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Financial Stability Review

June 2005

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/publications/fsr/2005/themesandissues0506.htm and the *Financial stability conjuncture and outlook overview* is at: www.bankofengland.co.uk/publications/fsr/2005/overview0506.pdf.

The Bank also now occasionally publishes papers on financial stability themes on its website; they can be found at: www.bankofengland.co.uk/fsr/financialstabilitypapers.htm. The papers may subsequently be included in whole or in part in the next *Financial Stability Review*.

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themes and issues

Since last December's *Review*, the short-run outlook for the stability of the UK financial system has remained good. The major UK banks, and the borrowers and other counterparties to which they are exposed, have not in general shown any signs of financial fragility. However, the 'search for yield' has been continuing and longer-term vulnerabilities may be building because of the still rapid growth in some borrowers' and financial institutions' balance sheets. The threats facing the UK financial system are discussed in the Bank of England's regular assessment of the *Financial stability conjuncture and outlook*.

Private firms cannot be expected voluntarily to take full account of the possible consequences of spillovers from their actions for the overall stability of the financial system as a whole, unless their incentives are altered. Hence there is a potential role for policymakers in influencing incentives appropriately and in some cases constraining private actions. The Bank's regular article *Strengthening financial infrastructure* considers two exercises designed to ensure that some of the risks faced by firms are managed in such a way that they do not give rise to an unacceptable level of systemic risk. First, it reports on the proposals of the Basel/IOSCO Trading Book Review, which are currently being finalised after a period of consultation. An important aspect of the proposals is that capital standards should take into account the liquidity of financial markets used by banks to transfer risk. Second, the article looks at the management of risks in payment systems. As a practical example, it describes the agreement put in place earlier this year by the Bank, the payments industry association APACS and the member banks of the United Kingdom's major retail payments systems, to reduce spillover risks that could arise in the event of the default of a member of these systems. This agreement required co-operation between the banks and the payments industry, the Bank of England and the FSA to ensure that the agreement was supported by prudential rules.

Another way in which the authorities can contribute to the maintenance of financial stability is by strengthening the framework for restructuring sovereign debts. The article by Paul Bedford, Adrian Penalver and Chris Salmon, *Resolving sovereign debt crises: the market-based approach and the role of the IMF*, notes that, historically, sovereign debt crises have often entailed protracted and costly debt restructuring negotiations. As such crises are not unusual, it is important to address these

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difficulties. The authors argue that, despite some helpful recent developments, there remains scope both to strengthen market-based mechanisms for resolving crises and to improve the clarity of IMF policies.

One of the market-based mechanisms that can help to mitigate systemic risk is the appropriate design of sovereign bond contracts. The Bank of England hosted a workshop in January 2005, reported here by Paul Bedford, to facilitate discussion among market participants. The workshop explored innovations that, in principle, might help to improve the effectiveness of the debt restructuring process. Three specific innovations were considered at some length: engagement provisions; the appointment of bondholder trustees; and aggregation clauses.

Contract design ought to take into account the possibility that debtors may default and the fact that some desirable financial markets and instruments are missing, so full private insurance arrangements to eliminate financial fragility are impossible. Ideally, such issues would be analysed together in a single coherent model. In *A model to analyse financial fragility*, Charles Goodhart and Lea Zicchino sketch a framework for such an approach to the analysis of financial stability, drawing on recent research at the Bank and forming part of a wider effort to develop the theoretical analysis of financial stability. In contrast to many previous models, it includes features that are essential if the possibilities of contagion and feedback effects are to be examined: banks and firms can default, there are incomplete markets and agents differ in their characteristics. The framework generates some complex models but, nevertheless, these can be calibrated empirically (if imprecisely) to examine the welfare consequences of a range of possible policy measures, such as capital adequacy requirements. One advantage of this approach is that it holds out the hope of deriving an empirical measure of financial fragility.

The Goodhart and Zicchino approach is helpful when assessing the likely long-run impact of changes in key parameters and policies on risks to financial stability, as it takes into account general equilibrium feedbacks. To achieve that goal while maintaining the model's tractability requires some strong simplifying assumptions. In assessing how robust real financial systems are likely to be in the face of shocks, it is helpful also to use approaches that accommodate a richer empirical data set and are more amenable to statistical estimation, even though they may not capture all the second-round effects of the shocks. In *Stress testing as a tool for assessing systemic risks*, Philip Bunn, Alastair Cunningham and Mathias Drehmann set out the current stress-testing framework used in this spirit in the Bank of England to assess the degree of credit risk; this can be seen as complementary to the Goodhart-Zicchino approach. As an example, the article updates the analysis of the shocks



