play a key role in reducing risk in financial markets.	In March 2004, the CPSS-IOSCO Task Force on Securities Settlement Systems published a consultative Report outlining 14 draft Recommendations. These cover the major categories of risk faced by a CCP: counterparty credit risk, liquidity risk, custody and investment risk, settlement bank risk, operational risk and legal risk. The task force is currently considering public responses to the report.
International Accounting Standards (IAS)	The use of a single set of modern accounting standards is likely to be beneficial to financial stability through enhanced transparency and market discipline. A complete set of accounting standards is fundamental to ensure reliable information is provided to users of financial statements. ¹	<p>Revised versions of IAS 32 and 39, regarding financial instruments, were published in December 2003. Final rules for the accounting treatment of portfolio hedging of interest rate risk were released in March 2004. However, the option to measure some instruments at fair value and the accounting treatment of some hedged positions remains under discussion.</p> <p>In March 2004, the IASB issued the first international accounting standard on insurance contracts, IFRS 4. The standard prevents new adoption of accounting policies for insurance contracts that are out of line with the economic substance, prohibits certain existing accounting practices, and requires considerably enhanced disclosures.</p>

¹: A detailed discussion of the impact of accounting standards on financial stability can be found in Michael, I, 'Accounting and Financial Stability' in this *Review*.



Financial stability

and macroeconomic models

Andrew Haldane, Victoria Saporta, Market Infrastructure Division, Simon Hall and Misa Tanaka, International Finance Division, Bank of England

Financial instability is commonly perceived to be costly. But how costly? And why? This article uses a set of macroeconomic models to address these questions. It finds that frictions in financial markets and institutions together with macroeconomic shocks can have quantitatively significant and behaviourally important implications for the macroeconomy. That provides a compelling rationale for developing an effective framework for financial stability policy.

CENTRAL BANKS AND FINANCIAL STABILITY have, for many years, been umbilically linked. The Bank of England has played a role in helping ensure financial stability in the UK for a significant part of its 300-year history. And the Federal Reserve Board in the US was set up precisely for that purpose.

Recent years have, if anything, seen a deepening and a strengthening of the public policy focus of central banks in the pursuit of financial stability. This is true despite – indeed, in some cases possibly because of – the transfer of supervisory responsibility for financial institutions to a separate regulatory agency in a number of countries, including in the UK. For example, a number of central banks now publish financial stability reports articulating their views on systemic risks.¹ These systemic risks have been all too apparent over the past decade, in developed and developing countries alike.²

Despite this increased public policy focus, it is striking that the key tenets of a framework for financial stability remain relatively vague. How is financial stability to be defined and measured? What policy instruments are available to the authorities to help achieve financial stability – and to central banks in particular? And what are the welfare costs of a failure to achieve financial stability?

The particular focus of this article is an evaluation of the welfare costs associated with deviations from financial stability. To address this question, we first need an operational definition of financial stability. We then consider a range of alternative macroeconomic models and give some examples of how these models might be used to assess the costs of financial instability. To conclude, we discuss some directions for future research on this important and rapidly evolving aspect of public policy.

What is financial stability?

Unlike monetary stability, financial stability has no off-the-shelf definition. Myriad definitions have been proposed.³ A great many of these view financial stability through the prism of financial crises. This approach has some attractions as crises are the most visible manifestation of financial instability. It also allows back-of-the-envelope calculations to be done on the costs of these crises, measured either as the opportunity cost of foregone output, or the fiscal costs of financial bailouts incurred during the crisis period. On either definition, these crisis costs are invariably large, amounting on average to 15–20% of pre-crisis annual GDP or more.⁴

While useful, a crisis-based approach leaves many questions unanswered. For example, what is the shock that is the root cause of instability? Through what

1: Including the UK (since 1996), Sweden (1997), Hungary (2000), Norway (2000), Austria (2001), Spain (2001), Belgium (2002), Denmark (2002), France (2002), Canada (2003), Finland (2003), and Australia (2004), together with the International Monetary Fund and the Bank for International Settlements. There are a number of other ways in which central banks have recently sought to influence financial stability. See, for example, Large (2004).

2: Caprio and Klingebiel (1996) document banking crises in 69 countries since the late 1970s.

3: For a survey of definitions of financial stability, see, for example, Houben, Kakes and Schinasi (2004).

4: See Hoggarth, Reis and Saporta (2002).

channels are shocks propagated to the wider economy? What 'financial frictions' might exaggerate the impact of these shocks? And what role, if any, can public policy play in mitigating these effects? To address these questions we require a general definition of financial stability which can be embedded within a well-articulated behavioural model of the macroeconomy. Here we consider one such definition and several such models.

Financial stability can be thought to be, on the one hand, about enabling individuals to smooth consumption across time (for example, by saving or borrowing) or across states of nature (for example, through insurance contracts); and, on the other hand, about the efficient financing of investment projects with saved resources. At root, it is about the saving-investment nexus. So financial *instability* could be defined as any deviation from the optimal saving-investment plan of an economy that is due to imperfections in the financial sector. Note that this broad definition typically nests others that equate financial instability with financial crises – that is, sudden and abrupt deviations from the optimal saving-investment plan due to financial sector imperfections.

Market imperfections in the financial sector take a variety of forms. The absence of certain financial markets is one example. Individuals may not be able to hedge against certain individual-specific risks – such as rainy beach holidays – simply because such an insurance market does not exist. Other market imperfections include informational problems between lenders and borrowers, which could prevent financial markets and institutions from financing worthwhile projects. The models outlined below focus on the role of such imperfections in financial markets and institutions. Specifically, we consider how these models react in the face of macroeconomic shocks. In this way, the welfare costs of the combined effect of financial frictions and macroeconomic shocks can be determined.

It is possible and useful to decompose further the welfare costs of financial market imperfections into

two parts: an *efficiency* effect and a *volatility* effect. Efficiency costs derive from the effect of a financial friction on equilibrium prices and quantities in the economy, even in the absence of shocks. Volatility costs derive from financial frictions in the presence of uncertainty, if they lead to changes in the amplitude of real and financial cycles. Decomposing these two welfare effects is important because trade-offs might sometimes arise between them in a financial stability context. For example, a banking system that comprises a monopoly bank is likely to be inefficient as the bank will earn supernormal profits. But these same profits also mean that the banking system is likely to be very robust in the face of shocks.

Models of systemic risk

There is a variety of models which might give rise to financial instabilities.⁵ Broadly-speaking, models of systemic risk fall into two categories:

- **Micro-Systemic Models:** These are models where the source of the disturbance is initially localised – say, a shock to a particular market or institution – but whose effects then become system-wide as a result of interconnections within the system.⁶ These interconnections could arise because of financial contracts between parties – for example, in interbank markets or payments systems;⁷ or through informational or expectational spillovers – for example, as in self-fulfilling expectational models of financial crisis.⁸ These models have interesting and important implications for crisis dynamics and public policy. For example, they give rise to discontinuous adjustments in the response of the economy, which are typical of financial crises. But we do not consider them further here.
- **Macro-Systemic Models:** These are models where the shock is to the entire system, rather than any one entity within it. The impact of this aggregate disturbance is, however, affected by financial frictions of various kinds. These alter the dynamic path of the economy following shocks, relative to the situation without frictions. And these displacements of the economy from its frictionless path, in turn, have welfare consequences.

5: See, for example, Summer (2003) for a survey.

6: See, for example, Eisenberg and Noe (2001) for a generic model of this type.

7: See, for example, Wells (2002) for the first and James (2003) for the second.

8: See, for example, Chui, Gai and Haldane (2002).

The models discussed below are all macro-systemic models. Each of them share some common characteristics: they are dynamic equilibrium models grounded in the optimising decisions of consumers and producers, acting subject to well-specified budget constraints. Where they differ is in their embedded financial friction. In turn, we consider the effects of: missing financial markets of various kinds; financial frictions in capital markets; and financial frictions in models with financial intermediaries.

None of these models generate financial crises in the sense of an abrupt and sudden fall in output. But they do have significant implications for the equilibrium level of output in the economy and its dynamic response to shocks. We use calibrations of these models, based as closely as possible on real world data, in an attempt to provide a quantitative evaluation of these effects. Because these calibrations are imprecise, however, these models and the simulation results should be taken as illustrative of the signs and sizes of responses, rather than as a definitive guide to real-world behaviour. The models are a tool for helping to tell coherent, quantitative stories about how and why financial instabilities might manifest themselves.

Models with missing markets

Some of the welfare costs of financial instability arise because of the absence of financial markets or instruments. These 'missing markets' are costly in a financial stability sense because they prevent the smoothing of consumption either across time or across states of nature. For example, there may be an inadequate market in insurance against spells of unemployment by workers or an inappropriate market in savings products for investors, both of which inhibit hedging by individuals against future contingencies.

One branch of the economics literature has sought to quantify the welfare costs of macroeconomic instability in the presence of missing markets. The literature was started by a provocative paper by Robert Lucas.⁹ Lucas (1987) computed rough upper bounds for the welfare gains associated with eliminating *all* business cycle instability. He found that these welfare gains were typically small, at around one tenth of one percentage point of average annual consumption.

Taken at face value, Lucas's calculations would imply that the welfare costs of business cycle movements are small. By implication, therefore, the contribution of missing markets or other financial frictions towards these instability costs would be a fraction of an already small number. So the important message from this approach is that the costs of financial instability (as distinct from inefficiency) may be small. Is this the case?

The literature has identified two key reasons why these estimates might understate the costs of business cycle variability. First, Lucas's calculations assume that individuals can insure perfectly against individual-specific ('idiosyncratic') risks. In practice, there are missing insurance markets for individual agents. For example, as Lucas (2003) himself has recently put it: "...where is the market where people can be insured against the risk of having irresponsible or incompetent parents or children?" Second, volatility in aggregate consumption (an example of 'aggregate risk') does not affect all individuals in the same way. Business cycles may be significantly more costly for the poor or the unemployed than for the rich or those remaining employed. In practice, individuals are different – that is, there is agent heterogeneity.

Imrohoroglu (1989) considers both dimensions, using a model of heterogeneous, infinitely-lived agents who cannot insure against becoming unemployed. The only partial insurance they have is through saving in a liquid asset. Individual employment prospects depend on the outcome of aggregate and individual-specific shocks. These shocks are linked: the better the state of the aggregate economy, the greater the probability of an individual being employed. The key finding is that the costs of business cycle fluctuations are 5 times greater than in an economy with complete insurance markets.

In Imrohoroglu (1989) factor prices – wages and the cost of capital – are not determined by the model. Krusell and Smith (1999) allow for agent heterogeneity but also for endogenously determined factor prices. They assume that agents can only insure against the risk of being unemployed by saving, in line with Imrohoroglu. In contrast to Imrohoroglu, however, idiosyncratic employment risks are assumed

9: Lucas (1987). More recently, Lucas (2003) re-ran the same exercise using recent data and argued in favour of his original estimates, at least in terms of orders of magnitude.

to be independent of aggregate risks – in their economy, ‘when it rains it does not pour’. This implies that the only risk-reducing effect of eliminating aggregate volatility comes from changes in the fluctuation of factor prices. It turns out that these costs are very small.

Along with Imrohoroglu (1989), Storesletten, Telmer and Yaron (2001) assume that the idiosyncratic employment risks facing households are larger when the economy is in a downturn. Storesletten *et al* also assume that, if realised, employment risks have a permanent effect and that households can only invest in one safe asset as insurance against a rainy day. These two assumptions limit agents’ ability to insure against spells of unemployment. In this framework, they find that the welfare gains of eliminating business cycle fluctuations are an order of magnitude larger than Lucas.

Taken together, the results of this literature suggest that missing financial markets or instruments may contribute significantly to the total welfare costs of business cycle variability. But as Table 1 illustrates, estimates of the total gains from eliminating business cycle variability depend heavily on the specification of the model. And overall, these gains are rarely that large.

Table 1:
Welfare gains from eliminating business cycle instability

Paper	Assumptions:			Gain ^(a)
	Agent heterogeneity	Missing insurance market	Correlated aggregate and idiosyncratic risks	
Lucas (1987, 2003)	×	×	×	0.05 ^(b)
Imrohoroglu (1989)	√	√	√	1.5 ^(c)
Krusell and Smith (1999)	√	√	×	0.1 ^(d)
Storesletten et al (2001)	√	√	√	2.5 ^(e)

(a) As percentage of aggregate consumption.

(b) Lucas (2003, page 4). Lucas (1987, page 26) reports estimate varying between 0.008% and 13.6%, depending on estimates of agent risk aversion and aggregate consumption volatility around trend.

(c) Depending on risk aversion parameter (Imrohoroglu (1989), page 1378).

(d) In one of the experiments (Krusell and Smith (1999), page 269).

(e) Storeletten et al (2001) page 1327.

There are at least two reasons why these models might understate the costs of financial instability. First, they leave unspecified and exogenous the underlying frictions that explain why agents cannot insure themselves against certain risks in the first place. Second, in most of the models the absence of

particular financial markets does not impair allocative efficiency by, say, mis-directing resources to less productive sectors. In other words, this approach captures the volatility costs of financial instability, but not the inefficiency costs. Finally, there is no explicit role for financial intermediaries in transforming savings into investment which might alter the impact of financial frictions. The models considered below aim to remedy these problems.

Models with capital market frictions

There is a wide variety of models which embed explicit financial frictions that can potentially exacerbate deviations between optimal savings and investment plans. In some models these are capital market frictions; in others they are frictions affecting financial intermediaries. We consider the former here and the latter in the following section.

In one class of models a financial friction arises because agents cannot commit credibly to financial contracts. Hart and Moore (1994) argue that it is not possible to enforce financial contracts in all conceivable states of the world. Lenders realise that entrepreneurs may threaten to withdraw from projects before completion unless the terms of any financing are renegotiated in their favour. As such, lenders may only provide finance up to the value of an entrepreneur’s collateral. This means that asset prices and borrower balance sheets may play a key role in the supply of finance and investment to firms and, in turn, the dynamics of the economy. Kiyotaki and Moore (1997) and Kocherlakota (2000) show how this source of financial friction can lead to a significant amplification of business cycles.

Other models incorporate informational asymmetries between borrowers and lenders. Some assume that lenders are unable to assess the quality of new borrowers’ investment projects. In Stiglitz and Weiss (1981), this leads to adverse selection, with poorer quality borrowers being drawn into the lending pool. Specifically, increases in interest rates on loans raise the average riskiness of loan applicants. Lenders may respond by rationing credit, thus reducing investment below its optimum level.

Moral hazard effects – borrowers behaving recklessly after loans are extended – arise when lenders cannot perfectly monitor the use of borrowed funds. Holmstrom and Tirole (1997) show that, if lenders are subject to moral hazard, finance supply and aggregate

investment can depend on the level of a firm's capital. As a result, the economy will be more sensitive to macroeconomic shocks, with this vulnerability depending on the financial condition of borrowing firms.

Finally, some asymmetric information models assume that unless lenders pay an audit cost to verify the outcome of borrowers' investment projects, borrowers will simply pretend that their projects have failed and claim bankruptcy in order to avoid repaying their debts. So lenders must incur an audit cost to verify the state of borrowers' projects whenever bankruptcy is declared. Carlstrom and Fuerst (1997) and Bernanke, Gertler and Gilchrist (1999, hereafter BGG) show that business cycles are amplified in this setting relative to the case without financial frictions.

The model developed by BGG can be used to provide some illustrative quantitative assessment of the macroeconomic impact of a particular financial friction. In their dynamic general equilibrium model there are three main sets of agents.¹⁰ Households are infinitely-lived, risk-averse individuals who work, consume and save by investing in a financial intermediary that pays a risk-free rate of return. Entrepreneurs are risk-neutral and finitely-lived, with access to risky investment projects. They acquire capital which they combine with household labour and their own efforts to produce output. Capital is financed using entrepreneurs' own net worth and debt from financial intermediaries. Entrepreneurs sell final output in competitive markets to retailers who differentiate goods and sell in monopolistically competitive markets.

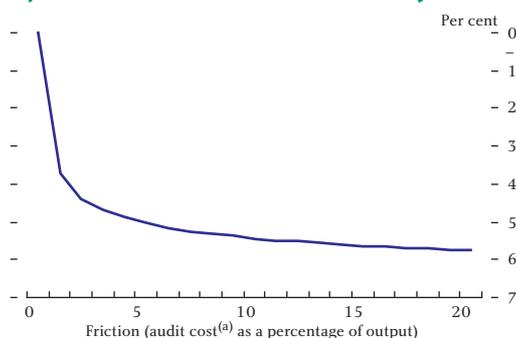
Financial frictions arise in this model because intermediaries are unable to observe and verify the returns to entrepreneurs' investment projects unless they pay an audit cost. BGG show that this means that investment is affected by the financial position of firms. Specifically, the cost of investment finance is augmented by an external finance premium which responds negatively to the level of corporate internal funds (net worth) relative to total project financing requirements. When a substantial portion of

investment is funded internally (companies have low gearing), audit costs are small and the external finance premium is low. Conversely, when investment is mainly funded externally (high gearing), the premium is high.

How do financial frictions affect the BGG economy? One aspect that we can examine is their impact on equilibrium levels of output in the absence of shocks – that is, efficiency costs. But frictions may also affect the behaviour of the economy in a dynamic setting with shocks – that is, there are volatility costs.

Chart 1 shows the impact of the financial friction on levels of output. Output falls quite sharply as financial frictions are introduced to a frictionless world, with their marginal impact declining. These efficiency costs are non-trivial. For example, output is around 5–6% lower compared to the level in the frictionless economy, when audit costs are assumed for illustrative purposes to be equal to 10% of total output.¹¹

Chart 1:
Impact of financial frictions on steady state output



Source: Bank calculations.

(a) 'Audit cost' here refers to the cost incurred by the lender to verify the state of the borrower's project after the cash flow of the project is realised and the borrower declares bankruptcy. The figure plots the percentage change in steady state output as this audit cost is increased.

Chart 2 shows the impact of introducing shocks into this world with financial frictions – here an unexpected 1% permanent fall in productivity.¹² The presence of financial frictions leads to greater amplitude and persistence in the economy's response to this shock. The incremental effect from financial frictions arises because the initial fall in output, and expectations of sustained lower output, lead to a

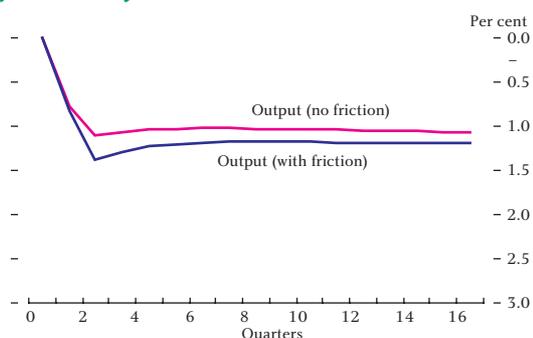
10: For full details see BGG (1999).

11: Hall (2001) provides details of the calibration of this model in the case of the UK. The parameters chosen for the reported simulations, and hence the resulting quantitative results, should be taken as illustrative of patterns and magnitudes.

12: For illustrative purposes, the level of financial friction is set equal to the base case considered in BGG, that is, a monitoring cost of 12% of output.

sharp fall in asset prices which has a propagation effect, reducing entrepreneurs' net worth and raising the cost of borrowing. The financial friction imparts an extra degree of instability to the macroeconomy – a volatility cost which BGG term the 'financial accelerator'.

Chart 2:
The impact of an unexpected, permanent 1% fall in productivity^(a)



Source: Bank calculations.

(a) The figure shows the percentage deviations of output from steady-state following a 1% negative productivity shock at quarter 1.

This model provides a useful vehicle for delineating the inefficiency and volatility effects of financial frictions in a macroeconomic setting. Calibration of this model suggests, in addition, that such effects may be quantitatively important. The model has its drawbacks, however, not least its restricted financial structure, with little explicit modelling of financial intermediaries.

Models with financial intermediaries

Dynamic general equilibrium models with financial intermediaries make explicit the link between intermediary behaviour and macroeconomic dynamics. They can therefore be used to analyse the macroeconomic impact of shocks to the financial sector. In addition, such models can potentially be used to analyse several key public policy issues – for example, how financial regulation might affect macroeconomic dynamics.

The literature on dynamic general equilibrium models with financial intermediaries is still nascent. That said, there are several papers which have considered the macroeconomic impact of financial sector

regulation in a dynamic partial equilibrium framework. For example, Chami and Cosimano (2001) and Van den Heuvel (2003) illustrate how capital adequacy regulation gives rise to a financial accelerator that amplifies the effect of monetary policy.

Chen (2001) is one of the few papers to develop a dynamic general equilibrium model with a financial sector. In this model, entrepreneurs use both internal funds and bank loans to finance their projects. Banks collect deposits from households, lend to entrepreneurs and monitor them on behalf of households. Households can either use their capital to produce output or deposit it in a bank.

At the heart of the Chen framework is a double moral hazard problem in the spirit of Holmstrom and Tirole (1997): an information asymmetry between entrepreneurs and banks on the one hand, and between banks and depositors, on the other.

Entrepreneurs enjoy private benefits from embarking on bad projects. For example, they might initiate a corporate takeover which is unprofitable but gives them the pleasure of expanding their 'empire'.¹³ Entrepreneurs are deterred from undertaking bad projects only if banks monitor them. But monitoring is costly for banks, and depositors cannot verify whether banks are doing this job correctly in using deposits to fund good projects.¹⁴ So both entrepreneurs and banks are potentially subject to a moral hazard problem.

Aggregate output is maximised in this model if households lend all of their money to entrepreneurs via the financial intermediaries. But given asymmetric information, households are willing to deposit their money in a bank only when they can be sure that the bank has adequate incentives to monitor the entrepreneurs.

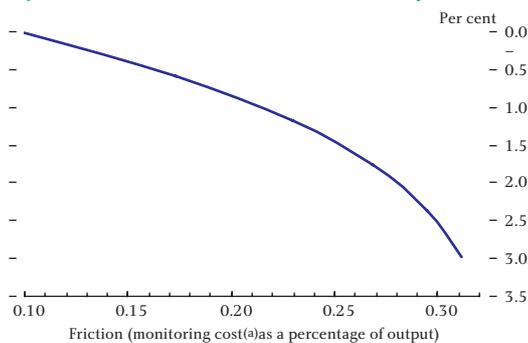
These frictions mean that not all of the economy's capital is channelled to the productive sector. Entrepreneurs face a credit constraint. Equilibrium output depends on the magnitude of this credit constraint, which in turn depends on the size of the frictions. For example, when monitoring is very costly,

13: See Jensen (1986).

14: The monitoring cost in Chen's model is different than the audit cost in the BGG model. In BGG, the lender incurs the audit cost after the cash flow of the project is realised and the borrower declares bankruptcy. In Chen's model, however, the bank incurs the monitoring cost during the operation of the project to verify the quality of the project chosen by the entrepreneur.

banks have little incentive to monitor their borrowers, so households are unwilling to hold bank deposits. This reduces bank lending to entrepreneurs, thereby lowering steady state output. Even for relatively modest monitoring costs as a percentage of total output, these inefficiency costs can be significant (Chart 3).¹⁵

Chart 3:
Impact of financial frictions on steady state output

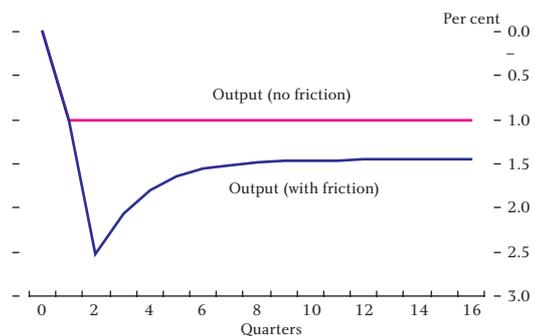


Source: Bank calculations.

(a) ‘Monitoring cost’ here refers to the cost incurred by the bank to verify the quality of the project chosen by the borrower. The monitoring cost is incurred during the operation of the project, before the cash flow of the project is realised. The figure plots the percentage change in steady state output as this monitoring cost is increased.

How do these financial frictions affect output dynamics when the economy experiences a shock? As in the BGG model, financial frictions in the Chen model amplify the impact of shocks. In a frictionless economy, a permanent, negative 1% productivity shock simply reduces output by 1% for all subsequent periods (Chart 4). In the presence of financial frictions, however, output falls more sharply. This is the result of two effects. First, the decline in productivity lowers entrepreneurs’ profits and the value of their capital, thereby reducing their net worth. As a result, entrepreneurs have fewer internal funds to invest in the next period. Second, the decline in productivity also reduces banks’ profits and lowers their net worth. This reduces bank lending, which further reduces the funds available to entrepreneurs for investment. The upshot is a further ‘financial accelerator’, only this time one which is even more pronounced than under the BGG model. Volatility costs are further amplified.¹⁶

Chart 4:
The impact of an unexpected, permanent 1% fall in productivity^(a)



Source: Bank calculations.

(a) The figure shows the percentage deviations of output from steady-state following a 1% negative productivity shock at quarter 1.

How does the aggregate economy respond when the financial sector — rather than the productive sector — suffers a large loss of capital? Using Chen’s model, Aikman and Vlieghe (2004) demonstrate that, in the absence of any financial frictions, shocks to banks’ net worth have no effect on aggregate output. For instance, a fall in banks’ net worth would not impair their ability to lend, since they can simply raise more deposits. So entrepreneurs in a frictionless world do not face credit constraints and all of the economy’s capital is ultimately channelled to the most productive sector. In an economy with frictions, however, entrepreneurs face credit constraints so that output is determined by both the amount of bank lending and entrepreneurs’ net worth. In such a world, a negative shock to banks’ net worth reduces bank loans and hence lowers entrepreneurs’ investment (Chart 5). In other words, a negative shock to bank capital causes a persistent output loss, which is consistent with the empirical findings of Hoggarth *et al* (2002).