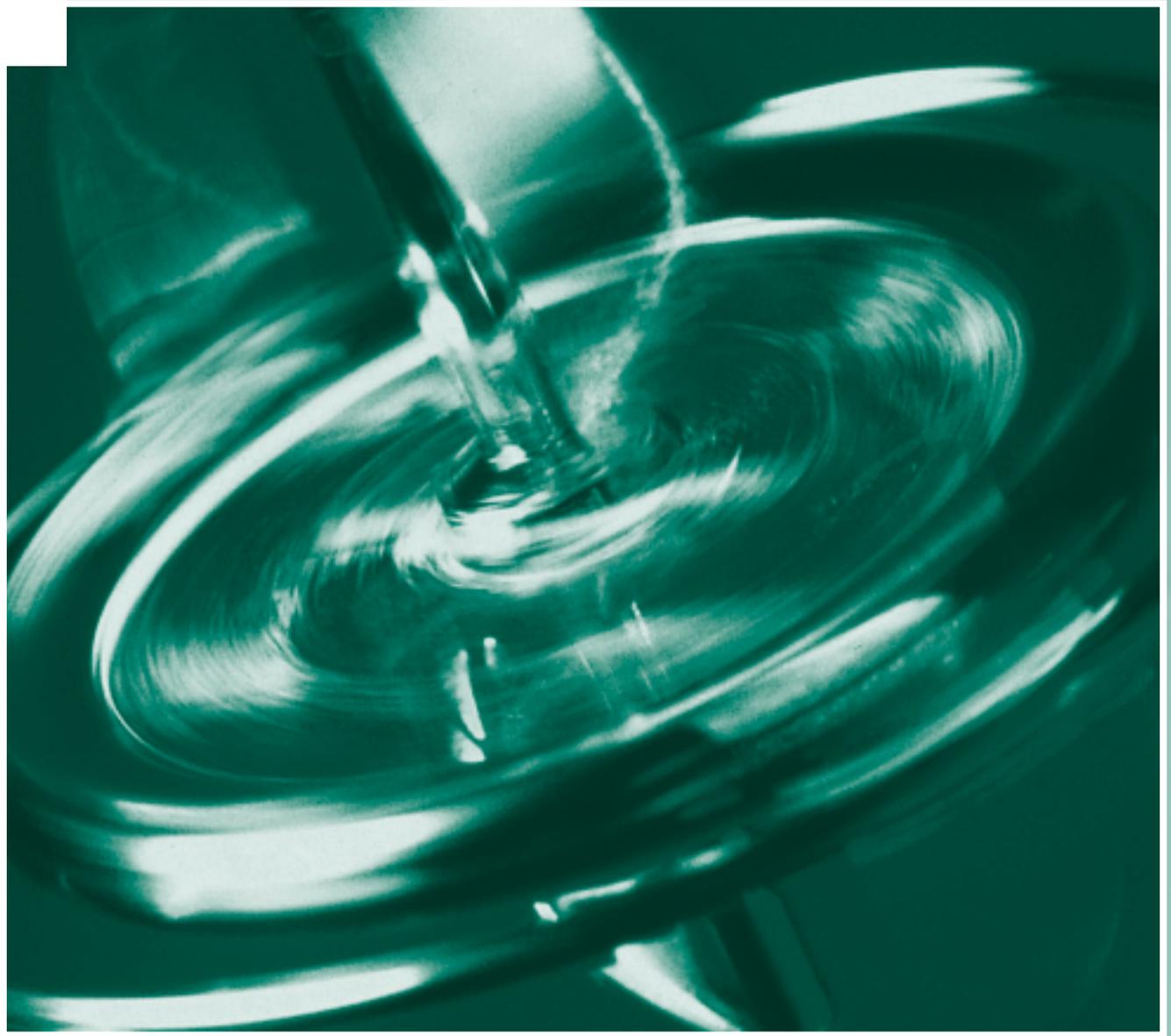
considered in the 2002 UK Financial Stability Assessment Programme exercise with the FSA and IMF; the results are reassuring and consistent with the qualitative judgements made in this issue's review of the *Financial stability conjuncture and outlook*. The authors also discuss some of the challenges associated with stress testing. Stress events are rare, which makes calibration of such circumstances difficult, particularly if the relationships between variables are non-linear and if there are structural breaks. But the stress-testing framework can be used to assess the importance of these challenges. The article is part of the Bank's wider strategy to communicate its stress-testing work and highlight some key issues for market participants, which complements the work being undertaken with firms by the FSA.

Stress-testing generally uses hypothetical 'shock scenarios'. But it is also possible to examine the impact of historical events. This is the approach taken by Marco Stringa and Allan Monks in their investigation *Inter-industry linkages between UK life insurers and UK banks: an event study*, which considers the impact of six events that affected life insurers' equity prices in 2001–03. They find that adverse events did not spill over to have a significant impact on the UK banking sector as a whole, but so-called bancassurers' equity prices were affected to some degree, possibly as a consequence of their direct ownership of life insurance subsidiaries.

The articles in this issue of the *Financial Stability Review* variously consider how to think about financial stability, threats to financial stability and measures to reduce those threats. The Bank of England, alongside the FSA and HM Treasury, is also heavily involved in ensuring that, in the unlikely event of a financial crisis occurring, it can be resolved quickly and effectively. These are all important aspects of a central bank's work, as Sir Andrew Large explains in *A framework for financial stability*, a speech reprinted in this *Review*. Sir Andrew makes the point that central banks need to be clear, accountable and transparent as to the reasons for devoting resources to financial stability work. He articulates a set of general organising principles for such work, acknowledging that — as in the United Kingdom — responsibility for this public policy objective is often shared with regulators and the finance ministry. And he draws attention to some of the reasons why making such a framework operational is challenging — not least because of the increasing complexity of financial systems. But it is important that the challenge be taken up, given the potential costs to economies of failure.

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The financial stability conjuncture and outlook

An overview of UK financial stability: threats and resilience

The near-term risks to the stability of the UK financial system remain low. The large UK-owned banks made fewer new provisions against bad debt last year than the year before (Chart 1); corporate default rates around the world are still low; ratings upgrades have outnumbered downgrades since the *December Review*; and volatility in international financial markets has been muted for most of the time. Unlike in the previous six months, there have, however, been a few signs of a reassessment of credit quality: bond spreads — especially at the high-yield end of the credit spectrum (Chart 2) — and credit default swap (CDS) premia have risen around the world since March, and market participants have been willing to pay a little more for protection against bank defaults. Write-offs on UK household debt have increased. But, overall, the outlook suggests that major threats to financial institutions from developments in the economic environment are unlikely to materialise in the short term.

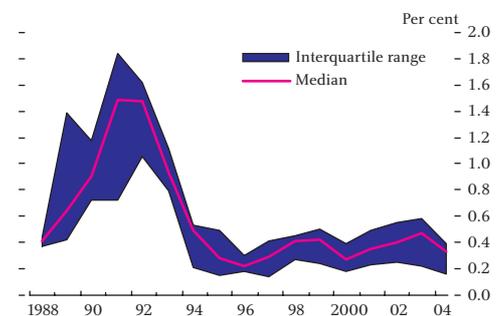
Nevertheless, financial stability authorities need to consider whether financial markets and institutions are robust enough if unlikely downside risks do crystallise. In the current conjuncture, with the ‘search for yield’ highlighted in previous *Reviews* apparently continuing, the question arises as to whether markets are underpricing risk and lenders underestimating the possibility of defaults. If that were so, it would encourage overborrowing, raising the vulnerability of borrowers and hence lenders to adverse shocks. And a reassessment of risk by market participants could lead to abrupt asset price changes.

Credit default risk

Past *Reviews* have noted how longer-term vulnerabilities may have increased, given continuing rapid lending growth by the major UK banks (Chart 3); high and rising debt-to-income ratios for households in the United Kingdom and several other countries; and historically high levels of UK corporate debt. This issue remains.

Domestically, the vulnerabilities are most evident in unsecured lending to UK households, which accounts for the largest

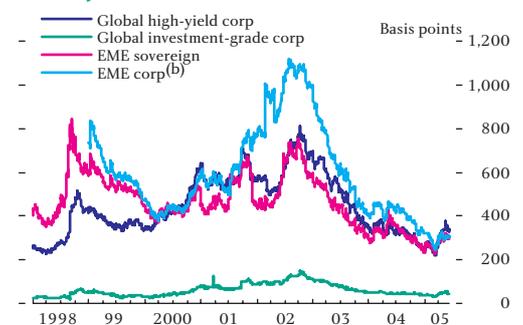
Chart 1
Large UK-owned banks' new provisions for bad and doubtful debts^(a)



Sources: Thomson Financial Datastream, published accounts and Bank calculations.

(a) New provisions charge for bad and doubtful debts in the P&L account as a percentage of loans to customers (including finance leases) and banks.

Chart 2
Bond spreads^(a)

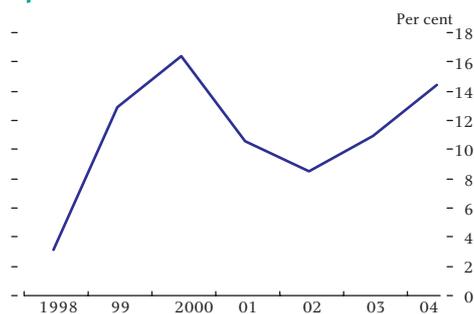


Source: Merrill Lynch.

(a) Spread over asset swaps.

(b) Data are only available from 31 Dec. 1998 onwards.

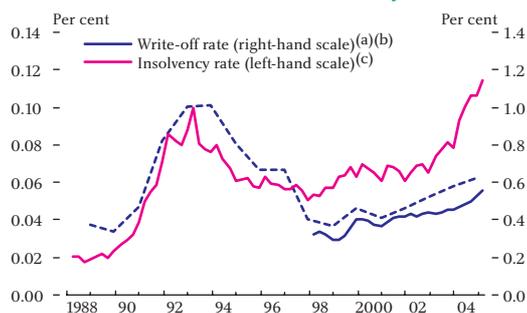
Chart 3
Annual growth in major UK banks' credit exposures^(a)



Source: Published accounts.

(a) Credit exposures are measured by loans and advances to customers and banks, items in course of collection from other banks, debt securities, Treasury bills and other eligible bills.

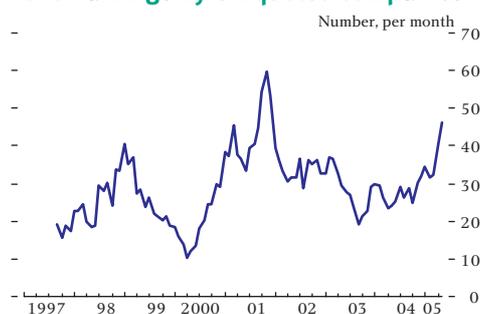
Chart 4
Household write-off and insolvency rates



Sources: ONS, DTI and Bank of England.

(a) Solid line shows annual write-off rate for UK-owned banks, dotted line the rate for all UK-resident banks (interpolated annual data).
(b) Data are for individuals; unincorporated businesses excluded.
(c) Data are for England and Wales, and are annualised.

Chart 5
Profit warnings by UK quoted companies^{(a)(b)}



Sources: Lexis Nexis and Bank of England.

(a) Includes AIM listed companies.
(b) Backward-looking three-month average.

domestic contribution to UK banks' write-offs of bad debts in recent years. The write-off rate on household lending is still low by historical standards. The sharp rise in personal insolvencies — on an annual basis, they are now some 30% above their early 1990s peak — very likely exaggerates the deterioration in the creditworthiness of households in general. However, the write-off rate increased quite sharply in the second half of last year (Chart 4), wholly because of losses on unsecured lending — on credit cards and via other channels. It seems unlikely that this rise was fully anticipated by lenders in their pricing, and some lenders report that they have started to tighten credit standards. Losses on mortgages have remained very low, although mortgage arrears have ticked up a little.

One challenge for banks is that a significant proportion of UK households borrow from more than one lender, so that their creditors do not have a full picture of their financial burden. Hence the efforts of the British Bankers' Association to promote data sharing, to allow improved assessments of borrowers' debt-servicing capacity, are welcome.

While the personal insolvency rate in the United Kingdom has been rising, the UK corporate insolvency rate has fallen to its lowest level for 25 years. But there have been some signs of a turning point recently: sterling bond spreads have risen since March, profit warnings (Chart 5) have become more frequent and Consensus forecasts suggest that profits growth is likely to slow. Capital gearing remains higher than past statistical relationships would have suggested, and firms in general are showing little inclination to reduce their leverage.