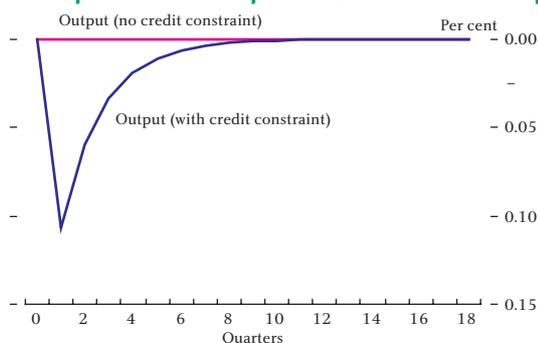
The Chen model provides a useful framework for analysing the role of banks in the macroeconomy. In particular, it helps describe the way in which financial imperfections might amplify the effects of macroeconomic shocks. But the model cannot address several important financial stability issues. First, the potential costs and benefits of financial sector policies — such as liquidity and capital

¹⁵: The calibration of the Chen model discussed here is based on Aikman and Vlieghe (2004), but uses a different parameterisation. Here, we have chosen the parameters such that the borrower’s leverage ratio in the steady state is the same as in Hall’s (2001) calibration of the BGG model discussed in the previous section. The calibration and results should again be interpreted as illustrative.

¹⁶: In the long-run output recovers, but the new equilibrium level of output is more than 1% lower than before the shock. This is because the productivity shock reallocates capital from the entrepreneurs to the less productive households. Since both entrepreneurs’ net worth and bank lending are permanently lower, entrepreneurs hold less capital in the new steady state and output is lower.

regulation and deposit insurance — cannot be formally assessed within this model.¹⁷ Second, while reductions in the size of the financial friction improve welfare (Chart 3), the model is silent on whether and how these can be achieved.

Chart 5:
The impact of an unexpected 1% fall in bank capital^(a)



Source: Bank calculations.

(a) The figure shows the percentage deviations of output from steady-state following a 1% negative shock to bank capital at quarter 1.

Conclusions

Research on developing a framework for financial stability is embryonic. And work assessing the welfare costs of financial instability is still in its infancy. The research presented here aims to illustrate how well-founded macroeconomic models can help to address some of these questions in a rigorous, quantitative fashion.

Clearly, this research agenda is far from complete. Among the interesting areas for future research are:

- developing alternative models of financial instability – both macro and micro-systemic models, incorporating a range of alternative financial frictions – and exploring their welfare implications;
- developing a hybrid macro-model which encompasses both capital market and banking frictions;
- examining the appropriate role of public policy within these models in helping to mitigate the welfare costs of financial instability – for example, the interplay between monetary policy, regulatory policy and financial stability.

This is a challenging agenda. But experience in developing a framework for monetary stability provides grounds for optimism. The monetary framework in the UK and in most other countries is unrecognisable from that a generation ago. It is not unrealistic to think that significant strides forward can also be made on the financial stability front.

¹⁷: This is because capital held by the banking sector is optimal given the financial frictions, so that there is no role for capital adequacy regulation.

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Understanding capital flows to emerging market economies

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A number of recent empirical studies have aimed to identify the determinants of capital flows to emerging market economies (EMEs), usually grouping these into two broad categories: factors that are specific to creditor countries ('push' factors), and those that are specific to debtor countries ('pull' factors). This article summarises two related pieces of work carried out at the Bank of England. The first is a model on the determinants of bank lending flows to EMEs, and the second a model on the determinants of spreads on EME sovereign bonds. The main finding is that push factors are important in explaining banking flows and bond spreads. In the case of the latter, the model suggests that two thirds of the compression in EME bond spreads in the period between October 2002 and earlier this year was explained by push factors alone, and in particular the fall in US short-term rates in 2001. This implies a need for caution by EMEs in borrowing too heavily during times of a benign external financing environment, as a reversal in credit conditions is more often than not beyond the control of the borrower.

EXTERNAL CREDIT CONDITIONS for emerging market economies (EMEs) have typically been marked by a high degree of volatility in the past. Periods of large, low-cost capital inflows have often been followed by periods of sharp outflows and a rise in the cost of borrowing, resulting in episodes of widespread financial instability. A notable example of this was the Asian crisis of 1997. And in 2002, the Brazilian economy was destabilised by a sharp deterioration in its external financing conditions. Such episodes are costly, not only to EMEs, but potentially also to developed economies where financial links to EMEs and global capital markets are significant. Understanding the key drivers of this volatility can therefore be an important element in assessing both global and domestic financial stability risks.

A substantial body of literature has developed which aims to identify the factors that might explain the volatility of these flows. The empirical strand of this literature has increasingly focused on two broad categories: those factors that are specific to creditor countries, or 'push' factors, and those that are specific to debtor countries, or 'pull' factors. Both impact on the flow of capital to EMEs, in terms of both the price and quantity of credit provided by developed-country investors.

Given the availability of data, the literature has typically focused on the price of credit from

secondary bond markets, and the quantity of credit for bank lending from regulatory returns. Accordingly, this article brings together two recent studies in these areas carried out by the Bank of England.

The first is a model that builds on recent work at the Bank for International Settlements (BIS) which aims to explain the determinants of the flow of bank lending from developed countries to EMEs. The second is a model for determining the spread on EME sovereign debt. The models are reduced-form, exploring correlations between push-pull factors and bank lending flows and bond spreads without exploring the economic processes that underlie these relationships. For bank lending, particular emphasis is given to the period from 1996 to end-2003, capturing the pre-Asian-crisis rise in cross-border lending to EMEs and the subsequent decline. For bond spreads, the focus is mainly on the rally in bond markets between late 2002 and early 2004.

Whilst the long-run trends in banking flows and bond spreads are captured by the models, their deviation from actual flows and spreads is sometimes significant. This might reflect data considerations and the limitations of the push-pull framework, including potentially important factors that are absent from the analysis. These are also discussed.

A push-pull framework for explaining bank flows to EMEs

In this section, the results of the estimation of a model that builds on Jeanneau and Micu (2002) are presented.

Data set and variable selection

Jeanneau and Micu (2002) analyse BIS-reporting banks' lending flows to ten EME debtor economies, of which five are Latin American economies (Argentina, Brazil, Chile, Venezuela and Mexico) and five are Asian economies (Malaysia, Indonesia, the Philippines, Thailand and Korea). Here, seven more countries – Turkey, Poland, Hungary, India, Taiwan, China and South Africa – were added to the data set, accounting for an additional one third of BIS-reporting banks' consolidated foreign claims on EMEs. Moreover, Hong Kong and Singapore, classified as offshore financial centres in the BIS statistics, were also added to the list. This is mainly due to their importance to UK bank exposures.

The dependent variable used in the estimation is the change in cross-border claims on the EMEs listed in the preceding paragraph by banks from the following BIS-reporting countries: USA, UK, France, Germany, Italy and Spain.¹

The explanatory variables are drawn from the theoretical literature and are listed in Table 1. The borrower-specific pull variables are intended to capture factors that affect either the demand for credit by an EME (borrower gross domestic product (GDP), local equity indices) or the risks involved (exchange rate volatility and borrower debt/GDP ratios). Push variables are intended to capture factors that are independent of the borrower but affect the supply of lending to EMEs. Specifically, these include the opportunity cost of lending (global equity returns), the risk appetite of lenders (spread differential on BB and BBB bonds) and the financial position of lenders (creditor-country GDP).

In the case of the latter variable, the relationship with banking flows is theoretically uncertain. On the one hand, greater growth in the creditor economy is associated with greater profits for the banking system, and thus a potential wealth effect may increase flows to EMEs. On the other hand, greater growth may

provide greater investment opportunities in developed economies, diverting flows away from EMEs.

Table 1:
Push-pull explanatory variables of changes in bank lending to EMEs^(a)

Variable	Rationale	Expected effect on flows
<i>Pull</i>		
Borrower GDP cycle	Greater growth suggests an improved creditworthiness and greater demand for credit by EMEs.	+
Bilateral exchange rate volatility	An increase in exchange rate volatility exposes borrowers and/or lenders to currency risk. May also be an indicator of financial instability in borrower country.	-
External debt/GDP	The higher the external debt burden, the more likely a country is to become insolvent.	-
Local currency equity return index	Proxy for attractiveness of investment in borrower country.	+
<i>Push</i>		
Lender GDP cycle	Strong growth in creditor country may result in greater investment abroad. However, it may also mean domestic investment opportunities become more attractive.	?
Global equity return	This is a measure of alternative investment return. The higher the return in industrialised countries, the lower the expected lending to EMEs.	-
Yield spread on low/high rated US corporate bonds	The higher the spread, the lower the risk appetite of creditors.	-
<i>Other</i>		
Bilateral trade	Controls for trade finance and/or the importance of information asymmetries (the greater the trade, the more familiar a country).	+
Brady operations dummy	Controls for Brady restructuring deals which resulted in one-off reductions in the value of BIS banks' exposures.	-

Sources: World Bank, IMF, Institute of International Finance (IIF), Bloomberg and Thomson Financial Datastream.

(a) For some countries, data from separate sources were used for certain factors, depending upon availability. All data are semi-annual, which in some cases has involved linear extrapolation of annual data.

Following Jeanneau and Micu (2002), two control variables were included. Bilateral trade attempts to filter out the effect of trade finance and the generally higher level of financial interlinkages that are associated with close trading relationships. The inclusion of a Brady dummy, which captures the effect of a Brady deal on bank lending, is intended to remove distortions arising from a one-off reduction in lending as loans are transformed into Brady bonds.

1: This is just a proxy for the flow of bank lending since international bank claims also include holdings of bonds and other debt securities by international banks. The dependent variable should therefore be thought of as changes in volume of all credit provided by international banks (though it will be referred to as bank lending in the remainder of this article).

Estimation and results

The model was estimated for the countries in the sample simultaneously by seemingly unrelated regressions for the period 1986 H1 to 2003 H2 (the annex contains more details on both models presented in this article). Coefficients were restricted to be equal across countries, and thus represent the common long-run elasticity of bank lending flows to EMEs to changes in the underlying factors.

Table 2 shows the results of the estimation. All coefficients are highly significant, except for GDP in the creditor country, and with the expected sign.

Table 2:
Coefficient estimates of push-pull variables on bank lending flows to EMEs^{(a)(b)}

Variable	Coefficient (Standard error)
Borrower GDP cycle	0.12 (0.03) ^(c)
Bilateral exchange rate volatility	-0.12 (0.03) ^(c)
External debt/GDP	-0.2 (0.03) ^(c)
Local currency equity return index	0.16 (0.03) ^(c)
Lender GDP cycle	-0.04 (0.04)
Global equity return	-0.09 (0.04) ^(d)
Yield spread on low/high rated US corporate bonds	-0.15 (0.03) ^(c)
Bilateral trade	0.09 (0.05) ^(c)
Brady operations dummy	-1.36 (0.23) ^(c)
Total observations	610
Time periods	36
Cross-sections	19
Overall R-squared	0.23
Adjusted R-squared	0.21
SE of regression	0.93
Durbin-Watson statistic	1.9

Sources: Bank calculations, World Bank, IMF, IIF, Bloomberg and Thomson Financial Datastream.

(a) Seemingly unrelated regressions (SUR) estimation technique employed.

(b) All variables (except Brady dummy) normalised, and creditor/borrower GDP, borrower debt/GDP, local and global equity indices, and bilateral trade de-trended prior to normalisation. Data not available for early part of the sample period for some countries. There are therefore fewer than the maximum 36 observations for all 19 countries, resulting in an unbalanced panel of 610 observations.

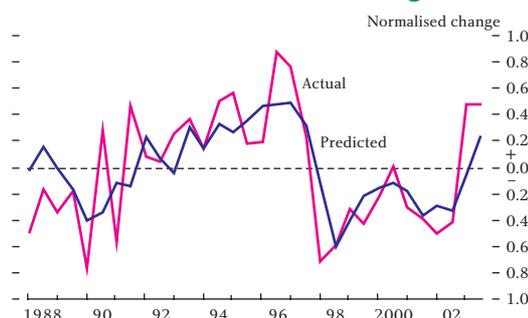
(c) Significant at 1%.

(d) Significant at 5%.

Although only one quarter of bank flows to EMEs are explained by the model, from Chart 1 it is apparent that the model captures the long-run trend in the data relatively well. Specifically, the model captures

the pattern of rising cross-border lending pre-1997, and the decline thereafter.

Chart 1:
Predicted versus actual bank lending flows^(a) to EMEs

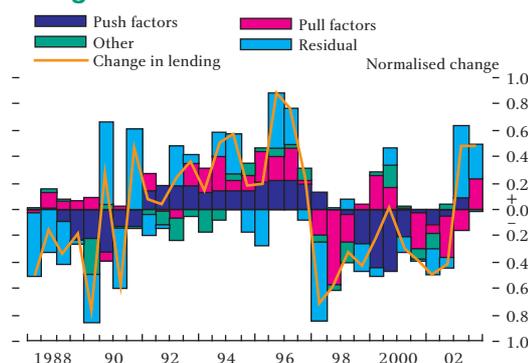


Sources: Bank of England and Bank for International Settlements.

(a) This variable was normalised by subtracting the mean and dividing by the standard deviation, as in Jeanneau and Micu (2002).

To show the relative importance of push and pull factors in explaining banking flows, Chart 2 plots the contributions of each to the flow of bank lending from 1988 to 2003. The deviations of actual flows from the long-run flows predicted by the model (blue bars) are discussed later in the article. Of the proportion of the change that is explained by the model, however, push factors appear to be, on average, equally important as pull factors.

Chart 2:
Relative contribution of push-pull factors to bank lending flows to EMEs



Sources: Bank of England and Bank for International Settlements.

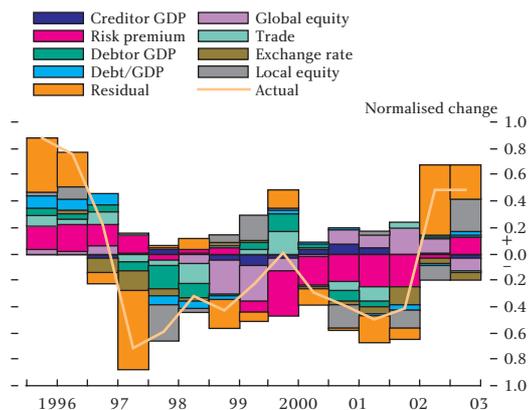
In order to determine just which pull and push factors have the greatest influence on the flow of lending, Chart 3 plots the contribution of each explanatory variable used in the regression, focusing on the period since just before the Asian crisis.

The first point to make is how important risk premia and global equity markets appear in terms of push

factors. This points to the importance of bank risk appetite and investment opportunities in lending decisions.

push-pull framework to assess the determinants of secondary market sovereign bond spreads is presented.

Chart 3:
Relative contribution of individual factors to bank lending flows to EMEs



Sources: Bank of England and Bank for International Settlements.

It is also interesting to note that although the expected positive relationship between trade and banking flows has been found to be statistically significant, the actual contribution of trade to banking flows is not very large. This may be because changes in the volume of trade over the period were in a smaller order of magnitude than changes in other variables. Alternatively, it may be that trade links play a larger role in explaining the level of bank lending, rather than the flows.

Data set and variable selection

The dependent variable in the analysis is the log spread on JP Morgan’s index of emerging market bonds.³ JP Morgan publish two variants of this index: a broader measure (the EMBI Global) which covers a wide cross-section of 27 countries from 1998 onwards, and a narrower measure (the EMBI), which covers only the limited number of Brady bonds and other restructured sovereign instruments, but which is available from 1991. From these two indices, an unbalanced, ragged-edge panel is constructed using the broadest cross-section available at each point in time, consisting of 1,982 monthly observations.

As in the bank flows model, the explanatory variables comprise of country-specific pull variables and external push variables. These are listed in Table 3. The pull variables are intended to capture the debtor country’s financial position and creditworthiness (external debt/GDP, fiscal surplus/GDP), as well as its ability to service its foreign debt (trade openness, amortisation/reserves, current account/GDP). The push variables capture the cost of purchasing EME bonds (yields on short- and long-term US debt), investor risk appetite (spread on BB and BBB bonds), and the macroeconomic environment in which the investment community operates (US equity index).

Notwithstanding the contribution made by push factors, pull factors, particularly those indicating growth of EME economies, such as debtor GDP and local equity indices, have a significant influence on bank lending flows to EMEs. This is less the case when explaining EME sovereign bond spreads.

Similar to the banking flows model, the relationship between the creditor-country’s macroeconomic performance and EME spreads is theoretically unclear: better financial performance (as proxied by higher US equity indices) may create wealth effects, but may also act to divert capital towards these strongly performing markets.

A push-pull framework for explaining bond spreads to EMEs

Early empirical literature on the determinants of the price of credit to EMEs focused exclusively on pull factors affecting the risk of borrower default (eg Edwards (1984), (1986)). The importance of push factors such as global risk-free interest rates was explored only relatively recently.² In this section, work done within the Bank of England that utilises a

The effect of long-term yields on bond spreads is also theoretically unclear. On the one hand, rising yields are associated with rising borrowing costs to EMEs and, potentially, wider spreads. On the other hand, rising long-term yields may result in a steeper yield curve if short-term yields do not, or are not expected, to rise (at least by the same rate as long-term yields). This has, in the past, been associated with greater

2: For example, Eichengreen and Mody (1998a,b), Kamin and von Kleist (1999), and Dell’Ariccia, Schnabel and Zettelmeyer (2000).

3: The use of secondary market bond spreads avoids the critique of Eichengreen and Mody (1998b) that studies using primary spreads are subject to a selectivity bias as the creditworthiness of primary issuers will vary with financing conditions.

investor leveraging, as investors ‘search for yield’ by borrowing short in domestic markets and investing in higher-yielding, longer-term debt such as EME bonds, thereby compressing spreads.⁴

Table 3:
Push-pull explanatory variables of changes in EME bond spreads^(a)

Variable	Rationale	Expected effect on spreads
<i>Pull</i>		
External debt/GDP	The higher the external debt burden, the more likely a country is to become insolvent.	+
Budget surplus/GDP	The larger the budget surplus, the more likely the sovereign can meet repayments. Also a measure of solvency insofar as lax fiscal policy endangers a sovereign’s financial position.	-
Trade openness	The more open an economy is, the greater in the foreign income with which to meet debt repayments.	-
Amortisation/reserves	The higher the amortisation and interest payments on external debt relative to foreign exchange reserves, the greater the likelihood the sovereign will fail to meet them.	+
Current account/GDP	The larger the current account surplus, the more able the sovereign will be to finance its external debt.	-
<i>Push</i>		
Yield of 30-day US T-bill	The higher the short-term interest rate, the greater the borrowing cost for the sovereign and the higher the probability of default.	+
Yield of ten-year US government bond	A steeper US yield curve raises borrowing costs of EMEs. On the other hand, it increases incentives for leveraged investors to buy EME debt.	?
Yield spread on low/high rated US corporate bonds	The higher the spread, the lower the risk appetite of creditors.	+
US S&P 500 equity index	Strong equity performance suggests strong growth in creditor country and may result in greater investment abroad. However, it may also mean domestic investment opportunities become more attractive.	?

Sources: World Bank, IMF, IIF, governments and central banks.

(a) In most cases monthly observations generated by linear interpolation of annual/quarterly data.

Estimation and results

The relationship between the push-pull factors and secondary sovereign spreads was estimated over the period December 1991 to March 2003, using a pooled mean group estimator (PMG) as developed by Pesaran, Shin and Smith (1999). This is a dynamic error-correction model that can conceptually be broken down into two parts: a long-run component,

which restricts coefficients to be equal across all countries, giving the long-run equilibrium relationship between push-pull factors and the average level of spreads on sovereign debt; and a short-run adjustment component, which captures the dynamics of the process by which short-run shocks to the underlying factors affect bond spreads, and which is allowed to vary across countries.⁵ As the purpose of this article is to examine the general relationship between push-pull factors and spreads, this section will focus on the long-run component of the model. This also makes the analysis consistent with the bank flows model presented in the previous section.

Table 4 shows the main results of the PMG estimation. Most regression coefficients are statistically significant and with the expected sign. The key result is that the coefficients on external push factors are highly significant. In particular, short-term US interest rates (30-day yields) have a large significant positive effect on EME spreads. This is consistent with the theoretical relationship between global interest rates and EME spreads as outlined in Kamin and von Kleist (1999). The hypothesis is that lower global risk-free rates make risky debt look more attractive on a yield basis, lower the cost of borrowing of EMEs (and hence solvency risk), and increase investor risk tolerance. This is also consistent with earlier empirical findings, such as Arora and Cerisola (2001).

Higher long-term US interest rates (ten-year yields), however, are found to have a strong negative impact on EME spreads. This contradicts the findings of Arora and Cerisola (2001), who find a positive relationship, but is consistent with others, such as Eichengreen and Mody (1998a) and McGuire and Schrijvers (2003). The result suggests that, on average, during the sample period, the effect of the steeper yield curve on leveraged investors’ incentives was greater than the impact of the long-term cost of borrowing to EMEs, as discussed earlier.

Chart 4 plots long-run equilibrium spreads predicted by the model with actual spreads for the countries in the sample between January 1992 and April 2004. The chart shows there are two main periods during the sample period where market spreads have been significantly and consistently below the model’s

4: IMF Global Financial Stability Report, 2004.

5: See Ferrucci (2003) for a full exposition of the estimation techniques and issues.

long-run equilibrium level. These were in 1993–1994 and in 1996–1998, which were both followed by sharp corrections in bond prices.

Table 4:
Coefficient estimates (long-run) of push-pull factors on changes in EME spreads^{(a)(b)(c)}

Variable	Coefficient (Standard error)
External debt/GDP	0.25 (0.12) ^(d)
Budget surplus/GDP	-0.72 (0.58)
Trade openness	-0.37 (0.11) ^(e)
Amortisation/reserves	0.19 (0.06) ^(e)
Current account/GDP	0.14 (0.35)
Yield of 30-day US T-bill	8.88 (1.39) ^(e)
Yield of ten-year US government bond	-8.00 (2.13) ^(e)
Yield spread on low/high rated US corporate bonds ^(f)	-0.44 (0.18) ^(e)
US S&P 500 equity index ^(g)	-0.6 (0.12) ^(e)
Constant ^(a)	0.78 (0.12) ^(e)
Error correction term ^(a)	-0.15 (0.02) ^(e)
Observations	1982
Cross-sections	23
Overall R-squared ^(h)	0.4
RBAR-squared ^(h)	0.21
Standard deviation of regressions ^(h)	0.065
No. of model parameters	262

Sources: Bank calculations, World Bank, IMF, IIF, governments and central banks.

(a) Dependent variable: log of spreads. PMG estimation technique. Sample period: Dec. 1991 to Mar. 2003.

(b) A fixed lag of one selected for all countries.

(c) The Schwarz-Bayesian criterion used to select the appropriate lag orders for each country, conditional on a maximum lag of two. Two countries (Côte d'Ivoire and Croatia) excluded from the EMBI index in estimations.

(d) Significant at 1%.

(e) Significant at 5%.

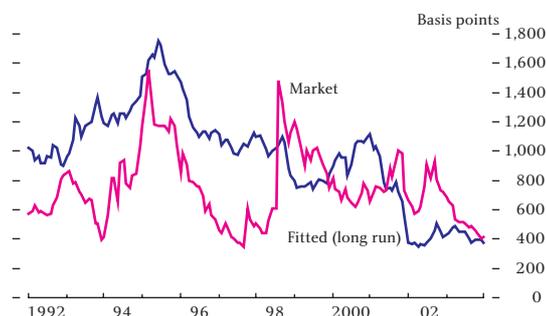
(f) Log value.

(g) Average of country-specific coefficients.

(h) Average of country-specific statistics.

The equilibrium level of spreads fell sharply between January 2001 and March 2002, in line with sharply declining US short-term interest rates. Actual spreads also fell somewhat during that period, but rose sharply during the summer of 2002, mainly in response to the Brazilian crisis. In October 2002, spreads began to narrow significantly and consistently, and by January 2004 were at levels in line with the long-run equilibrium.

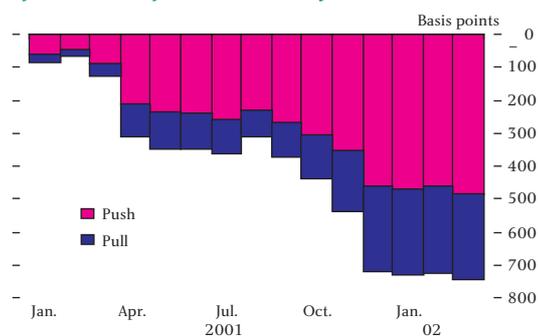
Chart 4:
Actual versus model-fitted spreads



Sources: Bank calculations and JP Morgan Chase & Co.

Chart 5 plots the cumulative contribution to changes in long-run equilibrium spreads for push and pull factors during the period from January 2001 to March 2002, when the equilibrium level was falling. It is clear that push factors are the more significant determinant during the period, explaining two-thirds of the fall in the equilibrium level of spreads.

Chart 5:
Cumulative contribution to reduction in long-run equilibrium spreads, January 2001 to March 2002



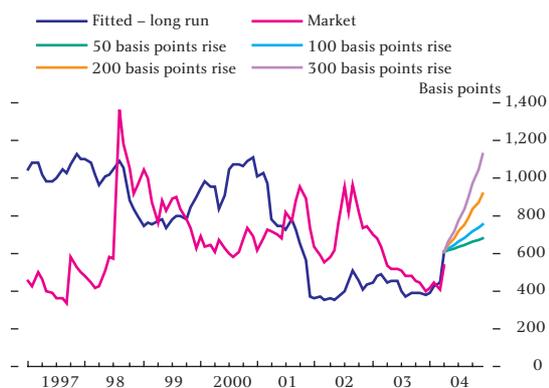
Sources: Bank calculations and JP Morgan Chase & Co.

The fact that push factors are more significant in explaining changes in equilibrium bond spreads than banking flows has an intuitive appeal. This may reflect the bank-borrower relationship, which is longer term and the importance of which reduces the weight put on lending decisions of factors such as alternative investment opportunities relative to borrower specific considerations.

Of the push factors, the model appears to be highly sensitive to short-term interest rates, which have a significantly positive impact on spreads, as noted earlier. To illustrate this point, Chart 6 plots the equilibrium level of spreads predicted by the model

assuming various movements in the short-term yield by end-2004, holding all other factors equal.

Chart 6:
Sensitivity of long-run equilibrium spreads to changes in short-term interest rates



Sources: Bank calculations and JP Morgan Chase & Co.

Limitations of the push-pull framework

The models presented here have focused on long-run relationships between push-pull factors and credit to EMEs. Some deviation between the observed and predicted values for banking flows and changes in spreads is to be expected due to noise in the short-run data. However, the push-pull models omit factors that plausibly could explain a systematic divergence between actual banking flows and spreads from those predicted.

To begin with, the models assume efficient markets and perfect information. Incomplete information and time-lags in the receipt of information may mean that banks and investors do not react to certain push-pull factors immediately. This is exacerbated by the possibility that, as explained in Calvo and Mendoza (1995), high information costs and relatively low exposures (as may be the case in EMEs) reduce incentives to monitor and process information.

Incomplete information and poor incentives to monitor may also contribute to herding behaviour. Such behaviour can act to both fuel exuberance during good times, and accentuate flight during bad times. This may explain some of the exuberance in the run-up to the Russian crisis evidenced by greater-than-predicted banking flows, and lower-than-predicted spreads, as well as the sharp fall-off in both post-1998.

The models also only take into consideration just one side of the price/quantity equation: the supply of bonds is related to external financing conditions, and as the supply will also affect the price, it is likely that the omission of supply considerations will have contributed to some deviation from equilibrium spreads. Equally, the interest charged on bank loans will affect the demand for such loans.

The models also do not take into account certain aspects of investors' long-term strategy. For example, bank strategy in the mid-1990s shifted towards expansion of local lending in EMEs via direct participation in local financial systems via foreign direct investment. This was motivated by a number of factors, including new investment opportunities in these markets, profit potential in underdeveloped financial systems, home market saturation, and geographical risk diversification (see Soussa (2004) for a discussion of these). This increase in local lending is commonly believed to have been at the cost of cross-border lending, perhaps explaining some of the fall-off post-1997.

Finally, the models do not take into account moral hazard. Dell'Ariccia, Schnabel and Zettelmeyer (2002) describe the potential impact of IMF lending on investors' lending decisions. A perception by investors that the IMF will 'bail out' a country when it gets into trouble may reduce the risk premium required by investors to hold that country's debt, reducing the spread beyond the long-run equilibrium level.⁶ The same could be true for banking flows, especially where these are to state-owned banks or enterprises, implicitly guaranteed by the sovereign.

Conclusions

The volatility of capital flows to EMEs in the past has often resulted in episodes of wide-spread financial instability that have been costly to both EMEs and developed countries. The Asian crisis and Russian default are two cases in point. In this article, two studies were presented which add to the growing body of literature that attempts to explain this volatility in a push-pull framework, going beyond traditional explanations of flows which focused exclusively on pull factors such as borrower creditworthiness.

The main lesson to be drawn is that banking flows and bond spreads are both significantly influenced by

6: Haldane and Schiebe (2004) also discuss creditor moral hazard.

push factors, although banking flows relatively less so, possibly due to the nature of the bank-borrower relationship. This implies a need for caution by EMEs in borrowing too heavily during times of a benign external financing environment, as a reversal in credit conditions is more often than not beyond the control of the borrower. While capitalising on a benign financing environment through, for example, pre-financing may be sensible, it is important to bear in mind that what is a sustainable level of leverage during good times is potentially unsustainable over a longer horizon, regardless of the creditworthiness of the borrower.

This point is illustrated particularly well by recent movements in EME bond spreads. While fundamentals in EMEs have continued to be strong, the expectation of rising US short-term interest rates has widened spreads since the early part of the year, in line with the predictions of the model presented earlier.

However, while sensitivity to push factors is apparent, the models show that pull factors are also important, particularly for banking flows, suggesting that the improvement in EME fundamentals witnessed over the past few years should mitigate the extent to which push factors result in a deterioration of external credit conditions.

Annex

The banking flows model consists of a constrained system of debtor equations using a seemingly unrelated regressions methodology (see Zellner and Theil (1962)). More formally, for each debtor i :

$$y_{it} = \sum_{j=1}^J \beta_j \chi_{jit} + \varepsilon_{it}$$

$$i=1,2,\dots,N; t=1,2,\dots,T$$

where y_{it} is a $T \times 1$ vector of BIS-bank aggregate cross-border lending observations for debtor i at time t ; χ_{jit} is a $T \times J$ matrix of observations on explanatory variables j for debtor i at time t ; β_j is a $J \times 1$ vector of coefficients, and ε_{it} a $T \times 1$ vector of disturbances. The disturbance and explanatory variables within each debtor equation are assumed to be uncorrelated. But across equations, to reflect common shocks, errors are assumed to be correlated contemporaneously, ie $E[\varepsilon_{it}] \neq 0 = \sigma_{ij}$. Zero correlation is assumed between all lagged disturbances. The model can be estimated by feasible GLS and coefficient estimates are asymptotically valid in the number of time dimensions.

The full bond spreads model's specification for country i at time t is:

$$\Delta \log s_{it} = \phi_i \left[\log s_{it-1} - \alpha_i - \sum_{j=1}^J \beta_{ji} \chi_{jit} \right] - \sum_{j=1}^J \gamma_{2ji} \Delta \chi_{jit} + u_{it}$$

where the term in square brackets in this equation is the long-run relationship and the β_{ji} are the long-run elasticities. The assumption of long-run commonalities in the equilibrium relationship (pooled model) requires that β_j applies to all cross-sections i ; that is constant long-run slope coefficients for all cross-sections. The error correction coefficient (ϕ) and the short-term elasticities (γ_{2ji}) are unrestricted and are allowed to vary in each. However, as discussed, the focus of the article is only on the long-run component of the model, which can be expressed in its general form as:

$$\log s_{it} = \alpha_i + \sum_{j=1}^J \beta_{ji} \chi_{jit} + \varepsilon_{it}$$

The bond spreads model, when looked at in the long run only, is therefore directly comparable to the banking flows model.

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Structured note markets:

products, participants and links to wholesale derivatives markets

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Hedging and taking risk are the essence of financial markets. A relatively little known mechanism through which this occurs is the market in structured notes, which have embedded derivatives, some of them very complex. Understanding these instruments can be integral to understanding the underlying derivative markets. In some cases, dealers have used structured notes to bring greater balance to their market risk exposures, by transferring risk elsewhere, including to households, where the risk may be well diversified. But the positions arising from structured notes can sometimes leave dealers 'the same way around', potentially giving rise to 'crowded trades'. In the past that has sometimes been associated with episodes of market stress if the markets proved less liquid than normal when faced with lots of traders exiting at the same time.

FOR CENTRAL BANKS, understanding how the modern financial system fits together is a necessary foundation for making sense of market developments, for understanding how to interpret changes in asset prices and, therefore, for identifying possible threats to stability and comprehending the dynamics of crises. Derivatives are an integral part of this, used widely for the management of market, credit and other risks. The associated positions and hedging strategies of banks and dealers are an important influence on how markets respond to changes in underlying fundamentals. It is perhaps less familiar that derivatives are also used by investors to take market risk in search of additional returns – often via bonds known as structured notes.

Some investors purchase such notes in order to obtain initial coupons that exceed market interest rates, receiving upfront premia for, in effect, writing options embedded in the notes. It is perhaps no coincidence that they have been as popular in recent years as they were in the early 1990s, both periods of low short-term interest rates in major currencies when some investors have been 'searching for yield'.¹ In 1994, a number of investors suffered highly publicised losses on holdings of structured notes when US interest rates rose significantly (Box 1).

For issuers, structured notes can be a way of buying options to hedge risks in their business. Most, however, swap the cash flows due on the notes with a dealer for a more straightforward set of obligations. In economic terms, the dealer then holds the embedded options. Sometimes they may hedge existing exposures taken elsewhere in a dealer's business. Alternatively, the dealer may seek to hedge by buying or selling similar options in the inter-dealer derivatives markets or through 'dynamic hedging' in the underlying cash markets. To a significant extent, so-called 'exotic' derivatives markets have developed hand-in-hand with the production and distribution of increasingly complex structured notes as intermediaries compete to offer investors new combinations of risk and return. Potentially, trading of exotic derivatives fills some 'missing markets', leading to a more efficient distribution of risk (as well as yielding information that can be valuable to central banks and others). But liquidity in such markets can still be shallow and may dry up in stressed conditions, complicating risk management.

After describing the structured note markets and discussing the motivations of investors and issuers, this article analyses the links to wholesale derivatives markets and identifies some issues relating to financial stability.

1: See the 'Conjuncture and Outlook' section of this *Review* for a discussion of the 'search for yield'.

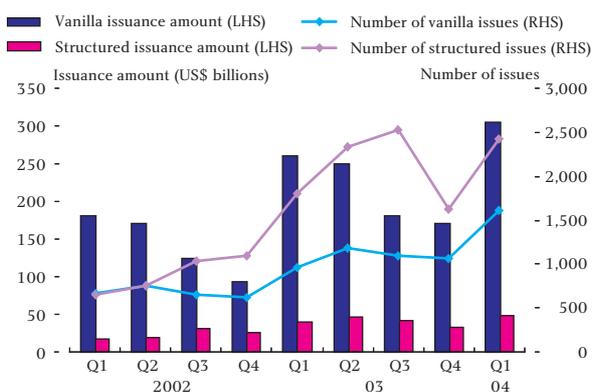
Market structure and size

Broadly, a structured note can be defined as a bond (potentially, fixed rate, floating rate or zero coupon) combined with one or more options or forwards linked to market prices or indices. They have existed for many years, but the variety of structures is almost limitless and constant innovation, at least at the level of ‘bells and whistles’, is a feature of the market.

They can take a variety of contractual forms, depending largely on the nature of the target investors (eg, nationality, regulatory and tax status). Most innovation in the structured note markets in recent years, however, has been through issuance of Euro medium-term notes (MTNs) distributed internationally.

Estimating the size of the market globally is difficult, partly because structured notes come in various forms. Data sources for new issuance of structured Euro MTNs suggest that they comprised around 15% of total MTN issuance by value in 2003 (Chart 1). But the value of outstanding structured MTNs is hard to determine because they are often callable by the issuer after an initial period (eg, twelve months). In terms of numbers of notes rather than values, more structured than vanilla MTNs are typically issued.

Chart 1:
Issuance of vanilla and structured Euro MTNs

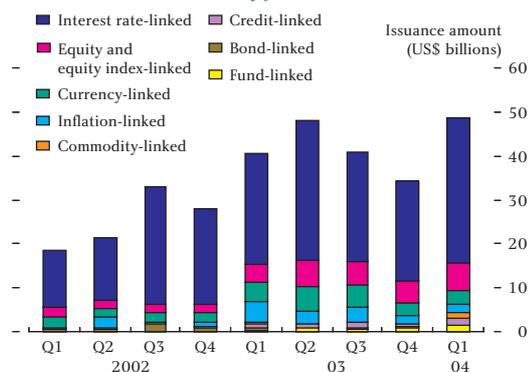


Source: mtn-i.com.

They are linked to almost every conceivable type of financial asset price, and other variables too: interest rates, equity prices, commodity prices, credit events etc (Chart 2). And they range from the relatively straightforward to immensely complex. As background to the discussion of what motivates investors and

issuers and of the links to derivatives markets, the Annex summarises the main types. The nature of the market risk exposures being transferred gives some idea of the associated exposures of dealers and investors.

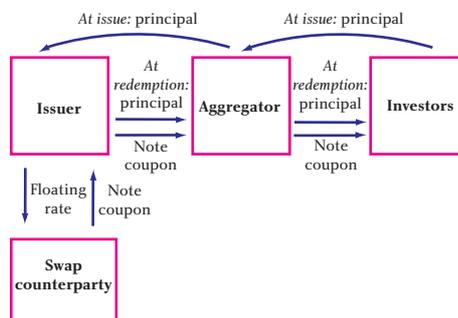
Chart 2:
Issuance of different types of structured Euro MTNs



Source: mtn-i.com.

Participants in the market include investors, issuers, swap counterparties, arrangers and distributors/aggregators. Issuers frequently enter into a swap to receive the cash-flows on the note and pay a more straightforward floating interest rate, such as a spread relative to LIBOR. Often, but not always, the swap counterparty is the dealer that arranges and distributes the notes (the arranger).² Finally, where the notes are being distributed to retail investors, they may be sold initially to distributors such as retail banks (sometimes called ‘aggregators’ because they pool together the exposures of many small investors), which will usually repackage them into retail financial products, such as tax-efficient deposits or life insurance policies (Diagram 1).

Diagram 1:
Typical structured note cash-flow structure with aggregator



2: For example, Japanese banks have been frequent arrangers of power reverse dual currency notes (see Annex) but rarely the swap counterparties.

Investors

Broadly, there are three main groups of structured note investors: high-net-worth individuals, financial institutions and retail investors.

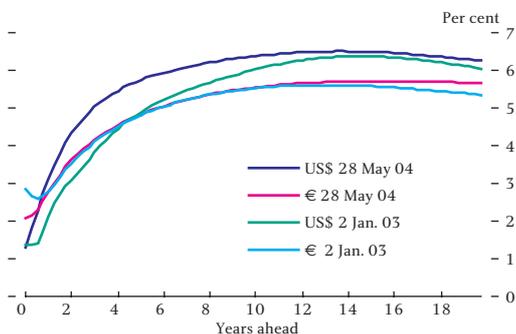
The precise pattern of demand, for each of these groups, affects the shape of dealers' derivative portfolios.

High-net-worth individuals

Many structured notes are issued in small denominations (eg, less than US\$ 10 million) for sale to high-net-worth individuals. Private banks will often approach dealers, or sometimes aggregators, on behalf of their customers in search of a particular target yield and with ideas about the nature of the risks they want to take (called 'reverse enquiry' because the initiative comes from the investor rather than the issuer or arranger). Dealers then compete to offer notes with structures that meet these requirements. Some individuals also approach dealers directly.

In the past couple of years, contacts suggest that the biggest purchases of Euro MTNs by high-net-worth individuals have been of US dollar and, more recently, euro-denominated notes – predominantly by Asian and Middle Eastern investors, as well as by customers of Swiss private banks. For the most part, these investors have been buying notes linked to US dollar or euro interest rates, selling embedded interest rate options in order to enhance the initial coupon, perhaps taking a view that interest rates would not increase as quickly as implied by the forward yield curve (Chart 3).

Chart 3:
Interest rate forward yield curves^(a)



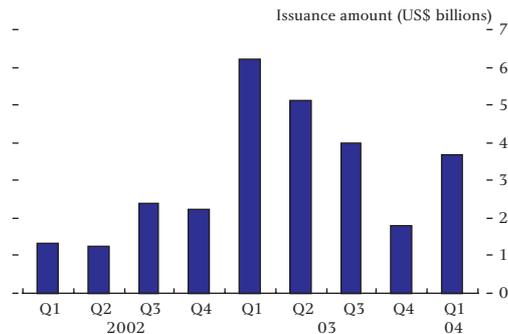
Source: Bank of England.

(a) Three-month forward nominal interest rates, derived from the Bank's bank liability curve.

A rise in such individuals' purchases appears to lie behind the increased issuance of such notes in 2002

and 2003, both in absolute terms and as a proportion of the structured note markets. For example, almost all US dollar-denominated range-accrual notes – the most frequently issued type of structured Euro MTN in 2003 – are said to have been bought by private investors (Chart 4).

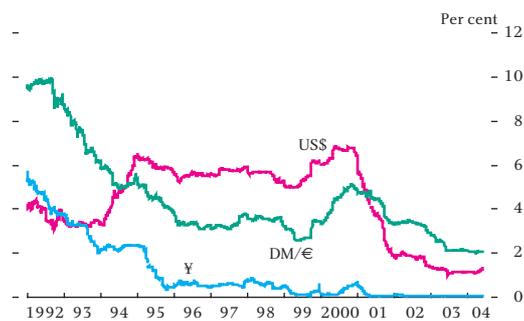
Chart 4:
Issuance of range-accrual Euro MTNs



Source: mtn-i.com.

In the US domestic market, purchases of callable notes by private investors are also said to have increased markedly. This appears to have been one manifestation of the so-called 'search for yield'. Against a background of low short-dated US interest rates (Chart 5), obtaining premia for writing interest rate options has been one way of enhancing initial coupons, taking the risk of possible sub-market returns in the future.

Chart 5:
International three-month interest rates



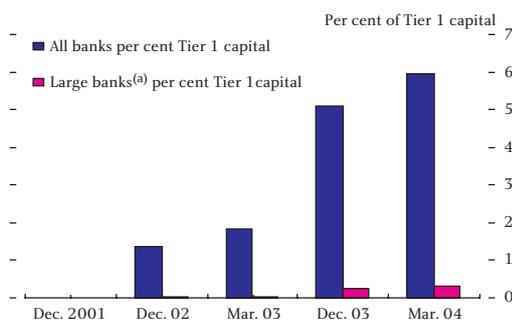
Source: Bloomberg: 3-month British Bankers Association fixings for US\$, Deutsche mark/€ and ¥.

Financial institutions

As well as high-net-worth individuals, financial institutions such as insurers, pension funds and small regional banks have also been buyers of structured notes as part of the recent 'search for yield'. In the United States, for example, a number of regional

banks and brokers in states such as Arkansas and Tennessee specialise in the distribution of callable bonds to smaller US banks and financial institutions. They have become significant players in that market and, relative to their capital, smaller US banks have bigger holdings of structured notes than do larger ones (Chart 6).

Chart 6:
Holdings of structured notes by US insured commercial banks



Source: Federal Financial Institutions Examination Council Uniform Bank Performance Report.

(a) 'Large banks' have total assets of more than US\$3 billion.

But a rather different motivation lies behind the large purchases of structured notes in recent years by European and Asian life insurance companies. As discussed in various issues of this *Review*, many have sold retail products with guaranteed nominal returns – in effect, they have sold options to their customers. These guarantees can take various forms, such as minimum returns on savings products and guaranteed annuity rates, and are often long-dated.

Although such guaranteed rates were adjusted downwards for new business as Asian and European nominal interest rates declined in recent years (Table 1), many insurers have liabilities under older contracts that guarantee returns above current risk-free interest rates.

Strategies for dealing with this problem appear to have taken two forms: either taking risk in their asset portfolios in search of above-market returns sufficient to meet the cost of their liabilities, or seeking to hedge the options they have sold by buying similar options. Insurers have used structured notes with embedded interest rate options for both purposes.

European and Asian insurers are said to be the biggest buyers of long-dated, zero-coupon US dollar and euro callable bonds – in effect, selling interest rate options to obtain higher yielding assets. They are also said to have been purchasers of other relatively high-yielding structured notes, such as equity-linked notes, credit-linked notes and notes linked to funds of hedge funds. But insurers have also used structured notes in order to *purchase* embedded long-dated interest rate options as hedges. For example, European insurers have been large purchasers of euro-denominated volatility or 'vol' bonds and bonds with interest rate floors linked to constant maturity swap (CMS) rates.³

Table 1:
Typical guaranteed interest rates on selected European life insurers' long-term savings products in 2002 compared with earlier periods

Country:	Per cent: Previous	When changed	2002
Denmark	3.0	1999	2.0
Finland	4.5	1998	3.5
Germany	4.0	2000	3.3
Italy	4.0	1997	3.0 ^(a)
Netherlands	4.0	1999	3.0
Portugal	—	1995	4.0
Spain	3.2	2002	3.1
UK	—	n/a	1.0 ^(a)

Source: European Commission 'Report of the working group on life assurance to the Insurance Committee solvency subcommittee'.

(a) Upper value of range.

Insurers may have a variety of reasons for purchasing structured notes rather than buying or selling options directly. First, they may be subject to regulatory or other prohibitions on using derivatives or making certain types of investment (eg, in hedge funds) but they may be able to purchase bonds. Second, they may prefer to purchase bonds rather than derivatives because accounting standards allow them to value bonds intended to be held until maturity at historical cost whereas derivatives might need to be marked to market. For example, some German insurers are said to prefer structured notes in the form of what are called *Schuldscheine* (promissory notes) because they are not required to mark such notes to market. Third, structured notes may offer exposures that institutions cannot easily acquire in other ways – for example,

3: A swap rate is the fixed interest rate which can be exchanged in the interest rate swap market for a series of floating rate payments (eg, LIBOR) until an agreed maturity date. Structured notes with coupons linked to CMS rates have coupon payments that depend upon the level(s) of swap rates prevailing in the market at one or more particular constant maturities at each coupon date. So, for example, the coupon might reset annually depending on the level of ten-year swap rates observed in the market on each date.

investing in commodity indices. Finally, life insurers and other asset managers with funds to invest may simply find it convenient, in effect, to combine the purchase/sale of derivatives with a purchase of a bond.

Retail investors

Savings products sold to individuals on the 'high street' by retail banks, financial advisers and others (eg, post offices and national savings banks) are often either directly backed by structured notes or hedged by structured notes purchased by the distributor or 'aggregator'. Typically, they are presented in tax-efficient forms, eg, life insurance policies in Italy or deposits such as individual savings accounts (ISAs) in the United Kingdom. Recently the biggest national markets are said to have been Italy, France and Belgium. Often such notes involve investors *buying* embedded options, so that they might obtain upside exposure to, for example, the equity market but with limited downside risk and/or principal protection. But market contacts report that issuance of principal-protected notes is not as significant in the United States, mainly on account of the large and diverse equity mutual fund sector.

The market for such notes is driven to a large extent by the current preferences of retail investors. For example, issuance of structured notes with returns linked to correlation between different equities or equity indices grew on the back of demand for such retail products offered by, amongst others, French banks since the late 1990s. In 2003, growth in issuance of structured notes linked to euro-area consumer price inflation is said to have been, in large part, a reflection of demand from Italian retail investors, who have been purchasing products with embedded purchased equity or other options and with some guarantee of the real (not just nominal) value of the principal.

Issuers

For the most part, issuers of structured notes are highly rated because investors want to take risk on the structure, not the issuer. So they are typically banks, other financial institutions, international organisations and agencies guaranteed by national governments (Table 2). They can be split into two categories, according to their motivations.

Hedging market risk exposures

Some issuers deliberately retain the associated exposures to market risk as a way of hedging exposures in the rest of their portfolio. For example, the European Investment Bank's notes linked to UK retail price inflation may partially hedge inflation-linked cash-flows in its loan book. On a larger scale, the Federal Home Loan Banks, Fannie Mae and Freddie Mac are very large issuers of callable notes as a way of purchasing interest rate options in order to hedge the prepayment risk on their holdings of US home mortgages.⁴

Table 2:
Top 15 issuers of structured Euro MTNs in 2003 and their credit ratings

	Moody's ^(a) credit rating	US\$ millions	Issues
Rabobank Nederland	Aaa	9,223	355
Kreditanstalt für Wiederaufbau	Aaa	8,133	328
Lloyds TSB	Aa2	7,324	613
European Investment Bank	Aaa	7,213	112
BNP Paribas	Aa2	6,229	764
CDC IXIS	Aaa	5,353	327
Compagnie de Financement Foncier	Aaa	4,173	65
Royal Bank of Scotland	Aa2	4,015	364
HSH Nordbank	Aa1	3,908	86
Bayerische Landesbank	Aaa	3,835	143
Commonwealth Bank of Australia	Aa3	3,682	273
Landesbank Rheinland-Pfalz Girozentrale	Aa1	2,742	30
Credit Lyonnais	Aa2	2,718	456
Dekabank Deutsche Girozentrale	Aaa	2,469	4
Depfa-Bank Europe	Aa2	2,440	221

Sources: mtn-i.com and Moody's Investors Services.

(a) Rating on senior unsecured or long-term foreign issuer debt as of June 2004.

Borrowing costs

Most issuers, however, are more passive, simply seeking to borrow inexpensively or to diversify their sources of funding. Once they have established an MTN programme, they are approached by dealers with offers of structures together with a swap so that the issuer's cost of borrowing is linked to a floating interest rate such as LIBOR.

Reflecting the attractive rates sometimes available, they have become a significant part of the wholesale funding of some large international organisations and banks, including a few large UK banks (Table 3). So

⁴ See the box on page 72 of the June 2002 Bank of England *Financial Stability Review*. An issue for these institutions is that US mortgages can typically be prepaid at any time (American options), whereas structured notes generally have European or Bermudan call options, which can be exercised at specific times only, making them an imperfect hedge.

grasping the dynamics of the structured note market has become one element in understanding how banks manage their liquidity.

Table 3:
Issuance of Euro MTNs by some UK financial institutions in 2003

	US\$ millions	Issues
Abbey	878	65
Barclays	45	5
Bradford & Bingley	5	1
HBOS	312	22
HSBC	2,332	215
Lloyds TSB	7,324	613
Northern Rock	5	1
Royal Bank of Scotland	4,015	364

Source: mtn-i.com.

Because of the swaps, issuers should not be exposed directly to market risk arising from the structure. But they do have potential exposure to the swap counterparty. This can be long-dated and difficult to value given the complexity of some notes; third party pricing services have emerged specialising in independent valuation of such swaps. In line with practice in the swaps market more generally, issuers will often demand collateral from dealers against any significant mark-to-market exposures on the swaps.

They are also exposed to some liquidity risk. Many structured notes are relatively long-dated but have call options exercisable at much shorter maturities. Issuers can, in principle, choose not to exercise call options if they are under liquidity pressure, even if the options are in-the-money, but the swap counterparty will have an identical option to cancel the swap, which it is likely to exercise in such circumstances. Choosing not to call the note would therefore leave the issuer exposed to the market risks arising from the structure over the remainder of its life.

Links to wholesale derivatives markets

As swap counterparties and arrangers, the market risks associated with structured notes are usually taken on by dealers, such as securities firms, banks or the financial products arms of a few large insurance companies. Dealers may manage these risks as part of their overall portfolio, finding existing hedges for the various dimensions of risk elsewhere in their book; or

they may seek to hedge in the wholesale markets. This might mean dealing in identical offsetting traded options if they exist. Or it might imply dealing in non-identical options thought to hedge some dimensions of the risk while not hedging some residual risks, eg, a mismatch between option maturities or differences in the definition of the underlying variable or hedging an American option with European options. Or it might mean hedging the option dynamically by buying and selling the underlying instrument (so-called 'delta' hedging).

Dealers will sometimes set out to influence the design of a structured note with the intention of obtaining market risk exposures that more or less offset existing exposures that they cannot hedge easily in wholesale markets or using other instruments. For the most part, however, the pattern of issuance is said to be driven by investor preferences – what risks they are prepared to take, what returns they are seeking and how these can be accommodated given current market prices, particularly the level of interest rates, the shape of the yield curve and the prices (implied volatilities) of different options. Innovation to find new structures that attract investors is a feature of the market, but returns to innovation are said to dissipate quickly as new structures are matched by competitors.