Borrowing by the UK commercial property sector has been increasing significantly. The annual growth rate of lending to the sector, at nearly 20% in 2005 Q1, has remained rapid, and the sector now accounts for over a third of the major UK banks' outstanding lending to UK-resident non-financial companies (Chart 6). And there may be substantial indirect exposures: much lending to small and medium-sized enterprises (a fifth of corporate lending) is collateralised by property. As with corporate lending generally, write-off rates have been very low recently. But there is a possibility that expectations of rental growth are optimistic. A recent survey by the Investment Property Forum suggested that nominal rental values were expected to increase by nearly 3% per year over the next five years; yet over the past 20 years, they have increased less rapidly than the general price level.

Risks in the international financial system

The higher-than-expected gearing of UK firms reflects in part a more widespread phenomenon, the 'search for yield' by investors that has helped to compress borrowing spreads globally. In the first part of the period under review, there was some evidence of

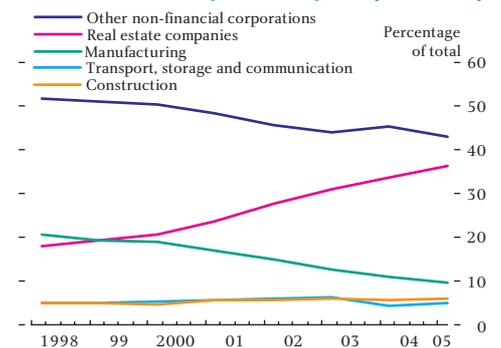
the ‘search for yield’ intensifying, with investors’ demand for risky assets helping to narrow bond spreads and CDS premia further. Syndicated loan origination — in which some major UK-owned banks are active — was close to the record levels of 2004; spreads in that market were lower, too, and there were reports of covenants and collateral requirements being loosened and leverage increasing. However, from around mid-March, bond spreads and CDS premia started to increase. Although much of the rise since mid-March has subsequently unwound, spreads generally remain a little above the level at the time of the previous *Review* (Chart 7).

Given the continuing low level of medium to long-term interest rates on assets without default risk (despite increases in US official short-term rates in the period), many investors have continued to seek out higher returns, accepting higher risks in the process. The systemic risk is two-fold: first, risk may be being underpriced, giving rise to the danger of a sharp movement in asset prices in the event of some trigger such as a major credit default; second, even if risks are being appropriately priced given the current outlook, financial market participants have taken on relatively illiquid assets to enhance yield, possibly giving rise to difficulties in adjusting balance sheets if the outlook changes. In both cases, risk management by firms is unlikely to take fully into account the spillover and contagion risks to other market participants, which are potentially large in the event of a major firm facing liquidity or solvency problems. Such events seem unlikely — judging by market indicators such as CDS premia — but their costs if financial intermediation is disrupted could be considerable.

The profit warning from General Motors (GM) in March and subsequent rating downgrades of GM and Ford provided a good example of how in the current environment the crystallisation of risk can have unexpected effects, as argued in the December 2004 *Review*. Perceived default risk spiked (Chart 8). Some hedge funds and trading desks of large complex financial institutions (LCFIs) are reported to have made significant losses, because the developments triggered unexpected relative movements in bond and equity prices, with spillovers to the rapidly growing structured credit market and the high-yield corporate bond market. Some participants reportedly found it difficult to close out positions in some ‘crowded trades’ because liquidity was scarce when they needed it. And some faced challenges in valuing positions.

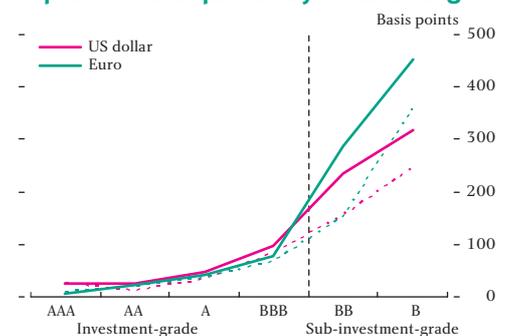
Whether all the consequences of this episode have yet worked their way through fully remains to be seen. There does not appear to have been contagion to the high-yield emerging-market asset class or to investment-grade bonds. It may have helped that increasing use of credit risk transfer markets has facilitated the dispersion of firm-specific credit risk.

Chart 6
Major UK banks’ stock of lending to non-financial companies, split by industry^(a)



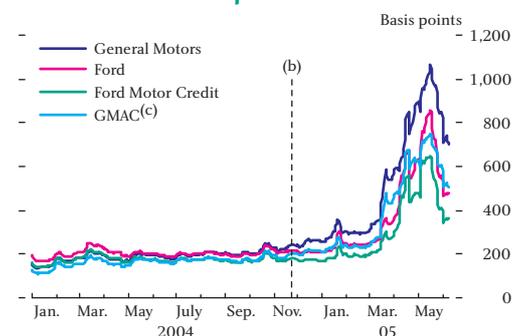
Source: Bank of England.
(a) Refers to peer group discussed in Box 1, page 18.

Chart 7
Corporate bond spreads by credit rating^{(a)(b)}



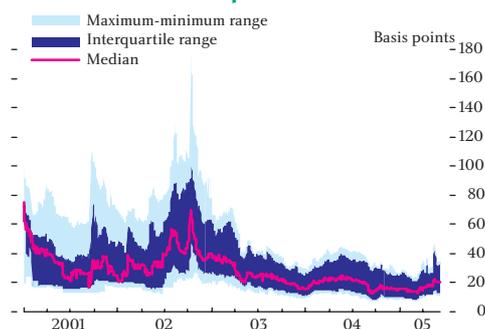
Source: Merrill Lynch.
(a) Spread over swaps.
(b) Spreads as at 9 June 2005 (dashed lines as at Dec. 2004 *Review*). Solid line as at June 2005 *Review*, dotted line as at Dec. 2004 *Review*.

Chart 8
US auto sector CDS premia^(a)



Source: Markit.
(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) Dec. 2004 *Review*.
(c) General Motors Acceptance Corporation.

Chart 9
Price of LCFI default protection^(a)



Sources: Markit and Bank calculations.