Demand from dealers to hedge positions arising from structured notes has encouraged the development of a number of wholesale markets. These include:

- Markets in financial variables such as inflation and real interest rates on the back of notes linked to euro-area consumer price inflation.⁵
- Trading of options exercisable on dates far into the future. For example, hedging of power reverse dual currency notes (PRDCs; see Annex) has led to trading of five- and ten-year US dollar/yen options; the market for 15-year options on 15-year euro swaps has grown partly as a result of hedging of structured note positions; and longer-dated equity-index options have developed in part to hedge equity-linked notes.
- Trading of deeply out-of-the-money options. For example, hedging of PRDCs has encouraged trading of US dollar/yen options at strikes of 90 and lower;

⁵: See the box on 'Inflation-protected bonds and swaps' on pages 124 and 125 in the 'Markets and Operations' section in the Summer 2004 *Quarterly Bulletin*.

and issuance of inflation-protected notes has led to trading of consumer price inflation floors at 0% in some currencies.

- Trading of exotic options with terms linked to those embedded in structured notes. For example, constant-maturity swaptions; and forward-starting options (eg, an equity-index put option exercisable two years ahead with a strike price fixed at the level of the index one year ahead – in effect, the buyer of the option is exposed to the performance of the index in year one and benefits from any rise without exposure to a fall in year two).

With a few exceptions⁶, the positions arising from structured notes can tend to leave dealers ‘the same way around’ – for example, they are either buying or selling particular types of option. Whether this imbalance leads to a corresponding imbalance of supply and demand in the market in the underlying financial instrument depends upon the scale of structured note issuance relative to that of the underlying derivative market. Broadly, an imbalance is more likely if the underlying markets for the embedded options and/or underlying instruments are small, illiquid, difficult to value (and so arbitrage) or already imbalanced in the same direction. In principle at least, crowded trades in illiquid markets, especially if combined with leveraged positions, can lead to unusual price volatility and even financial stability problems.

In well-developed and well-arbitrated options markets – such as on short-term interest rates in major currencies or on equity indices at relatively short maturities – flows from structured notes are too small to have any material effect on market pricing or dynamics. For many instruments, the stock of outstanding structured notes is likely to be small relative to outstanding over-the-counter derivative positions (Table 4).

But in less liquid markets – such as for some long-maturity options – flows from structured notes can potentially create or exacerbate a supply/demand imbalance or, alternatively, help to rectify one. At worst, many dealers can be left ‘the same way around’ with little incentive to trade with each other.

Table 4:
OTC options notional amounts outstanding and structured note issuance

OTC options (amounts outstanding US\$ billions)	End	End	End	End
	Jun. 2002	Dec. 2002	Jun. 2005	Dec. 2005
Foreign exchange	3,427	3,238	4,597	5,726
Interest rate	12,575	13,746	16,946	20,012
Equity-linked	1,828	1,944	2,311	3,186
Structured note issuance (US\$ billions)	2002 H1	2002 H2	2003 H1	2003 H2
Currency-linked	5	4	10	8
Interest rate-linked	27	49	57	36
Equity and equity index-linked	4	4	10	10

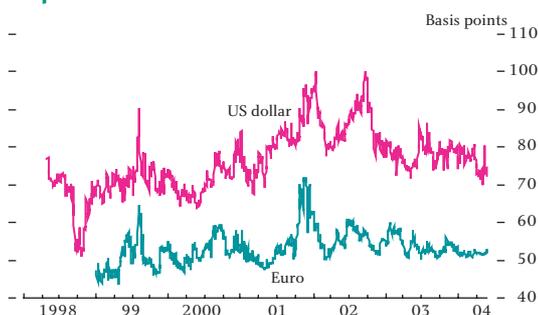
Sources: Bank for International Settlements and mtn-i.com.

The following are examples where positions from structured notes appear to have either moved markets towards or away from balance.

a. Long-dated euro interest rate swaptions

The long-dated euro swaption market is said to be more liquid, with two-way flows, than the equivalent US-dollar market. Consistent with this, the implied volatility of ten-year options to enter into ten-year euro swaps (ten-year/ten-year swaptions) has been lower and less volatile than for equivalent US dollar swaptions in recent years (Chart 7).

Chart 7:
Normalised volatilities of ten-year into ten-year swaptions



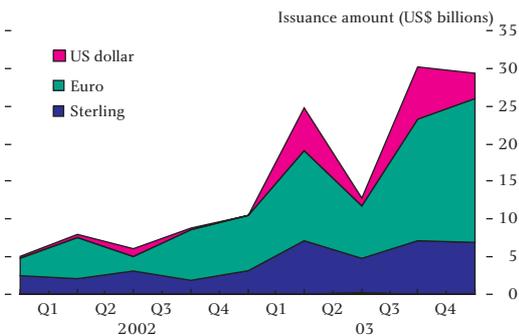
Sources: Bloomberg, Thomson Financial Datastream and Bank calculations.

There has been underlying demand to buy long-dated euro swaptions at times by European life insurance companies seeking to hedge guaranteed annuities. But issuance of long-dated euro callable bonds has enabled dealers to buy options in order to balance

6: Such as long-dated euro interest rates, on which dealers buy options embedded in some types of structured notes and sell them embedded in others.

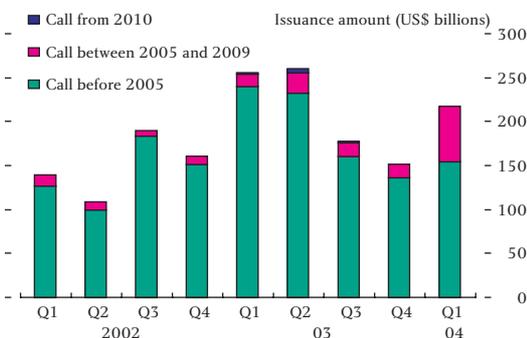
their books (Chart 8). By contrast, US dollar-denominated callable bonds typically have shorter call dates (Chart 9).

Chart 8:
Issuance of international callable bonds with first call dates 2010 or later



Source: Dealogic Bondware.

Chart 9:
Issuance of domestic US dollar callable bonds by first call date



Source: Thomson SDC and Bank calculations.

b. Five-to-ten year US interest rate swaptions

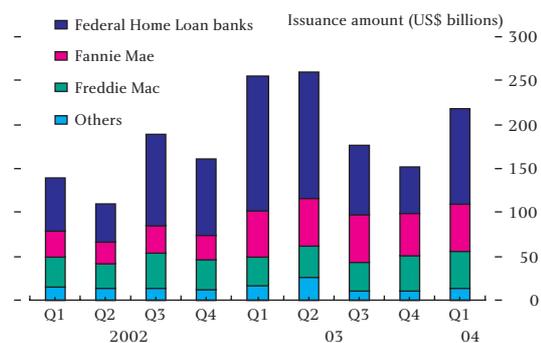
The option for US households to prepay long-dated fixed rate mortgages, free of penalty, leaves mortgage lenders and holders of mortgage bonds 'short' interest rate volatility, with models typically identifying the largest exposures at maturities of 5-10 years. One way in which they can move these books towards balance is to issue notes in which investors sell interest rate options, such as callable bonds. The growth of this market in recent years (Chart 10), has therefore helped to make the US swaption market more balanced at these maturities.

c. Long-dated equity index options

Equity-linked structured notes often involve investors buying near-the-money call options on equity indices and selling longer-maturity out-of-the-money call

options – in effect, they subsidise the purchase of upside exposure to the index by giving up the possibility of very high returns over the life of the note. Dealers are left holding long-dated, out-of-the-money call options, which trade in a relatively small market. Contacts say that the effect has been to lower the price of such options relative to other long-dated options, so that the profile of implied volatility across strikes at different index values has a 'smirk' – relatively higher for low values of the index and lower for high values.

Chart 10:
Issuance of US domestic callable notes



Source: Thomson SDC and Bank calculations.

d. Long-dated US dollar/yen options

The clearest example of an options market influenced by dealers' positions from structured notes – in this case, PRDCs – is that for out-of-the-money US dollar/yen call options. Broadly, PRDCs have left dealers with substantial short option positions. With few natural sellers of such options, particularly at longer maturities, and demand dominated by dealers with the same positions, hedging is difficult and expensive. The interaction between the dealers' hedges and movements in the US dollar/yen exchange rate is complex – broadly, as the yen appreciates, the likelihood of paying a high coupon in the immediate future falls, and the expected maturity of the note increases. But it is likely that a sustained appreciation of the yen would require dealers to buy more options.

Anticipation of this potential demand may help to explain why out-of-the-money yen call options tend to be more expensive (higher implied volatility) than out-of-the-money yen put options. The ratio of these implied volatilities – known as a risk reversal – at various maturities has consequently generally been highly negative in recent years. At shorter maturities in 2003 and early 2004, this may have reflected a perceived balance of probabilities that the yen might

appreciate against the US dollar if the Japanese authorities changed their intervention policy. Indeed, when the US dollar began to appreciate against the yen in March 2004, short-maturity risk reversals did become less negative. But it is striking that longer-maturity risk reversals have remained negative, perhaps reflecting the underlying supply/demand imbalance arising from hedging of PRDCs (Chart 11).

Chart 11:
Risk reversals in foreign exchange options markets



Source: UBS.

Conclusions and issues

Structured note markets are global and multi-faceted. Because virtually any type of market risk can be embedded in a note, the markets touch most wholesale financial markets (equity, bond, foreign exchange, etc.) and embrace a variety of investors, issuers and dealers. In aggregate, flows of funds and risk transfers through the markets are probably quite significant. For the most part, the flow of funds is between investors and issuers but the risk transfer is between investors and, in the first instance, dealers.

For most *issuers*, structured notes are just another way to borrow, although they do pose particular challenges for risk management, such as controlling credit exposures to swap counterparties. They are used by many banks, including in the UK, as part of their funding and liquidity strategy.

For *dealers*, the structured note business is primarily about designing notes with embedded derivatives that investors want to buy or aggregators to distribute. But they have to manage the consequent market risk exposures. This has contributed to the development of a number of wholesale markets, particularly for longer dated, out-of-the-money and exotic derivatives. To the extent that these fill missing markets (and also

provide richer information about market participants' assessment of the probability distribution for the future values of different assets), this is welcome. A challenge for dealers is that different structures tend to be 'hot' at any one time – for example, range-accrual notes and PRDCs during 2003. Different dealers can therefore tend to take on the same market risk exposures at the same time.

In some cases, the underlying markets may be sufficiently liquid to make hedging straightforward. In other cases, the note-related positions may help to balance exposures in other parts of their business. For example, the Federal Home Loan Banks, Fannie Mae and Freddie Mac have issued US dollar callable bonds to hedge exposures to prepayment risk on US household mortgages and mortgage bonds. In effect, they have used structured notes to help re-balance their structural 'short' interest rate volatility position with the US household sector arising from the design of the US mortgage market.

But, in other cases, positions from structured notes may leave dealers 'the same way around', without a liquid underlying market in which to hedge and no offsetting exposures elsewhere in their businesses. The clearest recent example, arising from hedging of PRDCs, has been exposure to long-dated implied volatility in the US dollar/yen exchange rate, particularly in the context of a sustained appreciation of the yen. Potentially, such position concentrations may lead to sharp price movements in the relevant derivatives markets in response to changes in fundamentals. Related hedging flows could even affect underlying markets and indeed crowded trades, particularly when combined with leveraged positions, have been a source of market instability in the past. The Bank highlighted this in the June 2003 *Review*.⁷

Structured note *investors* are heterogeneous, spread across the world and have a variety of motives. But the majority by value are probably private individuals, whether rich people buying notes through private banks or people buying retail financial products on the high street that are backed by notes. Much of the risk transfer is therefore between developed wholesale financial markets and the household sectors in many different countries. For this reason, risk-taking by investors may not pose any direct concerns for financial stability since the exposures are dispersed

⁷ See Box 3 of the 'Conjuncture and Outlook' section on page 43 of the June 2003 *Review*.

Box 1: 1994 and structured notes

Between September 1992 and February 1994, the US Federal Funds target rate was 3%, and the US dollar yield curve was generally upward sloping. Some investors sought to enhance the coupons on their investments by selling interest rate options, including via structured notes, speculating that short-term interest rates would not rise as rapidly as implied by forward rates. In fact, the Federal Reserve raised its target rate to 4.25% by June and to 5.50% by the end of 1994.

By summer 1994, several money market funds sustained major losses on investments in structured notes, in some cases jeopardising the US\$1 net asset value of the funds' shares ('breaking the buck'), with one instance of a money market fund actually doing so. Colorado-based Community Bankers Mutual Fund Inc., which offered a single institutional money market fund, had invested 27.5% of its portfolio in structured notes, specifically adjustable-rate derivative securities. Beginning in March 1994, the value of the notes began to decline as a result of the sharp rises in interest rates. The fund's net asset value fell to 96 cents and resulted in the liquidation of the fund in September of that year, as the sponsor of the

fund could not maintain its net asset value above US\$1. Several other sponsors that employed similar strategies were obliged to support their funds at that time; for example, Paine Webber injected US\$268.0 million into its money market funds and BankAmerica US\$67.9 million. The SEC responded in June by instructing money managers to 'plan to dispose in an orderly manner' of any holdings of several types of structured note that involved investors selling interest rate options, including inverse floaters and range-accrual notes.

More significantly, Orange County, a district in California, declared bankruptcy in December 1994, principally as a result of losses of more than US\$1.5 billion in one of its investment pools. The investment strategy had been to enhance the relatively low short-term interest rates available in the market, by speculating that these rates would continue to remain low for some time. The investment pool not only used leverage to try to enhance returns on their investments, by using securities that had already been purchased as collateral to make further borrowings, but also invested around US\$2.8 billion in structured notes, including inverse floaters.

and outside the financial sector. The types of risk being embedded in structured notes, however, can be an indicator of risk appetite. In recent years, for example, there was a pick up in selling of embedded interest-rate options by investors, probably as one manifestation of a 'search for yield' in response to low levels of short-dated nominal interest rates. There was a similar pick-up in interest-rate related notes in the early 1990s, followed by some highly publicised problems when US official interest rates were increased in 1994 (Box 1).

One group of structured note investors within the financial sector appears to be European and Asian life insurance companies. In some cases, notes are being used to hedge options embedded in the liabilities that arise from their sometimes complex, long-dated retail savings products. In other cases, however, the investors' motive appears to be to receive higher initial coupons by taking more risk. The use of structured notes is said to reflect either restrictions on using derivatives or a desire to avoid

mark-to-market accounting standards for derivatives. Without a fuller picture of their overall assets, liabilities and capital, however, it is impossible to know whether their risk-taking through structured notes poses any wider issues for financial stability.

What is clear is that financial stability authorities need to have a broad understanding of these products and the related derivatives markets if they are to understand the distribution of market risk in modern financial markets.

Annex

Structured note markets

Structured notes can take a variety of contractual forms, depending largely on the nature of the target investors (eg, nationality, regulatory and tax status, etc). For example:

- The large domestic US structured note markets comprise predominantly callable bonds issued by entities with large US mortgage portfolios, including the Federal Home Loan Banks, Fannie Mae and Freddie Mac.
- Structured notes targeted at German investors, particularly life insurers, are often issued in the form of *Schuldscheine*.
- Notes meant for Japanese retail investors may be issued as *Uridashi* bonds.
- Large international banks will also offer customers deposits or certificates of deposit with the characteristics of structured notes.

As discussed in the main text, most innovation in the structured note markets in recent years has been through issuance of Euro medium-term notes (MTNs), which are:

- Bonds of more than one year original maturity, typically issued under programmes governed by overarching ('shelf') legal documentation under English law.
- Denominated in many currencies, but principally in US dollars and euros.
- Physical bearer securities but typically immobilised, with transactions settled over accounts at the international central securities depositories Euroclear and Clearstream.
- Private placements or listed on stock exchanges (eg, Luxembourg or Dublin). But, either way, they can be issued quickly and relatively inexpensively. This is particularly important because structured MTNs are often for small amounts and need to be issued quickly to meet the wishes of one or more particular investors.

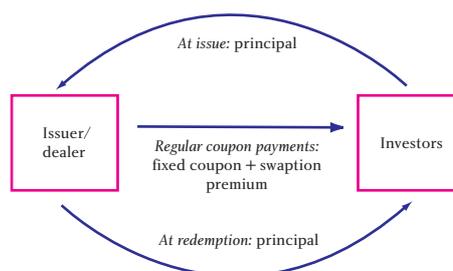
They come in many shapes and sizes, often involving complex payout structures, but the underlying building blocks usually involve investors (i) selling an option, or (ii) buying an option, or (iii) taking a view on how different asset prices or indices will co-move or (iv) doing some combination of the above.

Investors selling embedded options

Investors can increase the initial coupon on a bond by receiving a premium for taking risk via selling an embedded option to the issuer. Issuance of these types of structured note, particularly those linked to interest rates, grew rapidly in 2002 and 2003, more quickly than other varieties, and was probably one manifestation of the so-called 'search for yield' in response to low short-dated nominal interest rates.¹

One of the simplest examples of this type of note is a callable bond, where the issuer has the option to redeem (or call) the note early (Diagram 1). An issuer might exercise the option if market interest rates fell below the yield on the bond, so that it could achieve lower funding costs in the market by issuing a new bond. Investors have, in effect, sold an interest rate option to the issuer and in compensation they receive a premium in the form of a higher initial coupon.

Diagram 1:
Typical callable bond cash-flow structure

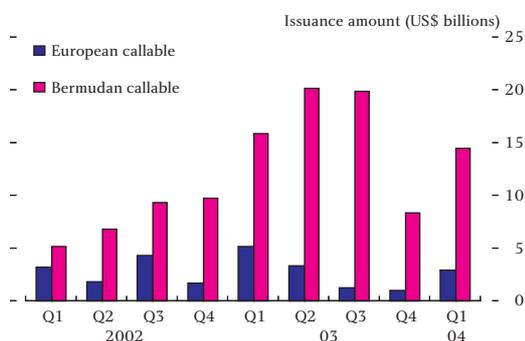


Whereas the value of a simple fixed rate bond rises when market interest rates fall, the value of a callable bond in those circumstances is capped by the call option, which, if exercised, leaves investors having to reinvest their principal at the new lower level of market rates. But the bond's value can still fall if market interest rates rise. (In other words, the bonds have 'negative convexity'.)

¹: See the 'Conjuncture and Outlook' section of this Review for a discussion of the 'search for yield'.

In the international and US domestic structured MTN markets, some callable notes – including some issued by the Federal Home Loan Banks, Fannie Mae and Freddie Mac – are callable at or any time after a certain date, similar to an American option. Other callable notes have so-called European call options, which can be exercised only on a particular date (Chart 1). An extension of the European callable bond is the Bermudan callable bond, which can be called on one of a number of dates. The number of times that such a bond can be called represents the number of call options that the investor has in effect sold to the issuer. For each additional call date, investors receive an additional option premium in the form of a higher initial coupon payment.

Chart 1:
Issuance of callable Euro MTNs



Source: mtn-i.com.

Another way of increasing the value of the option to the issuer, and therefore the initial coupon, is to extend the duration² of the bond, either by increasing its maturity or by lowering the coupon payments and issuing at a discount to face value. At one extreme, some callable Euro MTNs in recent years have been structured as zero-coupon bonds with maturities of 10-15 or even 30-50 years. When market interest rates were falling, some investors were willing to buy notes with longer duration in order to maintain initial yields at previous levels. Extending duration increases the sensitivity of the bond price to changes in market interest rates. The issuer will call the bond if it can refinance at a lower rate, which limits the scope for the price of the bond to rise if market interest rates fall ahead of the date(s) on which the call option can be exercised. Investors are therefore exposed to a risk of greater price falls if market interest rates rise without the corresponding opportunity for greater

price rises if rates fall; they earn an additional premium for taking on this risk.

One way of altering investors' exposure to interest rate risk is to add a so-called 'step up' in the interest paid on the bond if a call option is not exercised. This makes it more likely that the issuer will choose to exercise the call as the option will be 'in-the-money' unless market interest rates have risen by more than the size of the step-up. In these circumstances, investors receive the higher 'stepped-up' interest rate rather than the original rate.

Box A describes a number of other examples of structured MTNs where investors typically sell one or more interest rate options to the issuer. The detailed terms can be complex, but the essentials in most cases are that investors take a view on the pattern of future market rates relative to current market expectations implied by forward rates derived from the yield curve. This view might be about the path of short-dated rates, with the terms of the note typically linked to future LIBOR rates, or about the path of longer-dated rates, with the terms of the note linked to CMS rates. The pay-outs are often skewed, with a likelihood of the investor receiving an enhanced return (until the first call date) but some probability of a lower return, typically through a sub-market interest rate for a prolonged period (until the final maturity date) rather than any loss of principal at maturity. As the holder of one or more interest rate options, the issuer – or the dealer to which the issuer has on-sold the embedded option – benefits from greater volatility in market rates whereas investors benefit from stability.

Although most structured notes in which investors 'sell' options have typically been linked to interest rates, other types of underlying are common, including equity prices or indices, exchange rates, commodity prices and credit events. To give two examples:

- A **reverse convertible** is a structured note in which investors sell an embedded equity put option to the issuer (Diagram 2a). If the price of the underlying equity or equity index is lower than the strike price, the issuer is likely to exercise the option and deliver to investors a predetermined number of shares (or a

2: Duration is the weighted average maturity of the expected cash flows (interest and principal) on the bond, where the weights are the present values of these cash-flows.

Diagram 2a:
Reverse convertible note cash-flow structure – equity level above strike price

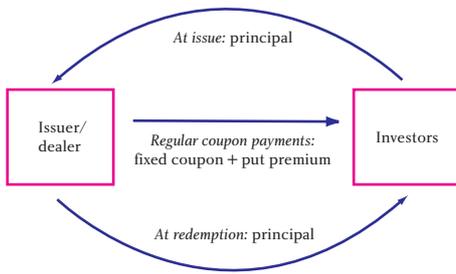


Diagram 3a:
Credit-linked note cash-flow structure – without credit event

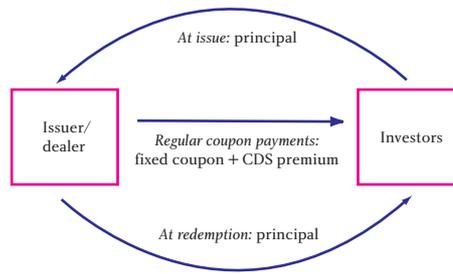


Diagram 2b:
Reverse convertible note cash-flow structure – equity level below strike price

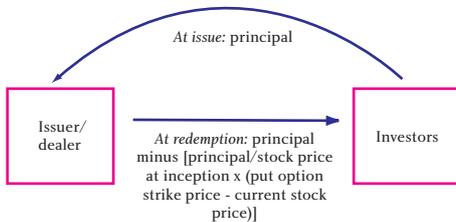
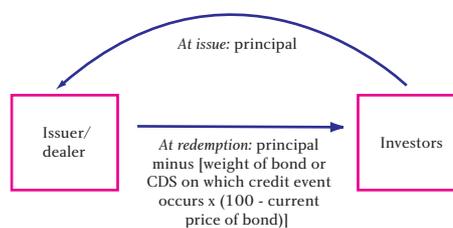


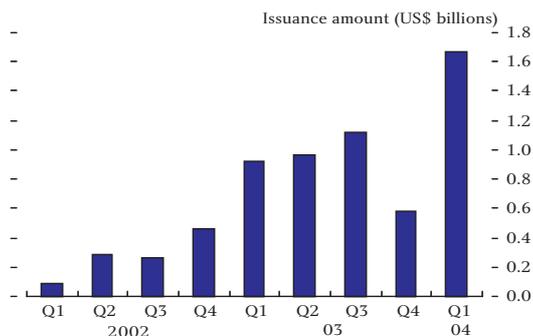
Diagram 3b:
Credit-linked note cash-flow structure – with credit event



cash equivalent) instead of repaying the face value of the note in cash (Diagram 2b). Investors are therefore exposed to potential losses should the value of the equity or equity index fall below a certain level (the strike price).

- A **credit-linked** note includes an embedded credit derivative sold by the investors (Diagram 3a). If a specified company or sovereign suffers a credit event, the face value of the note is reduced, depending on the recovery value of the defaulted debt (Diagram 3b). Often credit-linked notes are linked to ‘baskets’ of names so that, if any of the names in the basket experiences a credit event, investors suffer the same loss as they would if the note were the debt of the defaulted entity (a ‘first to default’ basket), depending on the weight of the defaulted entity in the basket under the terms of the note (Chart 2).

Chart 2:
Issuance of credit-linked Euro MTNs



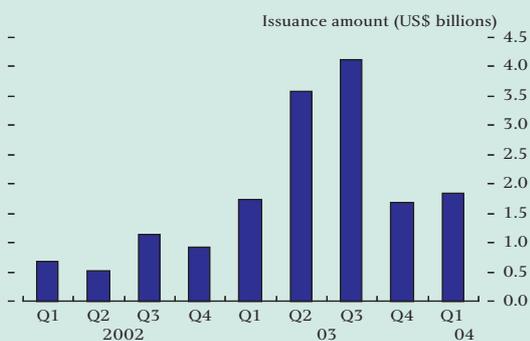
Source: mtn-i.com.

Box A: Variants of structured notes where the investor is taking interest rate risk

Floating rate notes (FRNs) have coupon payments that reset periodically depending on the level of reference market interest rates such as LIBOR rates. Some notes have caps on the interest rate paid, where investors in effect sell the issuer an option, with the 'premium' either monetised in the form of a higher initial coupon (spread over the reference rate) or used to purchase an interest rate floor. FRN investors benefit if market interest rates rise more rapidly than implied by the forward curve at the time of issuance. FRNs can also be leveraged – for example, paying a multiple of LIBOR less a fixed rate but with an interest rate floor of 0%; or de-leveraged, with the investor receiving a higher spread over the reference rate in exchange for agreeing to receive only a proportion of any increases in it.

Inverse FRNs also have coupon payments linked to reference market interest rates but they rise if the reference rate falls and vice versa (Chart A). The notes typically pay a fixed interest rate less the reference rate – in effect, an interest rate swap in which investors pay floating and receive fixed – but with a floor of 0%. Inverse FRN investors benefit if market interest rates rise less rapidly than implied by the forward curve. Similarly to FRNs, inverse FRNs can include interest rate caps and floors and varying degrees of leverage.

Chart A:
Issuance of inverse FRN Euro MTNs



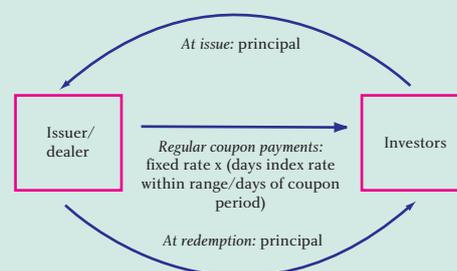
Source: mtn-i.com.

Ratchet notes are FRNs or inverse FRNs that have a maximum limit on the amount by which coupons can increase from the previous coupon level. Investors have sold a path-dependent option to the issuer, perhaps taking the view that market interest rates

might not rise as rapidly as implied by the forward curve.

Range-accrual notes (also known as range notes or corridor notes) accrue interest at different pre-specified rates, depending on the level of reference market interest rates, typically LIBOR. Most range notes have a high and a low accrual rate: the higher accrual rate is paid for every day that the reference rate remains within a designated range. The lower rate, often 0%, is paid during periods that LIBOR settles outside that range (Diagram A). By purchasing one of these notes, the investor has sold a series of digital, or binary, options: one with a strike price at the high end of the range and another with a strike price at the low end of the range. But range notes also exist in which the investor sells two barrier options: one where the interest payment becomes zero if the reference rate falls below a certain level, known as a down-and-out; and the other where the interest payment becomes zero if the reference rate rises above a certain level, known as an up-and-out. These upper and lower limits can apply for each coupon accrual period, where if the reference rate crosses either barrier on even just one occasion, the investor's coupon drops to zero for that period. Or, for some notes, the range can apply for a longer pre-determined period, or the whole life of the note, which could lead to zero interest on the note for much longer periods or even throughout the life of the bond. Investors are clearly taking a view on the future volatility of market interest rates.

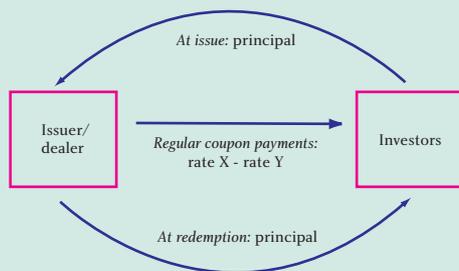
Diagram A:
Range-accrual note cash-flow structure



Dual-index notes are typically used to speculate on the shape of the yield curve (Diagram B). For example, investors might take the view that the yield curve will

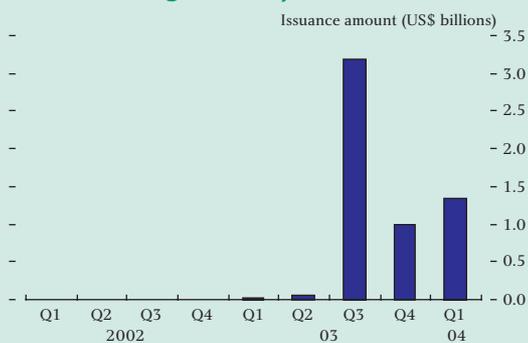
steepen and that the difference between the ten-year swap rate and the five-year swap rate (ten-year minus five-year) will be greater in the future than it is today. In this case, an investor might purchase a note with a coupon linked to the difference between five- and ten-year constant-maturity swap rates, but with a floor of 0% if this difference is negative.

Diagram B:
Dual index note cash-flow structure



Target redemption notes are typically FRNs or inverse FRNs that redeem early if the total interest paid to investors to date reaches a certain 'target' threshold (Chart B). In exchange for this option sold to the issuer, the notes might include an initial period of fixed coupon payments at a rate exceeding market interest rates (Diagram C).

Chart B:
Issuance of target redemption note Euro MTNs

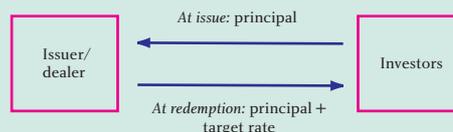


Source: mtn-i.com.

Index-amortising notes can be FRNs, inverse FRNs or fixed-coupon notes but with the feature that some or all of the principal is repaid early each year, depending on the level of a reference rate (eg, LIBOR). Often US dollar index amortising notes prepay more slowly as market interest rates rise and more rapidly as they fall, giving them similar characteristics to US mortgages. Large holders of

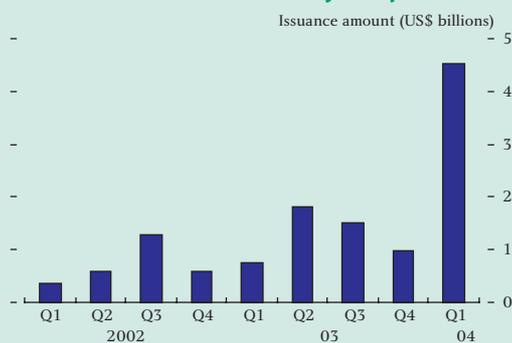
US mortgages, such as Fannie Mae and Freddie Mac, therefore, issue these notes to hedge their mortgage prepayment risk.

Diagram C:
Target redemption note cash-flow structure



In addition to LIBOR, **constant maturity swap rates** have increasingly been used as a reference interest rate for a variety of interest-rate-linked structures, including range accruals and target redemption notes (Chart C).

Chart C:
Issuance of constant maturity swap-linked Euro MTNs

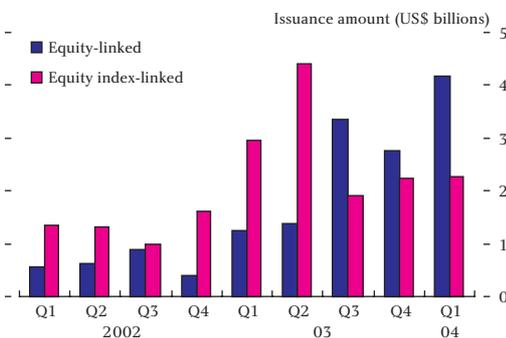


Source: mtn-i.com.

Investors buying embedded options

Another broad category of structured notes involves investors *purchasing* embedded options linked to risky underlying instruments (eg, equity indices). In effect, they exchange some proportion of the future cash flows on the bond for more uncertain but potentially higher returns, depending on the future value of the option (Chart 3). Typically, the structures involve investors giving up some or all of the coupons on the bond to purchase options, but leave the principal repayment intact so that the note, in effect, comprises purchased call options and a zero-coupon bond. These notes are often sold as (nominal or real – see below) principal-protected investments in, for example, equities. Issuance of such notes grew rapidly in continental Europe in the late 1990s, as equity markets rose strongly. But it has since been steadier, although higher in 2003 than 2002.

Chart 3:
Issuance of equity-linked Euro MTNs

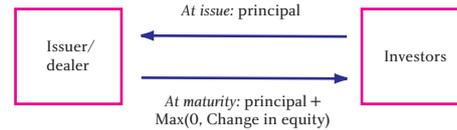


Source: mtn-i.com.

For a typical equity-linked note, investors purchase call options on an equity stock or an equity index (Diagram 4). The value of options that they can purchase depends on the present value of the foregone interest payments and the cost (partly related to implied volatility) of the options – it will be greater the longer the maturity of the note, the higher the level of nominal bond yields and the lower the equity implied volatility. In order to reduce the cost of the call options, investors can purchase fewer call options at the strike price (eg, the current or at-the-money level of the index). But this lowers the potential return on the note and investors receive only a percentage of any increase in the equity or index level: for example, if the index increases by 10%,

with a so-called participation rate of 70% of any increase, investors receive a return of only 7%.

Diagram 4:
Equity-linked note with principal protection cash-flow structure



Alternatively, the investor may wish to purchase less expensive call options (out-of-the-money call options) where the payoffs rise in line with increases in the equity or index but only once a certain level has been reached. Another common approach is to subsidise the purchase of at-the-money call option(s) by selling out-of-the-money call option(s) to the issuer. This has the effect of allowing the investor to receive 100% of a rise in the index up to a certain level. Some equity-linked notes are also callable, either at the issuer's discretion on one or more dates or if a certain trigger level in the equity price or index level is reached or when cumulative interest payments on the note reach a threshold level ('target redemption' notes).³ This is another way of subsidising the purchase of at-the-money or close-to-the money call options.

Similar structures, combining investment in risky assets with principal protection, are sometimes linked to assets other than equities. This year, for example, notes linked to commodity indices (eg, the Goldman Sachs Commodities Index and the Dow Jones-AIG Commodity Index, which include energy, industrial metals, precious metals, agriculture and livestock) have been popular.⁴

Another example is notes based on funds of hedge funds. But, given the absence of traded call options on hedge fund returns, such notes may be backed by direct investments into a fund of hedge funds or a hedge fund index combined with purchases of highly rated zero coupon bonds. Alternatively, and more frequently, funds are allocated dynamically between hedge fund investments and bonds, depending on returns on the hedge funds and changes in bond

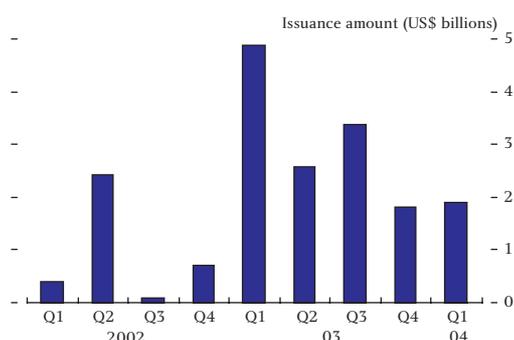
³: The payoff of a target redemption note is linked to the cumulative performance of the underlying equity index. The note is redeemed when some specified expiration date is reached or the accumulated coupon reaches a pre-determined target redemption level, whichever comes first (Box A).

⁴: According to mtn-i.com, there were more than 50 commodity-linked Euro MTNs issued in 2004 to date, amounting to more than US\$1 billion.

yields, in an attempt to ensure that the notes do not fall below their face value.⁵ Initially, the investment in hedge funds might be nearly 100%, but funds would be reallocated to bonds progressively as either the value of the investment or bond yields fell. Leverage can be employed to increase the initial allocation to hedge fund investments but this necessitates ‘steeper’ ‘stop loss’ triggers so that funds are reallocated into bonds more rapidly if the value of the investments falls. Dynamic hedging is intended to mimic the payoffs on a purchased call option on the underlying hedge fund investments, although it works only if it is possible to buy and sell the investments continuously. A financial institution, such as a bank or insurance company, may sometimes take on this risk by guaranteeing noteholders principal repayment at maturity.

As an alternative to protecting only the nominal value of their principal at maturity, investors may also choose to protect its real value by investing in inflation-protected bonds (Chart 4) or by converting the nominal cash-flows on conventional bonds into real cash-flows using inflation swaps. Structured notes may either combine inflation protection with other embedded options (eg, purchased equity index call options) or be more straightforward inflation-protected notes, purchased by, for example, retail banks to hedge inflation-protected savings products.

Chart 4:
Issuance of inflation-linked Euro MTNs



Source: mtn-i.com.

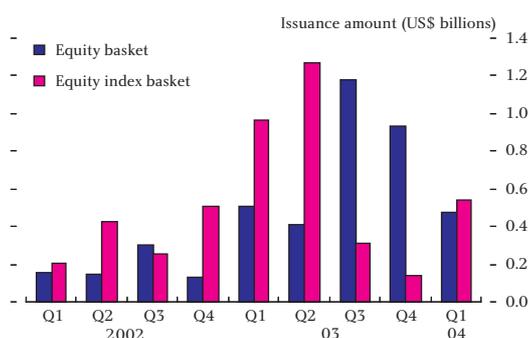
Although most structured notes in which investors purchase embedded options give the investor contingent exposure to the direction and magnitude of changes in the level of the underlying asset, there are some structured notes in which investors gain

contingent exposure only to the size of these changes, irrespective of the direction. In effect, they gain exposure to the volatility of the asset. An example is a so-called volatility (or ‘vol’) bond, on which the coupon is linked to the absolute size of the change in a market interest rate (eg, LIBOR or a CMS rate), regardless of direction, since the previous coupon payment date. So investors benefit when interest rates are volatile. In effect, investors have purchased a combination of put and call options on market interest rates.

Co-movement between asset prices or indices

The payoffs on another category of structured notes are linked to the *co-movement* of returns on different underlying instruments. Typically, returns on these notes are linked to price changes on a basket of individual stocks or movements in a basket of equity indices (Chart 5). In some cases, investors benefit more if the relevant prices/indices move together – investors are ‘long correlation’. In other cases, they benefit more if they diverge – ‘short correlation’. Issuance of these types of note began in the late 1990s. Recently, some notes have been linked to the co-movement of returns on different types of financial assets, known as ‘hybrids’. For example, a note might have payoffs linked to a number of equity, commodity, credit and government bond indices.

Chart 5:
Issuance of equity and equity index basket-linked Euro MTNs



Source: mtn-i.com.

In ‘best of’/‘worst of’ structures (Box B), returns depend on relative returns within a basket of assets, such as a number of individual stocks or different equity indices. In a typical ‘best of’ structure, the total return over the life of the note is the average of the returns on the best performing constituent stock

⁵ See page 72 of the ‘Financial stability conjuncture and outlook’ section of the June 2001 *Review* for a discussion of principal protection.

Box B: Best of/worst of products

A simple example of a ‘best of’ structure is an ‘outperformance basket’, in which the pay-off on the note is linked to the number of basket constituents whose prices rise by more than the market index over a defined period. Another more complex example is a ‘Himalaya’. At the end of the first period, the performance of the best performing asset or number of assets is recorded and the asset(s) is/are dropped from the basket for future periods. In each subsequent period, the procedure is repeated. At the end of the note’s life, the arithmetic mean of each recorded best performance is calculated in order to determine the payout. Investors benefit from both price volatility and correlation over the term of the note:

- the more volatility there is in the market the more likely the constituents will have risen significantly at some time during the period, to record a series of high best performers;
- correlation is less important for each period, as it is only the performance of the single best performing

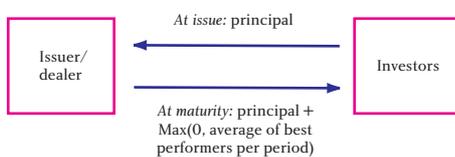
constituent that matters, but given that after each period the best performer is removed, the basket needs to be composed of stocks that are all expected to perform well, at least at some point during the life of the note.

A variation on the ‘Himalaya’ is the ‘Emeraude’, on which the average price change of the assets in the basket at the end of each period is recorded, and the final payoff of the note depends on the highest of all these periodic averages. Investors stand to gain from asset returns being high and highly positively correlated in at least one period over the life of the note, irrespective of the collective or individual performance of the assets in all other periods.

An example of a ‘worst of’ structure is an ‘Everest’, on which payoffs are linked to the price changes of one or more of the worst performing stocks from the selected basket. This structure is highly sensitive to volatility: a significant underperformance of just one asset, more likely if volatility is high, can significantly reduce the return on the note.

or index during each of a series of pre-defined periods throughout the life of the note (Diagram 5). This means that, as far as each period is concerned, the investor benefits most when the stocks are negatively correlated, as this increases the probability of each period having at least one stock performing well.

Diagram 5:
Note linked to basket of assets (‘best of’) cash-flow structure



In ‘worst of’ structures, by contrast, returns are linked to the changes in prices of those constituent stocks or indices that have risen the least – other things being equal, investors benefit from positive correlation, obtaining the highest returns when the prices of all stocks rise together.

For example, assume the basket comprises two stocks (A and B), and there are two periods. If in period 1 A rises 25% and B rises 5%, and in period 2 A rises 5% and B rises 25%, the return on the note would be $(5\% + 5\%)/2$ or only 5%. But, if in period 1 both A and B rise 10%, and in period 2 both A and B rise 8%, ie the stocks are positively correlated, the return would be higher, $(10\% + 8\%)/2$ or 9%, despite the fact that over the two periods the two stocks individually have risen by less.

Combination products

Some of the more complex structured notes involve combinations of investors buying and selling options on different underlying instruments. One popular variant this year was notes with payoffs linked to exchange rates but with knock-out options⁶ linked to, eg, the price of a commodity such as gold or oil or an equity index.

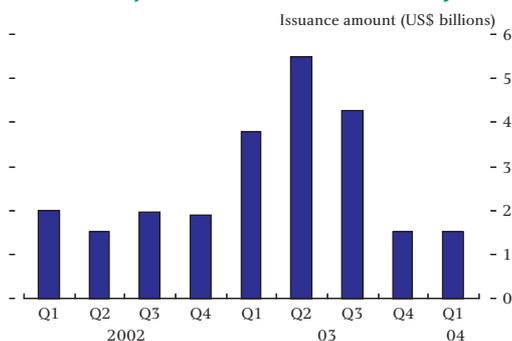
Another prominent example is **power reverse dual currency notes (PRDCs)**, created in response to the desire of some Japanese investors to receive an enhanced initial coupon against a background of very low yen nominal short-term interest rates (Table 1 and Chart 6).

Table 1:
Top ten dealers of power reverse dual currency Euro MTNs in 2003

	US\$ millions	Issues
Mizuho	3,219	399
Nomura	2,651	245
Citigroup	1,672	170
Daiwa SMBC	1,587	176
Not disclosed	1,265	194
JP Morgan	819	86
Bank of Tokyo Mitsubishi	583	79
Credit Lyonnais	567	78
Goldman Sachs	486	65
Shinkin	304	25

Source: mtn-i.com.

Chart 6:
Issuance of power reverse dual currency Euro MTNs

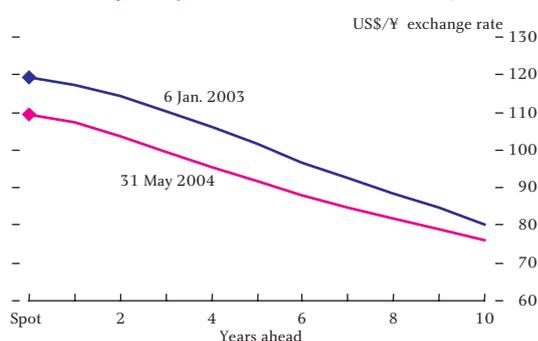


Source: mtn-i.com.

The history of PRDCs, which have been widely discussed as a potential source of stress in some markets, illustrates how structured notes can evolve,

adding complexity and with investors taking on greater risk in order to receive higher initial coupons relative to prevailing risk-free rates. The forerunners of PRDCs were dual currency notes and reverse dual currency notes. Dual currency notes pay the coupon in the currency of the investor and the principal in the currency of the issuer, meaning that the investor is exposed to foreign-exchange risk only at maturity. These first became popular with Japanese investors in the late 1980s. Investors are speculating that the yen will not appreciate against the US dollar in line with the path implied by forward interest rate differentials (Chart 7).

Chart 7:
US dollar/yen spot and forward exchange rates



Source: Bloomberg.

In contrast, reverse dual currency notes repay principal in the investors' domestic currency (in this case yen) but link coupon payments to short-term interest rates in an overseas currency (eg, US dollars, but also other currencies, notably Australian dollars).

As yen interest rates fell lower still in the 1990s, the reverse dual currency bond structure was adapted in various ways so that investors could continue to take the same speculative view but obtain a higher fixed initial coupon by taking more risk (hence the addition of 'power' to the name). Issuance of PRDCs reached more than US\$9 billion in the first half of 2003, comprising a large but – because the investors were almost entirely Japanese – segmented part of the structured note markets.

PRDCs have had many different 'bells and whistles' but the main steps from the simpler reverse dual currency note have been:

6: Knock-out options are a variant of barrier options, which either come into existence (knock in) or cease to exist (knock out) if the price of the underlying asset reaches or crosses a specified (or barrier) level that is different from the strike price.

- Linking the level of the coupon to the level of the US dollar/yen exchange rate, so that the coupon rises if the yen depreciates against the US dollar below a threshold level but falls to zero if it appreciates above that level. In effect, investors buy a series of call options on the US dollar/yen exchange rate with strikes at the threshold level.⁷
- Giving issuers a series of call options to prepay the notes, limiting the upside to investors beyond the first coupon date.
- Lengthening the final maturity of the notes, so that investors are potentially exposed to a long period of low coupons (with a minimum of 0%) before the notes are repaid if issuers choose not to call the bonds early, which would be most likely following a sustained appreciation of the yen against the US dollar. Many PRDCs have had final maturities of 30-50 years.
- Adding barrier options⁸ that, if triggered, give the issuer further options to call the bonds early. For example, an option might 'knock in' if the yen depreciates against the US dollar beyond a certain threshold. Again, investors receive a higher initial coupon in exchange for giving up some future 'upside'.

7: As a result, the basic coupon structure is as follows –

$$coupon_t = \max \left[\frac{S_t}{S_0} C_{\$} - C_{¥}, 0 \right]$$

where $C_{\$}$ and $C_{¥}$ denote the US dollar and yen coupons respectively, S_t denotes the exchange rate just before the coupon payout date and S_0 denotes the reference rate set at the purchase time of the bond. For example, with a US dollar and yen coupon of 15% and 10% respectively, the enhanced coupon will be 5% if the US dollar/yen exchange rate is the same as the reference rate, 20% if the US dollar/yen exchange rate is twice the reference rate, and nothing if the US dollar/yen exchange rate drops more than 33.3% below the reference rate.

8: See footnote 6.

Accounting and financial stability

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Accounting standards and the auditing of accounts influence financial stability in a number of ways. High quality accounts make an important contribution to transparency, market discipline and risk management. Interest in the impact of accounting has grown for a number of reasons, including the EU decision to require use of international accounting standards for the group accounts of companies listed in the EU from 2005.

ACCOUNTING INFORMATION PLAYS a crucial role in the healthy functioning of modern market economies. For example, credit decisions and the allocation of capital depend in part on an assessment of firms' profitability, balance sheet position and related financial data which are contained in published financial statements. From a financial stability perspective, risk measurement and disclosure which are broad in scope and reflect economic substance are important in underpinning market discipline. Accounting data are also a key basis for analysis by central banks and regulators.

This article reviews in turn: the economic channels through which accounting affects financial stability; recent significant changes in the arrangements for setting accounting standards; and current debates in accounting which could have important implications for financial stability.

The impact of accounting on financial stability

Accounting is part of the system through which information about corporate and other entities is assembled, deployed internally, and communicated to external stakeholders. While internal accounting data ('management accounts') are essential for the effective management of firms, this article focuses on the implications for overall financial stability of external dissemination of accounting information. Achieving satisfactory outcomes in the latter area is difficult because there are significant costs and time constraints on agents in gathering information and acting on it, and the needs of different users of accounts are different.

Instability in the financial system may arise from weakening or failures of significant parts of the financial sector and/or extreme volatility in financial asset prices. While unexpected shocks can never be eliminated, it is possible to minimise the likelihood of 'surprises', and their impact when they do occur. A key instrument for achieving these goals is the regular provision to financial markets of timely, economically meaningful information. In the accounting field, that implies accounting standards which mirror the economic substance, are applied in a consistent manner across entities, and require adequate disclosure.

Transparency and market discipline¹

Market discipline is a key contributor to financial stability. It requires an adequate flow of information to guide market decisions, as well as market participants having the capacity and incentives to process and act on it (Crockett (2001)). Shortcomings in the comprehensiveness and timeliness of financial information produced by a range of entities were one factor which exacerbated the financial crisis in Asia that started in 1998.² For instance, the scale of open foreign currency positions being run by banks and corporates, which contributed to the severity of the crisis, was not apparent to outsiders before the event.³

A sustained flow of timely, relevant information underpins the stability of traded markets. Where firms are required to disclose high-quality financial accounting information, the risk that investors will lose as a result of trading with parties with access to private information is reduced. This potentially

1: The economic arguments discussed here are set out in greater detail in Bushman and Smith (2003), and Baumann and Nier (2003).

2: See, for example, the report of the Group of 22 on Strengthening Financial Systems (1998).

3: Gai and Shin (2003) discuss the costs of providing information of this kind only once a crisis has begun.

increases the availability of capital and reduces investors' liquidity risk. In addition, there is evidence that relatively smooth and continuous disclosure of information leads to lower equity price volatility than less frequent disclosure. Sudden shocks to markets can cause very high price volatility and loss of market liquidity, as was seen when the scale of the leverage of the large hedge fund Long Term Capital Management (LTCM) was revealed in September 1998.

Minimum disclosure requirements have become progressively more demanding in an attempt to ensure greater transparency, and improve the functioning of financial markets. For example, UK disclosure requirements in the Companies Acts and Accounting Standards have increased significantly over time.⁴ Banking supervisors are also seeking to enhance transparency. Pillar 3 of the new international framework for bank regulatory capital (Basel II) specifies a set of disclosures by banks designed to provide market participants with information on the substantive economic risks being taken.⁵ Baumann and Nier (2004) provide evidence that greater disclosure by a bank has a favourable impact on the way it is assessed by the market.

Nonetheless, it is not the case that more disclosure is unambiguously better. Rather, proposed disclosure standards should be assessed against a number of criteria. A key question concerns the intended audience for disclosures, since that is a key factor in determining what information would be most relevant. For many users, the answer would be information which provides a genuine understanding of a firm's business model and the economic risks and potential rewards that it faces. Second, beyond a certain point, additional disclosure could *reduce* transparency, as there would be an increasing risk of important insights becoming obscured by the sheer quantity of information. Arguably, at present the length and complexity of formal financial statements are tending to reduce their usefulness for many readers. The Group of Thirty (2003) has emphasised the importance of disclosure being done in a form that is most relevant and effective for the intended audience. Finally, it is important to consider possible wider economic impacts of greater disclosure, which may not always be favourable. For example, disclosure

should not be pressed to the point that commercially sensitive information is revealed to an extent that would materially reduce incentives to invest in new products and services.

Economic meaningfulness

Accounting treatments affect the financial data used by investors, regulators and others to assess the financial performance and soundness of firms. While in principle the value of businesses and their economic characteristics turn on the cash flows they are expected to generate, and are independent of accounting rules for measurement and disclosure, in practice perceptions of complex institutions are heavily influenced by the accounting conventions used in financial statements. This is unsurprising, given that what is generally *observed* is the way that economic substance is measured and reported in published accounts. For instance, the US Securities and Exchange Commission (2003) cites evidence that market analysis of business mergers and acquisitions has been influenced by the accounting treatment adopted, even where this has no bearing at all on the economics of the transaction.