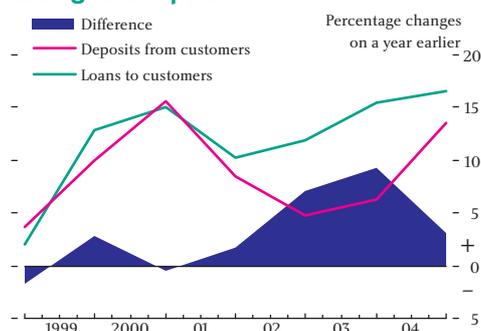
(a) Annual premia for credit protection on issuers using ISDA documentation, measured as mid-point between last bid and ask quotes of five-year senior debt credit default swap contracts.

But many hedge funds have reportedly been paying particular attention to managing the liquidity of their liabilities and positioning themselves to cope if withdrawals were to increase markedly. CDS premia (Chart 9) rose more for those LCFIs believed to be more involved in prime brokerage and structured credit markets, although the movements were small by historical standards. The experience emphasises the value of extensive stress-testing by financial firms, avoiding excessive reliance on models calibrated over short periods.

UK financial sector resilience

Some major UK banks have increased their overseas business and capital market activity rapidly, partly by means of acquisitions (notably in the United States). The major UK banks have also continued to increase their borrowing — from other banks and in international capital markets — to fill the ‘customer funding gap’ between customer deposits and more rapidly expanding customer loans (Chart 10). Hence the interaction of the major UK banks, as a group, with the international financial system has been increasing recently. The reliance of some UK banks on wholesale funding has in the past caused a degree of concern on the part of rating agencies and others. Wholesale funding could prove difficult and costly to roll over at a time of firm-specific or market-wide stress. However, major UK banks’ reported sterling liquidity exceeds regulatory minima (Chart 11). Some banks have been developing liquidity ‘stress testing’ to assess how assets and liabilities might behave in extreme scenarios, although, in general, they do not publicly disclose the results.

Chart 10
Major UK banks’ growth in customer lending and deposits^{(a)(b)(c)}

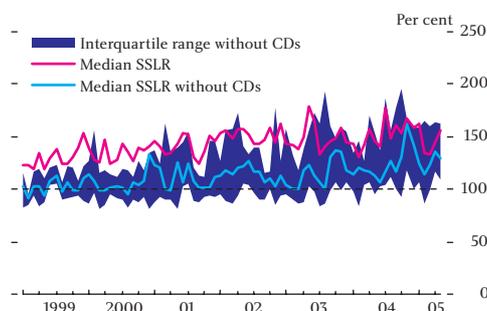


Sources: Published accounts and Bank calculations.

(a) Refers to peer group as discussed in Box 1, page 18.
 (b) Growth rates have been adjusted for peer group membership changes.
 (c) ‘Customers’ comprises all non-bank borrowers and depositors.

Banks’ stress testing of extreme shocks to credit quality has been evolving, and is apparently more advanced than similar work on liquidity. It is also possible to carry out stress tests for the UK banking system as a whole using aggregate data (see Bunn, Cunningham and Drehmann (2005), pages 116–26 of this Review). These suggest that the major UK banks would remain profitable in the stress scenarios considered. The median return on assets among the major UK banks has remained high, rising further in 2004, as both provisions and cost-income ratios tended to fall. But, in the light of the changing outlook for credit risk and the low absolute level of provisions, the likelihood of further falls in provisions continuing to enhance profitability seems limited. As a result, some banks have been seeking to diversify their activities — increasing their income from insurance, dealing profits, fees and commissions, for example — and this may help support profits in the event of a rise in credit losses. The major UK banks’ median Tier 1 capital ratio remained above 8% last year (Chart 12) — substantially above the regulatory minimum of 4% set by the Basel framework for internationally active banks.

Chart 11
Major UK banks’ sterling stock liquidity ratios^{(a)(b)(c)}



Source: FSA regulatory returns.

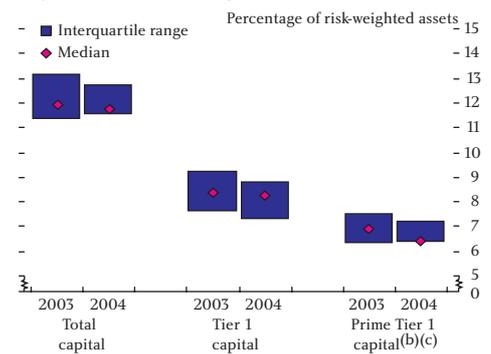
(a) Refers to peer group as discussed in Box 1, page 18.
 (b) Data for selected major UK banks, where data are available.
 (c) The FSA regulatory minima for the sterling stock liquidity ratio is 100 indicated by the dotted line.

Private financial firms cannot be expected voluntarily to consider the consequences of all the spillovers from their own actions, so

their risk management may not by itself deliver sufficient reduction in risks to the financial system as a whole. Public authorities can, in principle, design regulation to encourage firms to address these systemic risks. The article *Strengthening financial infrastructure* considers the Basel/IOSCO Trading Book Review (TBR), which is currently being finalised after a period of consultation. It provides a practical example of how regulation can be designed to enhance systemic stability.

The risk of financial instability can also be reduced by designing payment and settlement infrastructure so that it does not act as a potential channel for difficulties to spread from one institution to another, and can continue to operate should a member institution be unable to meet its obligations. *Strengthening financial infrastructure* also reports on the implementation earlier this year of arrangements which reduce risk associated with the United Kingdom's major retail payment systems, BACS and the Cheque & Credit Clearings. The Bank, working with the member banks of these clearings, the payments industry association APACS and the FSA, has put in place arrangements for members to fund possible shortfalls that would otherwise prevent settlement in these systems from completing in the event of a member's default.

Chart 12
Major UK banks' capital ratios^(a)



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

- (a) Refers to peer group as discussed in Box 1, page 18.
- (b) Prime Tier 1 comprises ordinary shares, associated reserves and retained earnings.
- (c) Data for selected major UK banks, where data are available.