If accounting information is to provide an appropriate guide to decisions, it is thus essential that it portrays the economic reality of an entity's financial position and performance. Moreover, management incentives – as well as information available to the market – can be distorted if accounting treatments do not reflect the substance. For example, reward structures such as share options can create incentives to target *accounting* measures of performance, even if these are not the best available measures of economic performance.

In seeking to represent economic substance through accounting, issues both of valuation and the principles governing which assets and liabilities are captured within financial statements are important.

A current issue regarding valuation concerns the extent to which traditional 'historic cost' accounting should be supplanted by 'fair value accounting' for financial instruments. Broadly, traditional accounting measures financial assets and liabilities at their value when originated, and only revalues them in line with

4: For a detailed history of financial accounting since classical times, see Edwards (1989).

5: The framework is set out in BCBS (2004). The Pillar 3 disclosure requirements, which are briefly summarised in Box 2, are designed to complement the other two Pillars of the framework: minimum bank capital requirements (Pillar 1) and review of capital adequacy by a bank's management and supervisor (Pillar 2).

market conditions if they are part of a trading book. However, this means that reductions in the true economic value of non-traded items, such as a 'banking book' of bank loans, can be masked for a considerable period. By contrast, the fair value approach seeks to measure the true economic value of assets and liabilities in the light of *current* market conditions.

For example, the US Savings and Loans crisis stemmed in part from the fact that the (variable) interest rates on their deposit liabilities rose above the (fixed) rates earned on mortgage assets. The application of traditional accounting meant that this showed up initially only gradually through negative annual net interest income. While it eventually became clear that many S&Ls were insolvent, a fair value approach would have highlighted much earlier that, as a result of changes in relevant interest rates, the true economic value of their fixed-rate mortgage assets was below that of their deposit obligations. Had fair value accounting been used, it is likely that the S&Ls' difficulties would have been recognised and addressed earlier, and perhaps at lower fiscal cost.⁶

Turning to the scope of assets and liabilities captured in financial statements, there are a number of issues which are particularly important for financial stability. One is the scope of consolidation, which should ensure that all of a firm's material economic exposures are captured, rather than omitted as a result of being held in off-balance sheet instruments or special purpose vehicles (SPVs). Another is the principles governing derecognition, which seek to ensure that assets and liabilities are only removed from an entity's balance sheet to the extent that it has ceased to be subject to the associated economic exposures.

Ensuring that accounting standards properly capture the economic essence of transactions is a formidable task. This is partly a result of continual innovation, and increasing complexity, in business. But it also reflects a tension between accountants' twin goals of relevance – representing the economic substance – and reliability. For example, in the context of fair value accounting, prices can be observed for financial

instruments which are traded in active markets, but there is an obvious concern about reliable measurement of the current economic value of those instruments, such as many bank loans, which are not actively traded.

There is evidence that the weight attached by markets to information in financial statements has fallen over time. For example, Lev and Zarowin (1999) find a continual decline through time in the influence of earnings, changes in book values and operating cash flow on the equity prices of listed companies. While this probably reflects a number of influences, including an increase in the flow of information from other sources, accounting standards that have not kept pace with market developments may be a factor. This suggests that the efforts currently being made by accounting standard setters to ensure that standards keep pace with innovation and changes in market practice – some of which are described below – are fully justified.

Accounting and prudential regulation

Prudential requirements for financial institutions such as banks and insurance companies are an important instrument for seeking to secure financial stability. The objectives of supervisors are, however, different in some ways from those of the owners – the equity holders – for whom published financial statements are primarily prepared. Regulators are mainly concerned with downside risks, and with the position of creditors (for example, bank depositors) rather than equity holders. They therefore give particular emphasis to factors such as the permanence, and immediate availability to meet losses, of an institution's capital base. The Basel Committee on Banking Supervision (BCBS) is considering what detailed adjustments banking supervisors should make to data based on international accounting standards. For example, the BCBS has already agreed that changes in equity arising temporarily from cash flow hedging should not be reflected in *regulatory* capital.⁷ Although the impact of cash flow hedging on measured equity is generally small, analysis of publicly available prudential data filed by a sample of large US banks shows that it can amount to some 5% of reported equity capital.

6: For more detail on fair value accounting, including the crisis in the US Savings and Loans, see Jackson and Lodge (2000).

7: Effective hedges of future cash flows that straddle instruments measured at historic cost and market value are accounted for under US and international accounting standards by feeding the change in value of mark-to-market instruments temporarily to equity, until they match hedged cash flows. See below for further detail on hedge accounting.

Accounting standard setting and auditing

While some, for example Myddelton (1995), argue that accounting principles can be determined largely by firms and their auditors alone, it is generally thought that a set of mandatory accounting standards is required. This partly reflects the desirability of comparability between different firms, as well as the scope for abuse in the absence of clear standards. Comparability enhances the accessibility of financial statements, and eases identification of key signals from them. But in addition public and private interests may not always coincide in the area of accounting. Left to itself, the private sector might not take account of externalities arising from inadequate provision of information. For example, damage to the financial system in aggregate could be caused by inadequate identification, measurement or disclosure of exposures, if this led to weak market discipline. This is one justification for official involvement in the setting of standards. Among the core principles identified by the Financial Stability Forum following the Asian crisis were internationally accepted accounting and auditing standards.⁸

A separate, important debate concerns the proper balance between principles and detailed rules in accounting standards. A possible advantage of moving beyond principles to detailed rules is that this might enhance comparability and perhaps make auditing of compliance easier. However, a rules-based approach can become one in which the letter of the rules, rather than their spirit, is paramount. Detailed rules can rapidly become outdated. Moreover, rules-based standards are more susceptible to becoming drivers of economic decisions rather than – as they should be – the framework for reporting on their results. Overall, the US accounting standard setter, the Financial Accounting Standards Board (FASB), recently concluded: ‘The Board believes that an approach focusing more clearly on the principles in accounting standards is necessary to improve the quality and transparency of US financial accounting and reporting’ (for a fuller discussion, see FASB (2002) and SEC (2003)).

A vital complement to setting accounting standards is ensuring – for example through external audit – that

they are properly applied, so that reliance can be placed on financial statements. One issue is technically correct application of individual accounting standards. The increasing number of restatements in the late 1990s in the USA raises some concerns here.⁹ But another is the importance of ensuring that a set of financial statements taken as a whole is not misleading. For example, Smith (1996) and Tweedie (2001) argue that a number of major UK corporates were using accounting policies in the late 1980s which, while within the letter of accounting standards of the time, were nonetheless questionable in terms of conveying the economic substance of these entities’ financial position.

Mechanisms for formal enforcement of accounting and auditing standards are also important. Many steps have been taken to strengthen enforcement mechanisms. These include the Sarbanes-Oxley legislation in the USA¹⁰, and various EU initiatives, including a draft Directive on statutory audit. In the UK, arrangements for oversight and regulation of the auditing profession have been strengthened through an enhanced Financial Reporting Council.

Convergence in accounting standards

Until very recently, accounting rules were set independently by each national jurisdiction, and the standards vary substantially. Yet capital markets have become increasingly liberalised and integrated globally, which suggests that there would be significant benefits to investors and other market participants from accounts being drawn up in a consistent manner across countries. The initiatives for international convergence of accounting standards described below are welcome and should reduce the scope for markets to receive inconsistent signals because results are being stated under different accounting regimes. This will significantly increase transparency and thus market discipline. The issue is illustrated in Box 1, which shows that at present major UK banks raise capital in London and New York using financial results drawn up on two different bases.

8: For more detail, see Clark and Drage (2000).

9: On this, see December 2002 Bank of England *Financial Stability Review*, page 88.

10: For a fuller description of the Sarbanes-Oxley legislation, see the December 2002 and June 2003 Bank of England *Financial Stability Reviews*, pages 87 and 77 respectively.

Box 1: UK banks' results under UK and US accounting

Several of the major UK-owned banks are listed on the NYSE as well as in London and consequently publish accounts according to US accounting standards (US GAAP) as well as UK accounting standards (UK GAAP). Accounting conventions differ in a number of areas. This box examines the differences in figures for capital (defined as shareholders' funds) and profitability (measured by return on equity (RoE)), for Barclays, HSBC, Lloyds TSB and RBS. It shows that differences in approaches to accounting can have a substantial impact on the published results of a bank. This raises two issues for financial stability. First, different accounting treatments suggest different figures for capital and profitability, both of which are important as 'buffers' against insolvency. Second, to the extent that different measures convey different messages, this has implications for transparency and market discipline.

Shareholders' funds

Table A shows that the differences arising from adjustments to shareholders' funds are significant, particularly for Lloyds TSB.

Table A:
Shareholders' funds: total adjustments from UK to US GAAP (£ millions and percentage difference)

	2000	01	02	03
Barclays	-158	305	810	357
	-1%	2%	5%	2%
HSBC^(a)	1,676	1,695	2,127	3,236
	5%	5%	7%	8%
Lloyds TSB	3,684	2,661	2,218	2,268
	37%	25%	28%	24%
RBS	2,307	2,303	1,876	4,244
	10%	8%	7%	15%

Source: Published accounts.

(a) HSBC accounts converted from US\$ using end of period spot rate.

Two accounting treatments are particularly important.

Derivatives. Under UK GAAP these are accounted for on an equivalent basis to the underlying assets, liabilities or net positions, so derivatives in the banking book are often carried at historic cost (frequently at or close to zero). By contrast, under US GAAP since January 2001 all derivatives must be recorded at fair value (FAS 133). This is also the treatment in IAS 39.

Goodwill. Under UK GAAP goodwill arising on acquisitions after 1998 is recognised as an asset and amortised on a

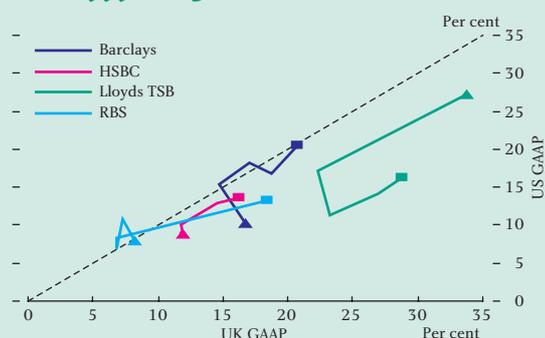
straight-line basis over its estimated useful economic life. Under US GAAP, the value of goodwill recognised is typically higher. Since January 2002, it has not been amortised, but instead reviewed annually for impairment.

Other areas where UK and US GAAP differ and which impact materially on balance sheet values are: the valuation of investment securities; shareholders' interest in the long-term assurance fund; software development costs; and revaluation of property.

Return on Equity (RoE)

RoE is a key figure used by investors to assess performance. It reflects profit and loss, and the balance sheet. Many of the differences in accounting convention noted above impact on both statements. Chart A plots RoEs for the selected banks under UK and US GAAP between 1999 and 2003.

Chart A:
Return on equity under UK and US GAAP for individual banks 1999–2003^(a)



Source: Published accounts.

(a) Timeline runs from squares (1999) to triangles (2003) for each bank.

For most banks and most years, the lines are close to the 45 degree line, indicating that RoEs under UK and US GAAP are similar – although RoE seems to be slightly higher measured under UK GAAP. Lloyds TSB has a consistently higher RoE under UK GAAP, due particularly to differences in the treatment of goodwill and pension costs.

The change in the relative position of Barclays' RoE under UK and US measurement between 2002 and 2003 reflects considerably lower net income in the most recent year under US GAAP than on a UK basis. This is in part due to the fair value treatment of derivatives under FAS 133 (which for Barclays in 2003 requires a negative adjustment of some £1.1 billion to UK GAAP profits).

In Europe, from 2005 the consolidated accounts of listed companies will be required to be based on international accounting standards issued by the International Accounting Standards Board (IASB), rather than the national standards used hitherto. EU Member States may permit or require other entities to use international standards. In the UK, other entities will have the option of using the IASB standards.¹¹ International accounting standards are also being widely adopted outside the EU, for example by Australia, the Russian Federation and South Africa.

Before application in Europe, however, international standards have to be adopted through decisions of the Accounting Regulatory Committee (ARC).¹² Thus far, the ARC has adopted all extant international standards with the exception of those for financial instruments (IAS 32 and 39). Given the significance of those standards, it is important that they should be finalised and adopted in time for the application of IASB standards in the EU from next year.¹⁵

In the Norwalk Agreement (October 2002), the US standard setter (the FASB) and the IASB agreed to work together to move towards harmonisation of their accounting standards so that they become fully compatible as soon as possible. While the principles underlying the standards should converge over time, it is likely that US Generally Accepted Accounting Practice (GAAP) will continue to embody more detailed rules than accounting standards and practice elsewhere.

Financial stability implications of international accounting standards

A number of IASB standards are particularly relevant to financial stability, for example because of their implications for which exposures are captured and how they are measured. The standards for disclosure and measurement as they relate to financial instruments¹⁴ (IAS 30, 32 and 39) are particularly significant, and are discussed further below, but the standard for consolidation (IAS 27), which seeks to

ensure that all positions of a group are captured in consolidated accounts, and the new standard for insurance contracts (IFRS 4), are also relevant. These standards are summarised in Box 2.

Financial instruments: disclosure

The two main financial stability issues which arise from the disclosure requirements in IAS 30 and 32 relate to transparency about credit risk and the rules for netting offsetting exposures. On the first, historically disclosure of credit risk embodied in balance sheet positions has been limited. This has been a factor constraining analysis on the basis of public information of the risk profiles of banks, given that credit is the most important risk in most banking organisations. It is expected that public information on bank credit risk will increase significantly in the next few years, given that the latest international disclosure standards will be complemented by Pillar 3 of Basel II. However, IAS 32 recognises netting in a more restricted range of circumstances than do current US or UK GAAP. While there are strong risk management reasons for institutions to put appropriate netting arrangements in place, it is possible that, at the margin, the accounting treatment will weaken incentives to do so, which could have a negative impact on financial stability.

Financial instruments: measurement

IAS 39 was first published in 1998. It aimed to ensure that international accounting standards would include measurement rules for the key area of financial instruments. The standard sought to enhance transparency towards that in the US, and to improve the alignment of the rules with the economic substance. However, the standard is complex. This is partly because most interested parties thought the IASB should produce a standard which retains the current 'mixed attribute' model of accounting, in which some items (eg bank loans) are booked at historic cost while others (eg in the trading book) are held at market value.¹⁵ The standard is likely to affect financial stability primarily through its effect on

11: The option for other entities is set out in Department of Trade and Industry (2003). Given the imminent use of international standards by listed companies in the UK from 2005, the UK Accounting Standards Board (ASB) has announced that it will bring British accounting standards progressively into line with those of the IASB: see ASB (2004).

12: This is a committee of representatives of national governments: the Department of Trade and Industry provides the UK representative.

13: This article is based on the version of IAS 39 as at March (see IASB (2004 d)), together with an exposure draft on the option to measure certain instruments at fair value with valuation changes taken through the profit and loss account (IASB (2004 c)).

14: Other than insurance contracts.

15: See Box 2 for details of the valuation treatment of different categories of instrument.

Box 2: International accounting standards¹

This Box reviews those international standards of particular importance to the financial sector which have been the subject of recent debate.

Financial institution and instrument standards

The IASB has recently been engaged in projects to update the standards for disclosure by financial institutions (IAS 30) and of financial instruments (IAS 32), and – crucially – the standard for the recognition and measurement of financial instruments (IAS 39). These standards deal with how financial instruments (other than insurance contracts) – which represent most of the balance sheets of banks and securities firms – should be measured and disclosed in accounts.

The most important features of IAS 39 are:

- Instruments are placed in four categories: trading, and other items measured at fair value, with valuation changes taken through the profit and loss account; originated loans; held-to-maturity (HTM) investments; and available-for-sale financial assets (AFS, the residual category)². Loans and HTM investments are held at amortised cost. AFS assets are fair valued, but valuation changes are fed directly to equity (not via the profit and loss account).
- All derivatives must be marked to market. By contrast, accounting practice in many countries allows derivatives not deemed part of a trading portfolio to be carried at cost. This means they often appear at a cost close to zero, even though they may embody substantial economic exposures, and their value may change significantly through time due to market movements.
- There will be an option to account for certain instruments outside the trading book at fair value through the profit and loss account, where, for example, this facilitates accounting for hedging transactions.

- Provisioning³ in respect of losses on assets such as loans should be based on objective evidence relating to past events: an incurred loss, rather than expected loss, approach.
- Detailed rules for ‘hedge accounting’ are specified. Where an instrument which is marked to market is used to hedge, in an economic sense, one that is not, there would be false volatility in accounting results unless this was addressed by special ‘hedge accounting’ rules. However, since these rules can permit deferred recognition of losses, there is potential scope for abuse. IAS 39 requires that hedging relationships be clearly documented, reliably measurable, and actually effective.
- The rules on when an asset should be taken off balance sheet have been clarified (see below).

The application of IAS 39 will affect the measured balance sheets of banks and other financial institutions. The main impacts are likely to be: an increase in the size of the balance sheet as derivatives are recognised at fair value (and from less recognition of netting); a change in measured equity as some investment securities are marked to market rather than carried at cost; possibly significant changes in the size of the balance sheet as a result of adopting international rules on consolidation; and a boost to capital from the write back of any general provisions (such as a ‘fund for general banking risk’) which do not meet the IAS requirements for a provision.

Regarding disclosure standards, the IASB is working to modernise the standard on disclosure by banks (IAS 30) such that it will become one for disclosure by all entities of their exposure to financial risks. The standard is expected to lay down broad principles for the disclosure of the major risks (liquidity, credit, market etc). The disclosure requirements in the standard on financial instrument disclosure and presentation (IAS 32) primarily relate to risk management and accounting policies; broad details of

1: Strictly, these are now known as International Financial Reporting Standards, the title of the series of entirely new standards issued since the International Accounting Standards Board was established in its present form in 2001.

2: Many ‘investment securities’ which have been recorded at amortised cost under national accounting rules will be classified as ‘available for sale’ because of the ‘tainting rules’ which state that if more than an immaterial part of a held-to-maturity portfolio is sold before maturity, all of it must be reclassified (as AFS) and the HTM designation cannot be used for two years.

3: Technically referred to as ‘impairment’.

interest rate and credit risk exposures; supplementary data on the fair values of instruments; and rules concerning netting in the context of financial statements.

In view of the particular importance of banks to financial stability, the Basel Committee has decided that banks subject to Basel II should make disclosures over and above those required by company law and accounting standard setters. They are consistent with the spirit of international accounting standards but are considerably more detailed⁴.

The Pillar 3 disclosures cover qualitative and quantitative aspects of a bank's capital structure, regulatory capital adequacy, credit risk, exposures arising from securitisation activity, market risk and operational risk. For the key area of credit risk, banks following the more sophisticated (internal ratings) approach to regulatory capital are required to disclose details of the processes through which they manage credit risk, quantitative indicators of credit risk for each class of exposure, and outturn data which will allow some assessment to be made of the performance of a bank's processes for estimating credit risk on a forward-looking basis.

Consolidation and Special Purpose Vehicles (SPVs)

The key accounting issues relate to the rules for 'derecognition' and consolidation. Treatments differ across jurisdictions. Derecognition relates to when assets or liabilities are removed from the balance sheet. The rules for this usually turn either on criteria for whether a 'true sale' has occurred⁵, or a components approach is adopted whereby a company keeps on its balance sheet any exposures retained, such as first loss tranches in securitisations. The question of whether SPVs have to enter consolidated accounts depends on consolidation rules which usually turn on criteria of control or 'risks and rewards'.

The approach to derecognition under international accounting is set out in IAS 39. The approach has

developed over time. Increasing emphasis has been placed on where risks and rewards lie, rather than legal control. Derecognition in the latest (March 2004) version of the standard turns primarily on whether or not an entity has retained substantially all the risks and rewards associated with an asset, with a further test relating to whether or not an entity retains control over it⁶. Turning to consolidation, the IAS approach⁷ is that an entity should be consolidated by an enterprise which exercises control over it. In the case of SPVs, control is to be assessed taking into account all relevant factors, including the relationship of the activities of an SPV to those of the entity; the nature of decision making regarding the SPV; and where the benefits and risks of the SPV's operations fall (the latter criterion brings in elements of a 'risks and rewards' approach).

Insurance

Transparency of the insurance industry is important to financial stability given ownership links between banks and insurance companies, and the growth of credit risk transfer to insurers. The IASB recognises that it will take some time to achieve a global consensus on accounting for insurance contracts and is therefore pursuing a two-phase strategy towards strengthening of insurance accounting.

The results of Phase 1 are set out in the first international standard on Insurance Contracts (IFRS 4), issued in March (IASB (2004 b)). The thrust is to prevent insurers newly adopting accounting policies which do not fully capture the economic substance of insurance contracts – though at this stage, for many such policies, insurance companies already using them are not required to stop doing so. IFRS 4 also requires enhanced transparency regarding insurance contract liabilities. Estimates of the degree of uncertainty in future cash flows arising from insurance contract, interest rate and other risks should be disclosed. Other financial assets and liabilities of insurance companies will for the most part fall under IAS 39.

4: These disclosure requirements are set out in 'Pillar 3' of Basel II: see BCBS (2004).

5: In turn, the criteria for a true sale are generally legal, or whether the risks and rewards have been substantively transferred.

6: The criteria for derecognition of a financial asset are set out in a flow diagram within the Application Guidance for IAS 39, paragraph 36.

7: See IAS 27: Consolidated and Separate Financial Statements, and Standing Interpretations Committee Interpretation 12: Consolidation – Special Purpose Entities, in IASB (2004 d).

transparency, hedging behaviour and provisioning of bank loans.

A pivotal requirement in IAS 39 is that all derivatives must be marked to market. This increases transparency because at inception most derivatives have a low value (in some cases zero) relative to the economic exposures they represent. For example, interest rate swaps (say between floating and a fixed rate) are generally transacted at zero initial net present value (zero market value). However, as interest rates change through time, such swaps often acquire considerable market value. Thus, on an historic cost basis derivative positions do not show up strongly on the balance sheet. While various criticisms, discussed below, have been made of the IASB's approach to derivatives and hedge accounting, it should be emphasised that the requirement that all derivatives be marked to market will significantly reduce the scope, that presently exists in national accounting standards which allow many derivative positions to be measured at cost, for economic risks to be hidden. Overall, given the scale of derivative positions in modern financial markets, the IAS 39 requirement that they should be marked to market represents an important step in promoting transparency, market discipline and sound risk management.

However, the complexity of IAS 39 is a concern from a transparency viewpoint. Moreover, the 'mixed attribute' approach requires distinctions to be drawn which are becoming increasingly artificial as banks move towards managing their positions on an integrated basis. Such distinctions are likely to lead to a lack of comparability between, and even within, institutions. For example, a bond could in principle be classified as part of a trading portfolio or 'available for sale', in which case it would be marked to market; or it could be deemed to be part of a 'held to maturity' portfolio, and held at historic cost (see Box 2).

The development of IAS 39 has led to an increased focus on hedge accounting. Previously, derivatives which were hedging banking book positions would themselves simply be measured at cost. For example, since banking books of deposits and loans are not measured at market value, interest rate swaps in place to hedge interest rate risk would have been accounted for in terms of the interest flows they generated, and

not marked to market. But given that IAS 39 requires all derivatives to be held at market value, there has been much discussion of the mechanics of deriving offsetting accounting entries so that there is no artificial impact on P&L from economic hedges which straddle historic cost and market value measurement.

An important practical issue is whether hedging performed at the portfolio, rather than individual transaction, level should be eligible for hedge accounting. The IASB was initially reluctant to allow this. However, reflecting the fact that risk management is generally undertaken at the portfolio level, more recently the IASB has issued revised rules on the hedging of interest rate risk (IASB, 2004 a).¹⁶

There are nonetheless continuing concerns that the IAS 39 rules do not fully reflect modern risk management practice. For example, banks generally find that the *behavioural* maturity of demand deposits is much longer than their contractual maturity. Many deposits which are contractually repayable on demand or at very short notice in practice remain with banks for months or years. The rules do not always allow that to be taken into account in fair value hedging. The IASB also specifies requirements, which banks see as restrictive, on when prepayments different from expectations will disqualify hedged transactions from hedge accounting treatment. Financial stability could be adversely affected if the complexity of the hedge accounting rules reduces the incentives for banks and other entities to hedge their risk appropriately, or if the extent of economic hedging in place is obscured. The latter could arise as a result of limitations in the hedge accounting framework, or from reporting entity decisions not to use hedge accounting.

Turning to provisioning, IAS 39 sets out an *incurred* loss approach – one in which provisions are made only when there is objective evidence that an asset (eg a loan), or group of assets, has become impaired. This is similar to the approach in UK and US accounting standards, but inconsistent with the typical *internal* accounting approach in banks that anticipates *future* losses in a loan portfolio from the time the loans are made. Moreover, this forward-looking approach is embodied in the Basel II proposals. From a financial stability perspective, it is

16: This permits hedges of changes in fair values constructed on a portfolio basis to qualify for hedge accounting, subject to various conditions. There are separate rules for hedges of cash flows.

important that the credit quality of bank loans is reflected in provisions in a timely way (see, for example, Mann and Michael (2002)).

Fair Value Accounting

While IAS 39 represents an advance, a number of issues remain to be resolved. It is therefore welcome that the IASB has announced that, once current discussions concerning IAS 39 are concluded, it will commence a longer-term review of financial instrument accounting. A key issue is whether a move to wider use of fair value accounting (FVA) techniques would better represent economic reality. Historic cost accounting has been challenged as an inappropriate way to measure financial instruments, on the grounds that most of them can and should be valued, directly or indirectly, using market prices. The present value of financial assets and liabilities generally depends on future events which are inherently uncertain. No accounting rules can remove that uncertainty. However, prices in financial markets reflect market participants' views on future developments based on the information currently available.

The advantages of FVA are that it would reflect the effect of deteriorations or improvements in credit quality at the time they came into view, as well as mark-to-market gains or losses due to market risks, such as interest rate risk embedded in banking books. As noted above, FVA might therefore have diminished the severity of episodes of financial instability, such as the US Savings and Loans crisis, because earlier identification of problems is likely to lead to prompt action to address them.

However, FVA has been criticised from a number of perspectives, including its possible wider economic implications, and concerns about reliability. Some suggest that it could lead to greater measured volatility in accounting results that might be artificial to the extent that it could reflect purely transient market movements. Moreover, even if the volatility were 'real', this could be a source of procyclicality: in buoyant economic conditions perceived credit risk might decline, leading to a rise in the fair value of banks' assets, which would in turn boost bank capital and encourage an increase in lending, so strengthening the economic upswing. The mechanism would work in reverse in recessions.

For banks any procyclical effect might be mitigated by mechanisms built into Basel II to address possible

procyclicality of their regulatory capital base. Moreover, since a fair value approach would probably lead to earlier and smoother recognition of banks' loan losses, it could actually impart *less* of a cyclical impact on the economy than at present. Under the current approach to bank loan provisioning, in practice full recognition of losses may be delayed as the economy moves into a cyclical downswing, leading to the possibility of large provisions being made near a cyclical trough. That would reduce banks' capital, and hence capacity to make new loans, at a time when economic activity was already particularly weak.

The debate concerning fair value accounting, which will be an important aspect of the IASB's longer-term review of accounting for financial instruments, might best be taken forward in the first instance through enhanced supplementary disclosures of fair value information. This would facilitate assessment of the characteristics of a fair value regime without changing the primary statutory accounts. Experience would be gained regarding issues such as the sensitivity of fair value information to particular inputs to valuation (for example, discount rates), and of the challenges of auditing such information, albeit at the cost of potentially further lengthening published financial statements. However, such supplementary disclosures would clearly not provide a direct test of the wider economic impact of using FVA in the primary accounts, for example the reactions of banks to the impact of FVA on their capital base.

Conclusions

This article has suggested that accounting has a number of important implications for financial stability. It is widely agreed that transparency is crucial to market discipline. Accounting standards play an important role in ensuring that financial statement information is measured in a way that is reasonably clearly defined, economically meaningful, comparable across entities and adequately disclosed. Such information is also required for assessment of the stability of the system, as well as for prudential regulation of individual institutions. An important challenge is to ensure that accounting standards keep in step with modern business, so that they capture economic substance and avoid perverse incentives in risk management.

Given the benefits of transparency, the EU's efforts to adopt international standards and the convergence process with US requirements are both welcome

developments. It is important that the EU adopts the remaining international accounting standards – those for financial instruments – as soon as possible. This will complete the set of IAS standards for use from

next year, and allow attention to move to the longer-term review of financial instrument accounting proposed by the IASB.

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Banking concentration

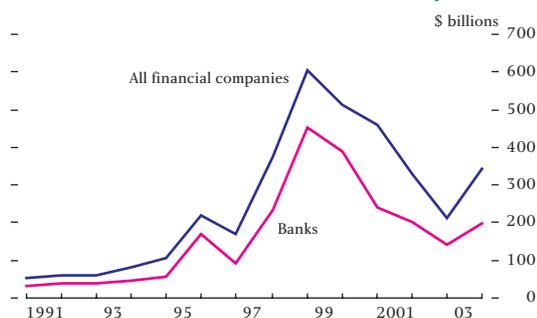
in the UK

Andrew Logan, Financial Industry and Regulation Division, Bank of England

This article describes measures of banking concentration in a range of banking activities. The measures are drawn from the Bank of England's confidential data set on UK-resident banks' balance sheets. The article finds that bank loans are a little more concentrated than deposits. Loan concentration has increased over the last 15 years, while deposit concentration is broadly unchanged.

DURING THE LATE 1990s, there were a number of high profile mergers and acquisitions (M&A) between large banks within the major industrialised nations. These were part of a broader increase in the rate of consolidation in banking and the financial services industry (Chart 1). This development motivated a number of studies investigating the causes, consequences and implications for public policy. For example, Berger, Demsetz and Strahan (1999) review the academic literature on how M&A affects market power, efficiency, availability of services to small firms and systemic risk. A Group of Ten (2001) study draws out some of the financial stability implications.

Chart 1:
Value of mergers and acquisitions within the banking and financial services sectors in the G7



Source: Thomson Financial Datastream.

The increase in M&A activity is likely to have increased concentration in the banking sector in a number of countries. However, data constraints mean that banking concentration is rarely measured in

most. This article uses a confidential data set collected by the Bank of England to construct simple measures (Box 1) of banking concentration in the UK.

The first section discusses the banking balance sheet data the Bank of England collects and how it needs to be manipulated to analyse concentration. The second analyses the extent to which deposits are concentrated in a small number of banks and how this has changed over the past 15 years. The third section looks at the concentration of bank loans through time and across industrial sectors. The fourth focuses on the concentration of lending to small businesses, a sector which is particularly dependent on banks for external finance. The fifth section investigates the extent to which large banks' loan portfolios are more diversified than those of small banks.

The data set

The Bank of England collects balance sheet data from all UK-resident banks.¹ These data provide the raw material for this article. Individual banks' data remain confidential, but aggregates are published and provide part of the background to the conduct of monetary policy and the understanding of the UK economy more broadly.²

Ideally, a study of concentration would extend to all firms' which take deposits (or close equivalents) from UK residents, and all firms which provide credit to them (regardless of location and institutional form). In practice, because of data deficiencies, only banks located in the UK are included.

1: All banks located in the UK are considered, regardless of nationality of ownership. At end-2003, 357 banks were authorised to accept deposits in the UK.

2: The data are published via press releases, an interactive database and a monthly publication *Monetary and Financial Statistics*. All are available from the Bank of England's website at www.bankofengland.co.uk/statistics.

Box 1: Measures of concentration

A variety of statistical measures have been used to study industrial concentration. It is generally thought desirable that any measure used should capture both the number of banks (the 'fewness') and the distribution of assets or liabilities between them ('inequality'). As Bikker and Haaf (2002) and Hannah and Kay (1977) discuss, none of the measures proposed is without problems. So in the remainder of this study three of the more simple and widely used ones are deployed.

The n firm concentration ratio measures the largest n banks' combined market share. It has the advantage of simplicity. It suffers from the disadvantage that the choice of 'n' is arbitrary. More important, it ignores all developments in the concentration of the banking industry other than at this one point (the nth bank). It is therefore wasteful of the data available as it is insensitive to any changes in concentration that occur elsewhere in the distribution of banks' assets or liabilities. The criticisms can be muted if a number of measures of 'n' are selected, albeit at the loss of having a unique signal.

The number of banks with greater than a 1% market share. This measure has many features in common with the n firm concentration ratio. While it is transparent, the choice of 1% is arbitrary and it is insensitive to developments other than at this point.

The Herfindahl-Hirschman Index (HHI) is the sum of the banks' squared market shares (Equation 1). An increase in the value of the HHI indicates a rise in concentration. The HHI is attractive in that it takes account of the entire population of banks. However, a number of combinations of banks with differing market shares can give the same value.

Equation 1

$$HHI = \sum_{i=1}^n s_i^2$$

where s_i is the i th bank's market share.

The balance sheet data are compiled on an unconsolidated basis. That is, each banking entity within a group reports the value of its assets and liabilities, ignoring any subsidiaries it owns. This poses two challenges for the analysis of concentration: the data need to be aggregated to reflect the structure of the large banking groups and the value of all intragroup transactions need to be removed.

'Quasi-consolidation'

If the data were used in their raw form, banks that are part of larger banking groups would be treated as individual small or medium-sized banks. Moreover, their balance sheets may be 'atypical', for example, if a particular subsidiary undertakes an entire group's mortgage lending. These problems can be overcome by aggregating the balance sheets of banks which form part of the same banking group. For the purpose of this article aggregated balance sheets are termed 'quasi-consolidated'.³

The aggregation of UK-owned banks has been carried out at each year-end using information on group structure. The same approach has been applied for foreign-owned groups. But our knowledge of the structure of foreign bank groups is less detailed, and some group relationships may have been overlooked.

Treatment of intragroup assets and liabilities

Although aggregation of balance sheets within a group addresses one problem, there remains an issue in relation to intra-group exposures – that is loans to and deposits from other group companies. Ideally, these exposures would be netted out. This is particularly important in a study of concentration as intragroup activity is likely to occur disproportionately amongst large banking groups with complex structures. In practice, however, data on intragroup exposures are not available. This article seeks to circumvent the problem by looking only at concentration in respect of deposit taking from and lending to the non-financial private sector (namely, households, non-profit

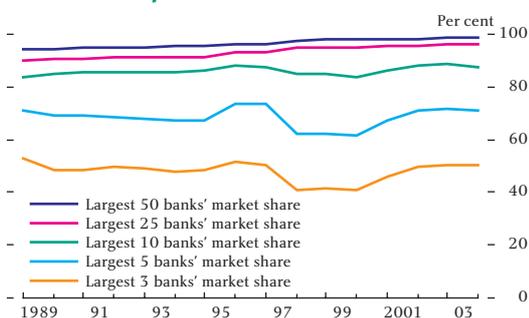
³: The term 'quasi-consolidated' is used in preference to consolidated as the aggregated banking groups' data exclude assets outside the UK and can include intragroup assets and liabilities.

institutions serving households (NPISH) and private non-financial corporations (PNFCs)), *ipso facto* excluding interbank exposures whether within or outside the group. Even then there may be some distortions to the extent that large banking groups own companies within the PNFC sector – but the extent of the distortion is probably small.

Non-financial private sector's deposit concentration

In 2003, the majority of the non-financial private sector's deposits were concentrated in relatively few banks. The three largest banking groups had a combined market share of 50% (Chart 2). The five largest groups held 71% of deposits.

Chart 2:
Largest UK-resident banks' share of deposits from the non-financial private sector



Source: Bank of England.

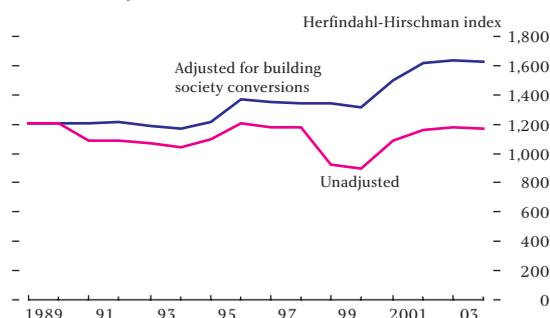
Twelve banks had a share of non-financial private sector deposits in excess of 1%. The nine banks with the largest shares were all UK-owned.⁴ Collectively, these nine banks held 86% of deposits from the non-financial private sector. The three foreign banks above the 1% threshold had a combined share of 4% of deposits.

The level of concentration of deposits in 2003 is little different from that in 1988. There have, however, been some fluctuations in the level of deposit concentration in the intervening period. These changes have been driven by mergers and acquisition activity between the large UK-owned banks (which increase concentration) and building society demutualisations (which generally, decreased it).

The transfer of the ten demutualised building societies' business into the banking sector affects both the level and distribution of deposits between banks. This is unavoidable because the Bank of England does

not collect data from building societies. To make a tentative correction for the impact of the demutualisations, the value of the Herfindahl-Hirschman index in Chart 3 is adjusted by excluding the former societies' deposits in their first year of operation as a bank. It suggests the underlying trend in deposit concentration has been upward.

Chart 3:
Impact of building society demutualisations on a Herfindahl-Hirschman index of the non-financial private sector's deposits

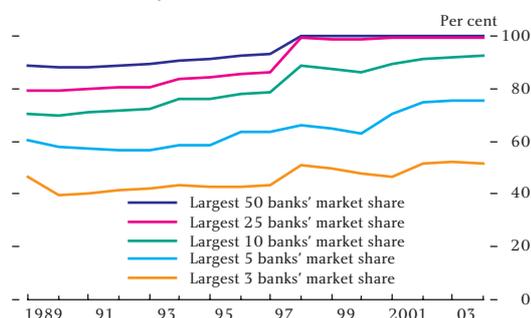


Source: Bank calculations.

Concentration of loans to the non-financial private sector

UK-resident banks' lending to the non-financial private sector is slightly more concentrated than are deposits. In 2003, the three largest banking groups made 52% of all loans (Chart 4) compared with 50% of deposits. The largest five groups held 75% of loans compared with 71% of deposits. Eleven banks had at least a 1% share of loans. The nine UK-owned banks above the threshold were the same as those that held greater than a 1% share of deposits.

Chart 4:
Largest UK-resident banks' share of loans to the non-financial private sector

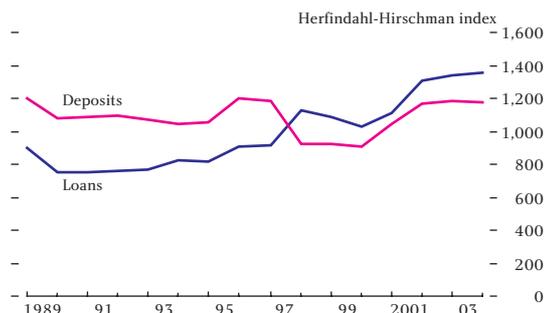


Source: Bank of England.

4: The financial stability conjuncture and outlook article in this *Review* focuses on the largest ten UK-owned banking groups' worldwide-consolidated activities.

Loan concentration in the banking sector has increased over time, contrasting with the relative stability of deposit concentration (Chart 5).

Chart 5:
Herfindahl-Hirschman indices of UK-resident banks' deposits and loans to the non-financial private sector



Source: Bank of England.

There is considerable diversity in the concentration of banks' loans to different industries (Chart 6). The largest three banks' sectoral market share ranges between 32% and 84%. The sectors that are most concentrated at the three bank level are fishing (where the largest three banks supplied 84% of loans), health and social work (68%) and agriculture (66%).

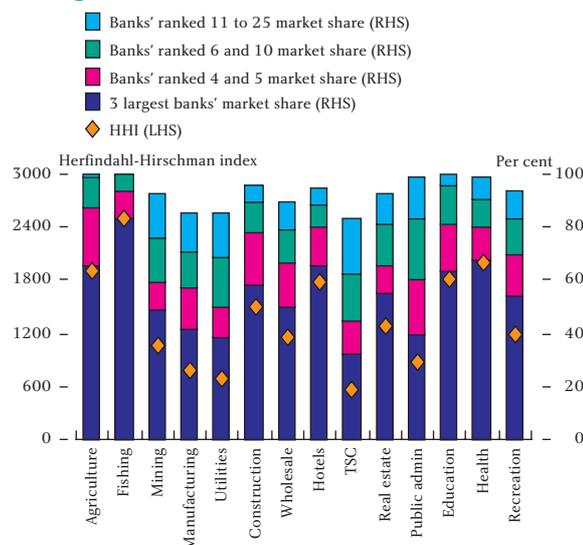
Loans to individuals and individual trusts are a little more concentrated than to PNFCs (Table 1). Within lending to individuals, bridging finance is the most concentrated loan type, followed by loans secured on property and other loans and advances.

Table 1:
Measures of concentration of UK-resident banks' lending to individuals and individual trusts and PNFCs at end-2003

	Individuals and individual trusts	PNFCs
Three largest banks' market share	52%	51%
Five largest banks' market share	75%	64%
Ten largest banks' market share	95%	75%
Number of banks with greater than a 1% market share	11	16
Herfindahl-Hirschman index	1,384	1,067

Source: Bank of England.

Chart 6:
Measures of concentration of UK-resident banks' lending to various industries^(a)



Source: Bank of England.

(a) Where TSC stands for transport, storage and communication.

Concentration of loans to SMEs

Small and medium-sized enterprises (SMEs) appear more reliant on banks for external funding than large firms. In a survey of small businesses, Cosh and Hughes (2003), found, for example, that banks provided 52% of external finance between 2000–02 (this compares to 15% for all PNFCs).

There is no comprehensive data source on UK-resident banks' lending by business size.⁵ But information is collected on banks' lending to unincorporated businesses as part of the monetary returns.⁶ Unincorporated businesses are an important part of the SME population – responsible for 46% of employment at SMEs in 2002.⁷

Bank lending to unincorporated businesses seems to be more concentrated than to PNFCs. The three banks with the largest loans to unincorporated businesses had a total market share of 62% (Chart 7) compared with 51% for all PNFCs. The figures for the five firm concentration ratios are 82% for unincorporated businesses and 64% for PNFCs. In

5: The British Bankers' Association publish quarterly data on major bank lending to and deposit taking from small businesses (defined as those with an annual bank account turnover of £1 million or less). The individual banks that contributed to the 2003 Q4 survey were Abbey, Alliance & Leicester Commercial Bank, Bank of Scotland, Barclays, Clydesdale, HSBC, Lloyds TSB, Natwest, Royal Bank of Scotland, Yorkshire Bank and The Co-operative Bank.

6: An unincorporated business is a privately-owned business that is not legally registered or recognised as a company. The owner or owners have unlimited liability for any debt the firm may incur.

7: Data drawn from Small Business Service (2002), where an SME is defined as any enterprise with less than 250 employees. Other figures show unincorporated businesses comprised 75% of all SMEs (by number of firms) and were responsible for 23% of turnover.

Box 2: Benchmarking measures of UK banking concentration

This article does not assess whether the UK banking sector is concentrated relative to other industries or banking sectors. Such analysis is complicated by a lack of consistent data and difficulties in comparing economic activity across industries. Two potential benchmarks are:

(a) The Office of Fair Trading's (OFT) merger guidelines

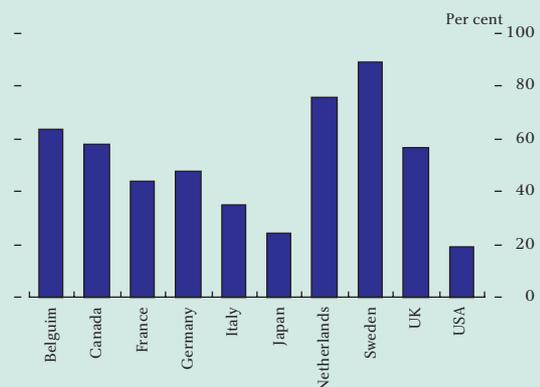
The OFT use HHIs as an initial indicator in deciding whether to refer a merger between two firms in the same industry to the Competition Commission. OFT (2003) states 'The OFT is likely to regard any market with a post merger HHI in excess of 1800 as highly concentrated, and any market with a post merger HHI in excess of 1000 as concentrated.' On this basis, non-financial private sector bank deposits and loans were concentrated but not highly concentrated in 2003.

(b) Other countries' banking sectors

We are unaware of any recent international study that constructs measures of concentration using

'quasi-consolidated' resident banking data. Using data constructed on a worldwide consolidated basis, Beck, Demirgüç-Kunt and Levine (2003) find the UK banking sector is not particularly concentrated relative to other industrialised countries (Chart A).

Chart A:
The three largest banks' share of assets owned by each nationality's banks^(a)

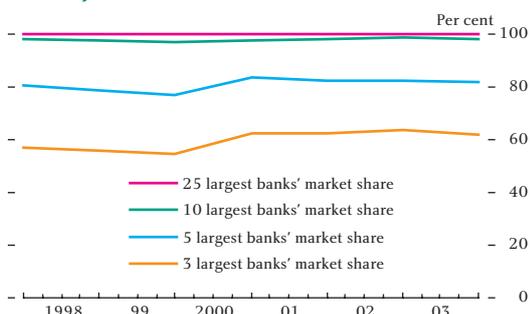


Source: Beck, Demirgüç-Kunt and Levine (2003).

(a) Average for the period 1989–97.

2003, eight banking groups had at least a 1% share of the market for loans to this type of small business. Six of the eight groups were UK-owned.

Chart 7:
Largest UK-resident banks' share of lending to unincorporated businesses^(a)



Source: Bank of England.

(a) 50 largest banks' market share line omitted from chart as it is virtually identical to the 25 largest banks' market share line.

Diversification of banks' assets

Hitherto, the data have been used to investigate the concentration of bank deposits and loans in the UK. But the same data can also be manipulated to look at how concentrated banks' asset books are across countries or industrial sectors. This section investigates the relationship between bank size and international, and industrial, diversification.

International dispersion

The Bank of England publishes statistics on the value of UK-owned banks' external claims constructed on a worldwide consolidated basis.⁸ Figures are available on the 21 reporting banks' claims on individuals and firms within 217 countries (including the UK).⁹ Using these data it is possible to construct a measure of the international diversification of each bank's assets by calculating a Herfindahl-Hirschman index based on countries' shares of a bank's balance sheet. Chart 8 presents a scatter plot of the measure of geographic diversification and bank size. The linear best fit line

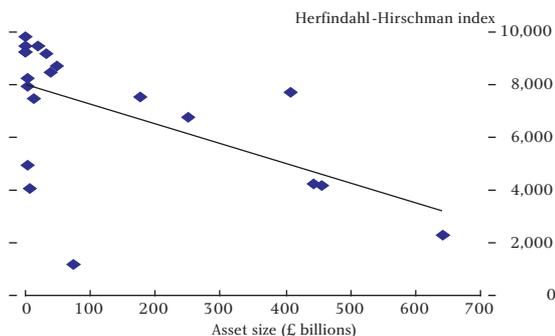
8: These are published in Table C4.1 of *Monetary and Financial Statistics*. See O'Connor (2004) for a description of the published data and Gracie and Logan (2002) for a discussion of how these statistics are manipulated by analysts within the Bank of England to assess the financial stability risks facing UK-owned banks.

9: A bank's assets in the UK are derived by subtracting total foreign claims from total assets reported in the bank's published accounts. To be required to report external claims data, a bank must have international claims in all currencies in excess of £100 million or sterling international claims in excess of £20 million.

suggests that geographic concentration and bank size are weakly negatively correlated. In other words, large UK-owned banks' assets are more diversified by location than small ones. The linear best fit line is however, only indicative as no attempt has been made to control for other factors and the number of observations on which it is based is small, making it sensitive to outliers.

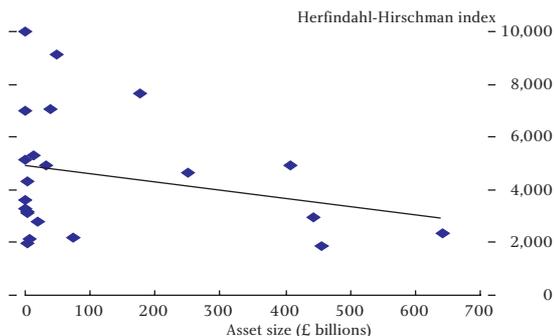
negative correlation between bank size and industrial concentration. The caveats at the end of the last paragraph about the simplicity of the analysis apply again here.

Chart 8:
UK-owned banks' asset size and a Herfindahl-Hirschman index of international diversification at end-2003



Sources: Published accounts and Bank calculations.

Chart 9:
UK-owned banks' asset size and a Herfindahl-Hirschman index of the sectoral diversification of UK lending at end-2003



Sources: Published accounts and Bank calculations.

Industrial dispersion of lending to UK-residents

The analysis of lending data used in Chart 6 can also be used to look at the diversification of UK-owned banks' loans to customers within the UK – split by sector. The Herfindahl-Hirschman index of industrial concentration has been constructed using 17 sectors' shares of banks' lending (Chart 9). Although, there is considerable disparity in the concentration of small banks' loan books, there is some evidence of a weak

Conclusion

This article uses balance sheet data collected by the Bank of England to measure the concentration of bank deposits and lending in the UK. It shows the majority of non-financial private sector deposits are held by relatively few banks. The banks with the largest share of deposits are UK-owned. Including the effect of building society demutualisations, deposit concentration in 2003 was little changed on its level 15 years ago. Bank loans are slightly more concentrated than deposits, but again the large UK-owned banks hold the dominant market share. Loan concentration has increased over the last 15 years.

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Assessing operational risk in CHAPS Sterling: a simulation approach

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The operational resilience of market infrastructures, large-value payment systems in particular, is important to maintaining financial stability. The United Kingdom's CHAPS Sterling system, for example, allows financial institutions to settle payment obligations associated with financial market transactions; a disruption to normal payment processing activity could therefore result in the build-up of significant unwanted risk exposures. This article presents the results of a series of simulation experiments designed to assess quantitatively the ability of CHAPS Sterling to withstand certain types of operational disruption. The analysis shows that the system exhibits a high level of resilience, reflecting the effectiveness of the operational risk controls that are in place and the ample amount of liquidity available in the system.

LARGE-VALUE PAYMENT SYSTEMS (LVPS) play a pivotal role in support of the financial markets and the economy more generally, as illustrated by the high overall value of payments processed by these systems. In the United Kingdom, for example, the CHAPS Sterling system handles on a typical day payments with an overall value of around £200 billion. Given this scale of activity, an LVPS that is inappropriately designed and/or poorly operated could expose users of the system to risk exposures potentially large enough to threaten their financial soundness and, in extreme cases, the stability of the system as a whole.

During the 1990s, central banks devoted considerable attention to reducing the financial (or settlement) risks present in LVPS. In particular, new system designs based on models of real-time gross settlement (RTGS) were developed to eliminate the credit exposures that arise in deferred net settlement systems. CHAPS Sterling became an RTGS system in 1996, since when all payments between direct members of the system have settled individually and in real-time across accounts held with the Bank of England.

Efforts to reduce settlement risk in LVPS have been motivated by the possibility that these systems could be a channel through which financial distress is transmitted between institutions. But it is also possible for an LVPS itself to act as a source of risk. This may occur where a shock to the payment system – for example, an operational failure – caused a

disruption to normal payments activity, such that financial institutions were unable to settle their payment obligations as they would otherwise wish.

Ensuring that LVPS achieve high levels of operational resilience is therefore a key financial stability objective for central banks. This is reflected in Core Principle VII of the Core Principles for Systemically Important Payment Systems (agreed by the G10 central banks in 2001), which requires a system to ensure a high degree of security and operational reliability and to have in place adequate contingency arrangements for the timely completion of daily payment processing.¹ That is, LVPS should implement controls and procedures designed to mitigate *operational risk*.

In common with all types of risk, operational risk can be considered in two dimensions – probability and impact. This article examines a range of operational incidents that carry a low probability of occurring but could, potentially, have a large impact on CHAPS Sterling and its member banks. It uses simulation methods to evaluate the risk consequences of such incidents under assumed worst-case conditions.

The article first considers the different types of operational disruption that could affect CHAPS Sterling and discusses the arrangements currently in place to control operational risk in the system. It then describes the data and methodology used to

1: Bank for International Settlements (2001).

evaluate the impact of operational incidents, before reporting the results of some illustrative simulation experiments.