1 Credit risk: key points

Near-term risks to the UK financial sector from default by households, firms, and overseas borrowers have remained low since the December *Review*. The demand for credit has moderated somewhat, with the annual growth rates of both secured and unsecured lending slowing, in line with the outlook for economic activity and the housing market. Perceptions of the likelihood of default appear to be changing. Some lenders have begun to tighten credit standards on unsecured lending and are reviewing measures of affordability on new mortgages. Market participants also seem to be reassessing the probability of corporate default, following the recent downgradings in the US auto industry. The growth in profits of UK firms has shown signs of slowing and profit warnings among quoted firms have risen. However, corporate default and write-off rates in the United Kingdom remain at low levels.

The outlook for credit risk is likely to remain favourable in the short term, reflecting prospects for economic activity around the world. But the high levels of indebtedness of households and firms continue to point to medium-term vulnerabilities. Unexpected periods of economic strain could precipitate tighter credit conditions and repayment problems. In particular:

- losses on unsecured lending are likely to rise sharply during times of stress. So the continued build-up of unsecured debt poses challenges for borrowers and lenders in the event of a significant adverse shock to incomes;
- the relatively high level of gearing leaves the corporate sector vulnerable to any sharper-than-expected slowdown in activity. Any financial pressures are likely to be exacerbated by the growing prominence of private equity transactions (see Box 3). And investors' desire to increase their exposure to the commercial property sector further could trigger problems should rental growth expectations prove over-optimistic; and
- there are sizable exposures overseas (see Box 6) — in particular, to households and firms in the United States, to banks in Europe and to residential property in Hong Kong. Immediate risks from these credit exposures remain small, although some borrowers' balance sheets may be vulnerable to further rises in oil prices and sharp falls in property prices. Unexpectedly sharp rises in US interest rates, or an abrupt slowdown in economic activity in China, could also adversely affect these exposures.

The UK financial system remains well placed in the face of these near and medium-term risks. Although unsecured lending is a small part of UK-owned banks' lending activities, the recent acceleration of write-off rates on lending to households is unlikely to have been fully anticipated by banks. The risks of default on mortgage portfolios and commercial property lending have also risen somewhat, but potential losses appear likely to be contained. And the likelihood of default on the overseas exposures of the main UK-owned banks is moderate, although the slight deterioration in the global financial environment since December points to the need for vigilance.

1 Credit risk

Introduction

The credit exposures of the major UK banks — a group defined in Box 1⁽¹⁾ — have been rising rapidly over the past few years (Chart 1.1). Total losses remained a small percentage of outstanding loans (Chart 1.2). While the majority of credit exposures in 2004 were to UK residents (Chart 1.3), losses arose mainly from overseas lending.

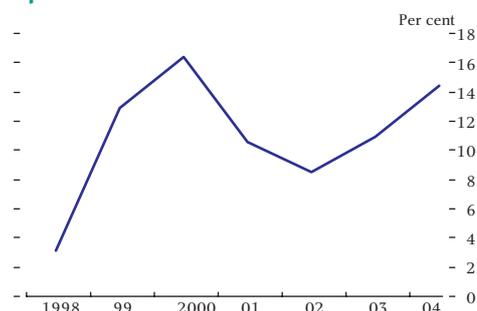
The low level of losses reflected the favourable macroeconomic environment in the United Kingdom and in some of the key overseas markets of UK banks, such as the United States, in the second half of last year, although growth was relatively sluggish in the euro area. The impact on borrowers of the increases in short-term interest rates in the United Kingdom and United States in response to prospective inflationary pressures was outweighed by the impact of lower longer-term rates and robust economic growth.

The outlook for the major macroeconomic factors influencing credit risk is broadly benign. According to the May 2005 *Inflation Report*, UK output growth is expected to remain close to trend over the next three years. However, there are downside risks, relative to the central projection, arising from uncertainty over the strength of domestic consumption, the impact of oil prices and economic recovery in the euro area.⁽²⁾ The latest Consensus forecasts still project a robust expansion for the US economy this year, but the near-term outlook for the euro area has weakened compared with six months ago (Chart 1.4).

Forward contracts suggest that market participants expect, in the near term, further monetary tightening in the United States, but not in the United Kingdom. Longer-term interest rates, such as ten-year government bond yields, in the United Kingdom, United States and the euro area are currently lower than six months ago.

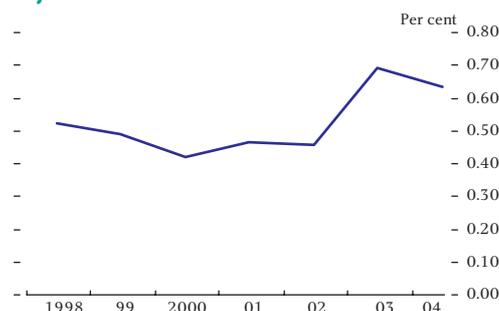
Recent changes in market indicators suggest that there may have been a turnaround in perceptions of corporate credit risk. Since the December 2004 *Review*, bond spreads have tended to widen somewhat, with the widening more marked for global high-yield corporate debt than for investment-grade corporate debt. However, the widening of spreads so far has been much less pronounced than that during the period of global stresses in autumn 1998 or following the defaults of Enron (2001) and WorldCom (2002) (Chart 1.5). The recent widening could be linked to a number of factors, including some softer global macroeconomic data and developments in the finances of the US

Chart 1.1
Annual growth in major UK banks' credit exposures^(a)



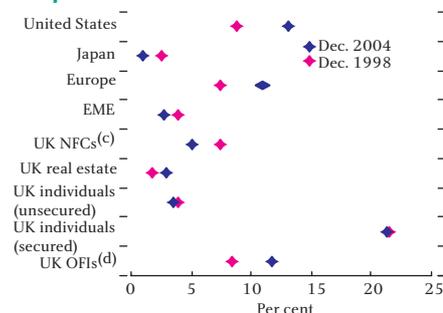
Source: Published accounts.
(a) Credit exposures are measured by loans and advances to customers and banks, items in course of collection from other banks, debt securities, Treasury bills and other eligible bills.

Chart 1.2
Major UK banks' write-off rate



Source: Published accounts.

Chart 1.3
Major UK banks' credit exposures as a percentage of total assets, 1998 and 2004^{(a)(b)}



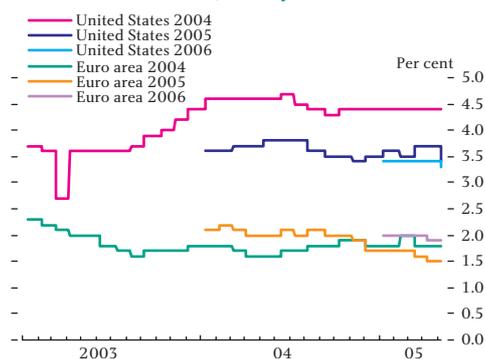
Sources: Bank of England and published accounts.
(a) For selected major UK banks, where data are available.
(b) Credit exposures by country are measured using foreign claims on an immediate-risk basis.
(c) UK non-financial corporates excluding real estate.
(d) UK other financial institutions.

(1) As discussed in Box 1, membership in the 'major UK banks' peer group is based on the provision of banking-type services in the United Kingdom. It is necessary to use data on UK-owned banks when analysing foreign exposures, for reasons of data availability.

(2) Bank of England May 2005 *Inflation Report*, pages 41, 43–46.

Chart 1.4

Real GDP forecasts, 2004 to 2006^{(a)(b)}

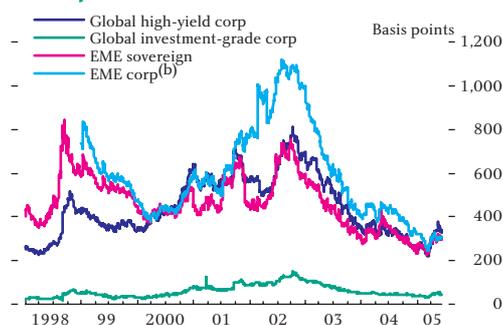


Source: Consensus Economics Inc.

- (a) Average percentage changes for the year shown relative to a year earlier.
- (b) Horizontal axis refers to the month in which the survey of forecasts was taken.

Chart 1.5

Bond spreads^(a)

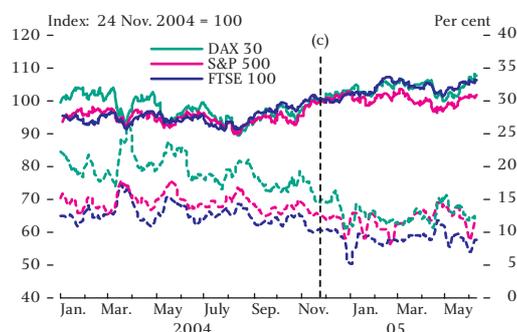


Source: Merrill Lynch.

- (a) Spread over asset swaps.
- (b) Data are only available from 31 Dec. 1998 onwards.

Chart 1.6

Equity indices and their implied volatilities^{(a)(b)}



Sources: Bloomberg and Datastream.

- (a) Implied from options with a minimum of 20 days to maturity, five-day rolling average.
- (b) Solid lines represent the equity indices (left-hand scale), dotted lines represent the implied volatilities (right-hand scale).
- (c) Dec. 2004 Review.

auto industry (see Chapters 1.3 and 2). There may also have been some fall in investors' risk appetite. However, bond spreads remain low by the standards of the past seven years. Credit default swap premia are also low at present.

Other indicators also suggest that debtor default risk has been muted. Twelve-month global corporate default rates, which were already at less than 1% at the time of the December 2004 Review, have declined further since then. The number of rating upgrades continued to rise and the number of rating downgrades to fall, so that the former outweighed the latter in 2005 Q1. World equity indices, on the whole, have increased slightly since the previous Review, with the largest increases for the oil and gas sectors, which have benefited from the oil price shock, and for the pharmaceutical sector (Chart 1.6). Uncertainty about corporate prospects has generally declined over the period, judging by expected equity index volatility implied by options prices.

The sharp increase in oil prices over the past year is likely to have worsened the terms of trade of net oil-importing countries and put pressure on some corporate borrowers. Options on oil futures suggest that oil prices will remain high in the next twelve months, above the level expected at the time of the December 2004 Review.

Another risk to the UK financial system is a disorderly adjustment of global imbalances. Over the past year, many large Asian EMEs have had large current account surpluses compared with the averages in the previous five years. At the same time, the United States has had a current account deficit equivalent to around 6% of GDP. That raises the likelihood of adjustments in exchange rates, reinforcing uncertainty about the stability of global capital flows. Such adjustments in exchange rates need not be abrupt, but could, in some circumstances, lead to a sharp loss of export competitiveness or rises in interest rates, or both, in some countries. If that were to happen, the downside risk to the debt-servicing capacity of some borrowers from UK banks and from the counterparties of UK banks would increase. And asset price volatility would heighten market risk. The remainder of this chapter discusses further the main factors that could affect the debtor default risk facing the major UK banks.

1.1 UK household sector credit risks

Major UK banks' lending to domestic households comprised about 25% of their total assets at the end of 2004, and is the single largest component of their global balance sheet. This share was a little lower than a year earlier (because of new acquisitions overseas) but was broadly in line with the average over the past few years. This section considers the nature of these exposures; the recent increase in household insolvencies and write-offs; and factors that influence the outlook for credit risk.