Types of operational failure

The smooth processing of payments in CHAPS Sterling depends on both the central payment processing infrastructure – which is operated by the Bank of England – and the internal payment operations of the system's direct members (known as settlement banks). Three distinct types of operational disruption can therefore be identified:

- the inability of one settlement bank to send and receive payments;
- similar problems involving multiple settlement banks (simultaneously); and
- the unavailability of the central payment processing infrastructure.

The ability of the central infrastructure and/or the settlement banks to process payments in the normal way could be compromised by a number of factors, both internal and external.

A distinguishing feature of *internal* sources of operational disruption, examples of which include IT failures and a shortage of suitably trained staff, is that the system operator is able to influence both the likelihood and impact dimensions of the risk. Appropriate technical-level system design (accompanied by sufficiently robust operational procedures) allows the likelihood of an internal failure to be minimised, while effective contingency arrangements reduce the impact of those incidents that do nevertheless occasionally occur. Such contingency measures would typically also be available in the event of operational disruption caused by external factors.

Plausible *external* sources of operational disruption, the likelihood of which system design cannot directly influence, include, inter alia, general power failures; problems affecting local transportation arrangements; disruption to telecommunications networks; and

natural disasters. Terrorist action represents a further external source of disruption. Indeed, the threat presented by global terrorism has prompted public authorities (including the Bank of England) and the private sector to review and, where necessary, enhance contingency arrangements.²

Operational risk controls in CHAPS Sterling

The Bank of England aims to ensure that the CHAPS Sterling system's central payment processing infrastructure is available at all times during every business day. A range of controls and procedures are in place to reduce the likelihood of disruption from internal sources of operational risk. In addition, the Bank maintains remote back-up facilities capable of assuming fully the payment processing role should the primary system experience problems.

In the unlikely event of the primary and back-up payment processing infrastructures being unavailable simultaneously, an additional layer of contingency exists in the form of 'RTGS by-pass mode'. In by-pass mode, which has been extensively tested but never required for actual operations, CHAPS Sterling reverts to a model of deferred net settlement. Payment information continues to flow between settlement banks, but central bank money is no longer transferred in real time. Rather, obligations are settled (across accounts held with the Bank of England) on a multilateral net basis at the end of the business day.

The aim of by-pass mode is to ensure all critical CHAPS Sterling payments can be settled on the same day. If the disruption occurs sufficiently late in the day, by-pass mode may not be required to achieve this objective; the Bank of England could process a small volume of unsettled payments manually. Where it is necessary to invoke by-pass mode, however, the switch to deferred net settlement re-introduces some of the financial risks eliminated by RTGS. In particular, the default of a settlement bank holding a net debit position could cause the other settlement banks (and their customers) to incur financial losses.³

To control the scale of the risks to which settlement banks could be exposed in the event of by-pass mode

2: For example, in the United Kingdom, a December 2003 report (prepared by a Task Force chaired by Sir Andrew Large, Deputy Governor of the Bank of England) outlined a series of steps intended to improve the resilience of the financial markets. Significant progress has been, and continues to be, made towards meeting the eight recommendations of that Task Force.

3: For a description of the risk properties of deferred net settlement (relative to the RTGS alternative), see Bank for International Settlements (1997) or McAndrews and Trundle (2001).

ever being needed, an arrangement based upon multilateral net sender (or net debit) caps was put in place in July 2003. It is intended that these (self-imposed) caps would be set equal to the amount of collateralised intraday liquidity each settlement bank is able to draw from the Bank of England at the point by-pass mode is invoked. As a result, the credit risk associated with by-pass mode would be tightly controlled – all net debit positions would be fully backed by collateral.

Although this model of full collateralisation is the preferred approach to controlling credit risk in by-pass mode, its feasibility depends on the ability of the Bank of England to determine settlement banks' account positions at the time by-pass mode is invoked. In circumstances where this is not possible, each settlement bank would set its net sender cap at a maximum level of £1 billion.

In this second variant of by-pass mode, it is possible that the net sender caps would prevent the settlement of some payments. Such a situation could arise when the net value of payments an individual settlement bank had to make during a period of by-pass mode operation exceeded £1 billion. The constraint imposed by the sender caps could, however, in practice be relaxed by means of interbank loans agreed between the settlement banks, which, when processed by CHAPS Sterling (operating in by-pass mode), would reduce the net debit position of the borrower.

Arrangements for mitigating operational risk affecting the central payment processing infrastructure are necessary, but not sufficient, to ensure the overall robustness of CHAPS Sterling; it is also important for the individual settlement banks to implement suitable risk controls. As a condition of membership of the system, therefore, settlement banks are required to comply with certain minimum standards in respect of their internal back-office arrangements for handling payments. An auditable system of self-certification is in place to ensure these standards are satisfied.

In addition, a range of contingency arrangements are in place to limit the impact on CHAPS Sterling of instances where a settlement bank is unable to

submit payments to the system. For example, the settlement bank concerned may send authenticated faxes or use the RTGS Enquiry Link facility to instruct the Bank of England to process manually a small number of high-priority payments.⁴ This mechanism is particularly important for ensuring that 'time-critical' payments, for example those associated with other market infrastructures (such as multilateral net settlement in BACS or pay-ins to the Continuous Linked Settlement (CLS) system, which settles foreign exchange transactions on a payment-versus-payment basis), are processed at the required time.

The inability of a CHAPS Sterling settlement bank to send payments also raises the possibility of a 'liquidity sink' developing as available liquidity becomes concentrated on the settlement account of the bank concerned. Intraday, this could cause liquidity shortages elsewhere in the system, which may in turn lead to significant delays to the settlement of payments between the unaffected settlement banks. It is therefore important for prompt action to be taken to prevent large flows of liquidity to a settlement bank experiencing operational problems – this would typically be achieved by communicating details of the situation to the full community of settlement banks.

A liquidity sink that occurred late in the business day would also be likely to leave the unaffected settlement banks short of funds and unable to repay their intraday borrowing from the Bank of England.⁵ The CHAPS Sterling 'stricken bank scheme' (which has never been used) addresses this problem by requiring a settlement bank that is unable to resume normal payment processing operations by 4pm to extend uncollateralised overnight loans (settled manually by the Bank of England) to any unaffected settlement bank requiring additional liquidity.

Data and methodology

Serious operational incidents in CHAPS Sterling are reassuringly rare. It is therefore not possible to make a comprehensive assessment of the impact of operational disruption, and the ability of the system to withstand it, using actual data. A simulation approach offers an alternative assessment method. In particular, it is possible, using actual payment flow data, to perform simulations of what would have

4: The Enquiry Link facility is an interactive information and communication service available to all CHAPS Sterling settlement banks.

5: The Bank of England extends interest-free intraday credit to all CHAPS Sterling settlement banks, in return for suitable collateral. Intraday borrowing not re-paid by the end of the business day is converted into collateralised overnight borrowing and charged a rate of interest set at the discretion of the Bank.

happened in CHAPS Sterling had an operational event occurred, conditional on an assumption that the set of payments each settlement bank wishes to settle is unaffected. The behaviour of the settlement banks may change following an operational incident, however, and capturing this is an important aspect of the simulation methodology.

The findings presented below are based on a series of simulation experiments carried out using a payment system simulator developed by the Bank of Finland.⁶ Each experiment was conducted using a simulation set-up designed to replicate CHAPS Sterling as closely as possible, including in respect of central queuing arrangements and procedures for gridlock resolution.⁷

To assess the impact of exceptional events, it is first necessary to establish a 'benchmark' against which the results of simulations of operational events may be compared. This involved conducting a simple simulation of CHAPS Sterling under normal operating conditions using actual transaction data from February 2004 – a total of 2.1 million payments. For the purposes of establishing benchmark liquidity levels, the simulation permitted all twelve CHAPS Sterling settlement banks to draw on unlimited amounts of intraday credit from the Bank of England (having started each day with zero account balances).

Output from the benchmark simulation allowed the calculation of two hypothetical liquidity levels useful to simulation-based analysis of RTGS systems. In particular, it was possible to derive, for each settlement bank on each day within the sample period, the 'upper bound' and the 'lower bound' of liquidity.

The upper bound of liquidity measures the amount of intraday credit a settlement bank would need to obtain in order for all its outgoing payments to settle immediately upon their submission to CHAPS Sterling (that is, without being placed in the central queue to await the arrival of additional liquidity). The lower

bound of liquidity, on the other hand, refers to the amount required for the settlement bank just to cover its net outflow of funds across the day as a whole.⁸

In practice, the total amount of intraday credit obtained by the CHAPS Sterling settlement banks typically significantly exceeds (by about half) the upper bound; this largely reflects the low overall cost of the liquidity.⁹ But the upper and lower bounds nonetheless define a suitable range across which settlement banks' ability to draw on intraday credit can be varied in order to examine the impact of changes to the amount of liquidity available in the system.

To facilitate investigation of the extent to which the amount of liquidity available in CHAPS Sterling influences the ability of the system to withstand different types of operational disruption, additional benchmark simulations were conducted (each using the same transaction data and with CHAPS Sterling operating under normal conditions). In these experiments, the amount of intraday credit available to the settlement banks was constrained to levels between the upper bound (UB) and the lower bound (LB), defined on the basis of the following expression

$$UB - \alpha (UB - LB)$$

with α set equal to 1, 0.75, 0.5, 0.25 and 0.¹⁰

The second stage of the analysis then involved comparing the benchmark cases to the results from simulations of CHAPS Sterling operating under stress conditions. Three alternative scenarios – described in turn below – were considered. In each case the operational failure was assumed to be both unanticipated and of sufficient severity to preclude resumption of normal payment processing operations before the end of the business day concerned.

In addition, it was assumed throughout that operational disruption does not create doubts

6: For further information on the simulator and its capabilities, see www.bof.fi/sc/bof-pss. The authors would like to thank Harry Leinonen and colleagues at the Bank of Finland for their work in developing the simulator.

7: Under current operational procedures, the CHAPS Sterling central queuing mechanism is not used; this implies that settlement banks must queue payments for which insufficient liquidity is available within their own back-office systems. The simulations carried out for this article relax this constraint and allow payments to queue centrally. In addition, the simulations employed gridlock resolution procedures at the end of the day only.

8: For further discussion of the upper and lower bound of liquidity concept, see, for example, Bech and Soramäki (2001).

9: In addition, the settlement banks face further demands on their liquidity positions that are unrelated to CHAPS Sterling (for example, from the CREST securities settlement system).

10: In each simulation, no constraint was placed on the amount of liquidity available to the Bank of England.

regarding the financial soundness of any of the CHAPS Sterling settlement banks. This assumption allowed settlement bank behaviour to be modelled in a very simple way; considerably more complex behavioural responses would arise in the event that insolvency was thought possible.

For each scenario, the aim was to evaluate the ability of CHAPS Sterling to withstand the particular type of operational disruption under consideration. To this end, output from the benchmark simulation was examined with the aim of identifying the point (date and time) at which an operational failure would potentially expose the settlement banks to the greatest risks. The metrics used to inform this process of identifying the 'worst-case' outcome are described below.

Operational failure affecting one settlement bank

In this scenario, a single settlement bank – the 'stricken bank' – is unable to submit payments to CHAPS Sterling owing to a failure of its internal back-office systems. Payments in favour of the stricken bank can still be settled (across Bank of England accounts), but it is likely that only the most urgent of these payments would continue to be processed.

For the stricken bank itself, the operational failure creates a risk that it is not possible to complete its payment activities by the end of the business day. More significant for the payment system as a whole, however, is the possibility that the operational failure could disrupt the payment activity of the unaffected settlement banks. In particular, there is a risk that, owing to a liquidity sink effect, these banks will be unable to settle their outgoing payments at the desired time (or even, in extreme cases, not at all) owing to shortages of available liquidity.¹¹

Whether additional risks are created by system-wide liquidity shortages would depend on the extent to which the affected payments are 'time-critical' and thus require settlement at (or before) a certain time. For a large proportion of CHAPS Sterling payments the precise time of settlement is unlikely to be of major significance. But a certain sub-set of payments are appropriately described as time-critical, and delays to any of these payments would thus represent

a crystallisation of liquidity risk (which could, in turn, create wider disruption going beyond CHAPS Sterling itself).

The likelihood of liquidity shortages arising can be reduced, however, by the behaviour of the unaffected settlement banks. Indeed, on learning of the operational problem one response would be immediately to stop sending payments to the stricken bank (thereby preserving liquidity). In line with this, CHAPS Sterling operational procedures aim to ensure that details of a disruption to normal payment processing are communicated to all settlement banks as promptly as possible – in practice the time-lag between a settlement bank experiencing an operational failure and the flow of payments to that bank slowing significantly is likely to be of the order of ten minutes.

Nevertheless, the possibility for a liquidity sink to develop remains real, particularly if the stricken bank holds a large positive balance on its account with the Bank of England (and is therefore controlling a large amount of liquidity) at the time of the operational failure. The risk is also greater where the stricken bank is due to receive a large gross value of payments in the ten-minute period immediately following the operational failure.

One of the potentially most problematic scenarios therefore involves the operational incident occurring at a point in time when the stricken bank has the potential to act as a liquidity sink and there remain a large volume (and value) of CHAPS Sterling payments still to settle.

The potential for a settlement bank to become a liquidity sink can be assessed using output from the benchmark simulation. In particular, a 'virtual' credit balance – defined as the actual balance on account with the Bank of England plus the gross inflow of funds over the next ten minutes – was calculated for each settlement bank at every point in time. The worst-case date and time for the operational failure to occur was then determined by identifying the peak virtual credit position (for any settlement bank) observed during the sample period, subject to this occurring before 12 noon on the day concerned.¹²

11: In practice, the unaffected settlement banks would always have the option of resolving the shortage by obtaining additional intraday liquidity from the Bank of England (although this relies on the settlement banks having sufficient access to suitable collateral).

12: The before 12 noon constraint was introduced to ensure that there would be a significant volume and value of CHAPS payments still to settle following the initial shock to the system.

Applying this reasoning, a set of simulation experiments (using five different initial levels of liquidity ranging from the lower bound to the upper bound) were carried out under the assumption that an operational problem affected one particular CHAPS Sterling settlement bank at a point when it held a credit position of £4.2 billion on its account with the Bank of England. Over the remainder of the day concerned, this settlement bank was due to be either sender or receiver for some 46,000 payments with an overall value of £45.7 billion. This illustrates a point made by James (2003) – an operational incident of the kind considered here has the potential to have a large impact on the total volume and value of payments actually settled in CHAPS Sterling.

More significant from a systemic perspective, however, is whether the operational failure creates liquidity shortages in the system as a whole. In particular, it is interesting to determine the extent to which payments between unaffected settlement banks are either delayed or prevented from being settled.

Under normal operating conditions, any level of initial liquidity at least equal to the lower bound would be sufficient to allow all CHAPS Sterling payments to settle. This is not necessarily the case, however, following an operational incident – the failure of the unaffected settlement banks to receive payments from the stricken bank may leave them short of liquidity. In fact, the simulation results (reported in Table 1) reveal that, at most liquidity levels, the disruption did not prevent settlement of a substantial volume and value of payments between unaffected settlement banks. Indeed, a significant impact (in terms of unsettled payments) was observed at the lower bound of liquidity only.

Given that the actual amount of liquidity available in CHAPS Sterling typically exceeds the upper bound, the findings reported in Table 1 imply that CHAPS Sterling is well placed to withstand an operational incident affecting one settlement bank. This conclusion is strengthened further by the presence of the stricken bank scheme, the effects of which were not captured in the simulation experiments. If the scheme was invoked, the resulting re-distribution of liquidity should allow some (or all) of the outstanding payments to be settled.

Table 1 captures the extreme outcome of the operational failure causing liquidity shortages that are of sufficient scale to prevent same-day settlement of all CHAPS Sterling payments. Also significant, however, is the extent to which settlement of individual payments (particularly those that are time-critical) is delayed beyond the preferred time – that is, the amount of extra time payments spend in the central queue awaiting the arrival of additional liquidity.

Table 2 draws on the simulation results to present two alternative measures of queuing and delay, in each case expressed relative to results obtained from the benchmark simulations of CHAPS Sterling operating under normal conditions (with the appropriate amount of available liquidity). The first measure – average queue value – refers to the average (across the entire day) value of payments held in the central queue. The second measure is the ‘delay indicator’ introduced by Bech and Soramäki (2001). This statistic is based on the amount of time each individual payment spends in the central queue relative to its maximum possible queuing time; a value-weighted average of the (relative) delay to all payments may be viewed as a measure of the aggregated level of delay in a payment system.

Table 1:
Effect of an operational failure affecting one CHAPS Sterling settlement bank on payments between other settlement banks – unsettled payments

Liquidity level	Value of unsettled payments (£ billions)	Volume of unsettled payments
$\alpha = 0$ (UB)	0.00	0
$\alpha = 0.25$	0.00	0
$\alpha = 0.50$	0.01	7
$\alpha = 0.75$	0.35	66
$\alpha = 1$ (LB)	4.03	4,086

Table 2:
Effect of an operational failure affecting one CHAPS Sterling settlement bank on payments between other settlement banks – delayed payments

Liquidity level	Average queue value (£ billions)	Delay
$\alpha = 0$ (UB)	0.01	0.00
$\alpha = 0.25$	0.03	0.01
$\alpha = 0.50$	0.07	0.01
$\alpha = 0.75$	0.15	0.04
$\alpha = 1$ (LB)	0.23	0.06

Algebraically, the delay indicator (which must lie between 0 and 1) is defined as:

$$\frac{\sum_i (t_{2,i} - t_{1,i}) a_i}{\sum_i (t_{end} - t_{1,i}) a_i}$$

where a_i is the value of payment i ; $t_{1,i}$ and $t_{2,i}$ are, respectively, the submission and settlement times for payment i ; and t_{end} is the time for the end of the business day (4.20 pm in the case of CHAPS Sterling). A value of zero for the indicator implies that no payment has spent any time in the central queue (as would be the case with upper bound liquidity under normal operating conditions), while a value of one shows that every payment has been held in the queue for the maximum possible time (that is, from the point it was first submitted to the system until the end of the business day).

The results reported in Table 2 point to a similar conclusion to that drawn from Table 1. In particular, an operational failure involving a single settlement bank is unlikely to have a significant impact on the system as a whole (or, more precisely, on the ability of the unaffected settlement banks to make payments to each other), except in situations where the initial level of liquidity is low. Moreover, current levels of liquidity in CHAPS Sterling imply that such an outcome is improbable.

Operational failure affecting multiple settlement banks

The risk implications of operational disruption affecting the ability of multiple settlement banks to submit payments to CHAPS Sterling are similar to those arising from the operational failure of a single settlement bank. In particular, the scale of the risk will be related to the aggregate volume and value of payments that remain unsettled at the time of the initial shock, along with the potential of the stricken banks to act as liquidity sinks. On both measures, the risks are intuitively likely to be greater than in the case of a single stricken bank.

To examine this further, output from the benchmark simulation was used to calculate the aggregate credit position held on the Bank of England accounts of

three randomly selected settlement banks at every point in time during the sample period. The peak value of this metric (again subject to the before 12 noon constraint) was then used to identify the worst-case date and time for an operational incident simultaneously to affect the three settlement banks in question.¹³

A further set of simulations was then carried out under the assumption that the three settlement banks would all encounter operational problems at a point when they (collectively) controlled £4.8 billion of liquidity. The immediate consequence of this was that nearly 51,000 payments with an overall value of £143.4 billion could not be settled as normal because they involved one of the stricken banks as either payer or payee.

In order to assess the impact on the system as a whole, Table 3 describes the outcome of the simulations in terms of the volume and value of payments between settlement banks unaffected by the operational incident that were left unsettled at the end of the day.

Table 3:
Effect of an operational failure affecting three CHAPS Sterling settlement banks on payments between other settlement banks – unsettled payments

Liquidity level	Value of unsettled payments (£ billions)	Volume of unsettled payments
$\alpha = 0$ (UB)	0.00	0
$\alpha = 0.25$	0.68	24
$\alpha = 0.50$	2.84	1,078
$\alpha = 0.75$	7.58	3,225
$\alpha = 1$ (LB)	13.08	6,299

A comparison of Tables 1 and 3 reveals that the impact of operational disruption involving multiple settlement banks is, unsurprisingly, significantly greater than in circumstances where a single settlement bank is affected. Nevertheless, it remained the case that no payments between unaffected settlement banks were left unsettled at the upper bound of liquidity (by implication, this result would also hold at actual levels of liquidity in CHAPS Sterling).

Table 4 describes the outcome of the simulations on the basis of settlement delay, using the two measures

13: For simplicity, it is assumed that any operational incident affecting multiple settlement banks (for example, a localised general power failure) will be of sufficient severity that it is immediately visible to all settlement banks; the flow of payments to the stricken banks would therefore cease almost immediately.

described above. As previously, the results are (in each case) reported relative to the outcome of the benchmark simulations of CHAPS Sterling operating under normal conditions.

Table 4:
Effect of an operational failure affecting three CHAPS Sterling settlement bank on payments between other settlement banks – delayed payments

Liquidity level	Average queue value (£ billions)	Delay
$\alpha = 0$ (UB)	0.02	0.03
$\alpha = 0.25$	0.05	0.05
$\alpha = 0.50$	0.07	0.06
$\alpha = 0.75$	0.13	0.20
$\alpha = 1$ (LB)	0.02	0.25

It is clear from Table 4 that an operational event affecting three settlement banks is likely to lead to a significant increase in settlement delays, even at upper bound levels of liquidity. A caveat to this finding, however, is that the removal of all payments involving the stricken banks has a significant impact on the set of payments upon which the measures of queuing and delay are based (relative to the benchmark simulations). This explains why the relationship between liquidity level and the average queue value is not monotonic.

Operational failure of the central payment processing infrastructure

In this final scenario, it is assumed that an operational incident renders the CHAPS Sterling central payment processing infrastructure inoperable. The standard response to such a situation (which has never occurred) would be to invoke RTGS by-pass mode. If the operational incident occurred late in the day, however, it may not be necessary to take this step – the Bank of England would be able to process manually a small number of unsettled payments, which would avoid the introduction of additional risks. This highlights the importance, from an operational risk perspective, of rapid payments throughput in CHAPS Sterling.

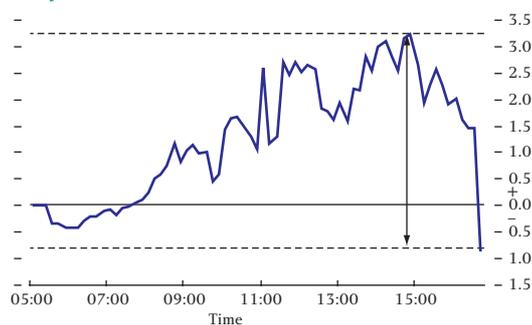
Invoking by-pass mode would allow payment processing to continue, but would also create additional settlement risks. In particular, the departure from RTGS would result in intraday credit exposures between the CHAPS Sterling settlement

banks, the scale of which would be directly related to the absolute size of individual settlement banks’ net debit positions.

Under the preferred variant of by-pass mode, net debit positions are fully backed by liquidity held with the Bank of England. The credit risks are thus tightly controlled. This may not be the case, however, in situations where it is necessary to implement the alternative version of by-pass mode and impose net sender caps set at a maximum of £1 billion for each settlement bank. In such circumstances, net debit positions may be only partially collateralised – a default could therefore result in the remaining settlement banks (and their customers) incurring financial losses. Moreover, there are currently no formal arrangements in place to provide the additional liquidity that would be required to complete the net settlement.¹⁴

One of the potentially most difficult scenarios therefore involves invoking by-pass mode at a point of time when an individual settlement bank would incur a large net debit position during the period CHAPS Sterling is operating in by-pass mode. On any given day, the maximum possible value of this position may be calculated (using the output from the benchmark simulation) by measuring the difference between each settlement bank’s largest intraday net credit position (on its account with the Bank of England) and its end-of-day balance. This is illustrated in Chart 1, which depicts a randomly generated settlement account balance over the course of one business day. The vertical distance shown by the arrow represents the maximum possible net debit position the settlement bank concerned could incur were by-pass mode to be invoked intraday.

Chart 1:
Sample settlement account balance



14: The CHAPS Company intends to consider the introduction of such arrangements once a similar financial risk management scheme involving the UK’s main retail systems (BACS and the Cheque and Credit Clearings), both of which settle on a net basis, has been implemented.

Applying this methodology, the worst-case outcome was identified by determining the time at which invoking by-pass mode would lead to the largest single net debit position. A simulation experiment was then performed under the assumption that by-pass mode was invoked (with net sender caps set at £1 billion for each settlement bank) at this exact time.

The simulation results indicate that under such circumstances 23 payments with a total value of £3.8 billion would have remained unsettled at the end of the day. This finding stems from the fact that one settlement bank needed to make net payments in excess of £1 billion between the time that by-pass mode was invoked and the end of the day, but was unable to do so as a result of the sender cap.

An important aspect of this analysis is that it has assumed that settlement bank behaviour is unchanged. In practice, a settlement bank would be able to raise additional liquidity by borrowing in the interbank market (or elsewhere) in order to ensure it could settle all of its outstanding transactions. This has the effect of transferring, but not eliminating, the credit risk associated with the net debit position; rather than being within CHAPS Sterling, the exposure would then be held outside the system by the lending bank.

Conclusions

This article has employed a simulation approach to explore the consequences of operational disruption affecting CHAPS Sterling, the UK's main large-value payment system. In particular, a series of experiments was carried out to quantify the liquidity and credit risks that the settlement banks could incur in the event that normal payment processing activity was to be disrupted.

The simulation results illustrate that, while there remains scope for CHAPS Sterling contingency arrangements to be improved further (for example, through the agreement of a loss-sharing mechanism for use in the event of a settlement bank being declared insolvent while the system is operating in by-pass mode), the system is already highly resilient. More specifically, the analysis has shown that CHAPS Sterling is well placed to withstand a variety of plausible, though low-probability, types of operational disruption, and thus that the likelihood of operational risk in CHAPS Sterling acting as a source of financial instability appears to be reasonably small. Nevertheless, a degree of liquidity risk is still potentially present; this is especially the case in situations where an operational incident affects many settlement banks simultaneously (as illustrated by the simulation results presented in Tables 3 and 4).

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