Exposures of the major UK banks

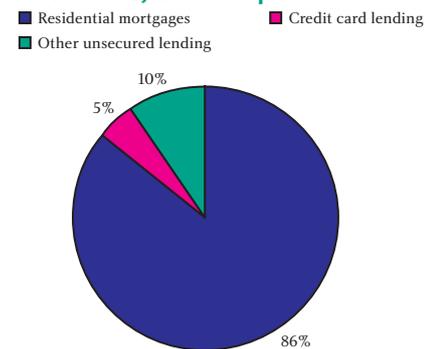
Over 80% of the major UK banks' household exposures are secured on property (Chart 1.7). The annual growth rate of this lending has slowed a little since the previous *Review* (Chart 1.8), but the quarterly growth rate has stabilised in recent months, in line with the fall and then stabilisation in housing market activity (May *Inflation Report*, page 5). As buy-to-let lending has continued to grow faster than lending to owner-occupiers, it has accounted for an increasing proportion of secured household lending, but still makes up only around 6% of the stock.

The annual growth rate for unsecured lending remains higher than that for secured, and has averaged over 15% since the late 1990s (Chart 1.8). Despite this growth, unsecured lending still makes up less than a sixth of the major UK banks' exposures to households (Chart 1.7). However, it accounts for over 90% of write-offs (Chart 1.9). Moreover, losses on unsecured lending tend to be more volatile, and Bank of England stress-testing work has suggested that, in times of stress, losses on unsecured lending are likely to rise more sharply than write-offs on secured lending. Exposures could also increase rapidly were borrowers to draw down on available credit (such as overdraft and credit card facilities) in times of financial strain. Undrawn facilities for credit card lending, at roughly three times drawn borrowing, are particularly significant. But these risks can be reduced by lenders, as discussed later in the chapter.

Insolvencies and write-offs

Despite the favourable macroeconomic environment, personal insolvencies rose further in the first quarter of 2005 (Chart 1.10). They are now about 30% above their early 1990s annual peak, probably because unsecured debt per household is higher, although households may also be more aware of their bankruptcy option (Box 2). Nevertheless, insolvency remains a rare event, affecting only about one person in a thousand each year, and the insolvency rate for England and Wales is less than a fifth that in the United States.

Chart 1.7
Major UK banks' stock of lending to UK households, end-2004^{(a)(b)(c)}



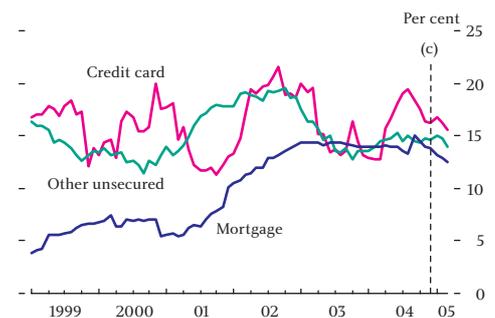
Source: Bank of England.

(a) Refers to peer group discussed in Box 1, page 18.

(b) Data are for individuals; unincorporated businesses excluded.

(c) Due to rounding, segments do not sum to 100%.

Chart 1.8
Annual growth of major UK banks' lending to households^{(a)(b)}



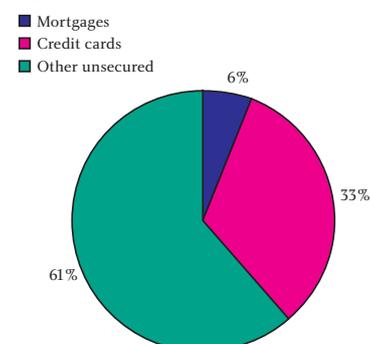
Source: Bank of England.

(a) Refers to peer group discussed in Box 1, page 18.

(b) Data are for individuals; unincorporated businesses excluded.

(c) Dec. 2004 *Review*.

Chart 1.9
UK-owned banks' write-offs on lending to UK households^{(a)(b)}



Source: Bank of England.

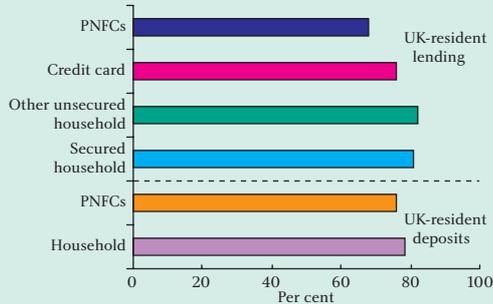
(a) From Sep. 1997 to Mar. 2005.

(b) Data are for individuals; unincorporated businesses excluded.

Box 1: The major UK banks

Chart A

Market share of major UK banks, end-2004^{(a)(b)}



Sources: Bank of England and FSA regulatory returns.

- (a) Shares calculated as a proportion of total UK resident lending to and deposits from relevant sectors.
 (b) UK resident totals calculated using data from banks, building societies and other specialist lenders.

Since December 2002, the *Review's* analysis of the UK banking system has focused on the ten largest UK-owned banks by total global assets. In November 2004, Abbey, the sixth largest UK-owned bank by total assets, was taken over by Banco Santander, a foreign-owned bank. This takeover prompted a review of the membership of the peer group analysed in the *Review*.

Membership

Membership in the new 'major domestic monetary financial institutions' peer group is based on the provision of banking-type services in the United Kingdom, regardless of the country of ownership, and regardless of the legal definition of the intermediary — bank, building society or other finance provider. For convenience, the peer group will be referred to as 'major UK banks' throughout the *Review*.⁽¹⁾

Inclusion in the group will be reviewed over time and revised if necessary to ensure that membership reflects developments in the UK financial landscape, including mergers and acquisition. While limiting membership to ten financial groups at any one time is arbitrary, most relevant activity is captured, given the concentrated nature of most of the main banking services in the United Kingdom (Chart A).

Chart B

Total assets of major UK banks, by area end-2004^{(a)(b)}



Sources: Bank of England and published accounts.

- (a) Data for all countries except United Kingdom reported on ultimate risk basis, as discussed in Box 6, page 38.
 (b) Data for one member estimated from annual accounts.

Risks and resilience

While membership is based on the provision of banking-type services in the United Kingdom, foreign assets make up a material proportion of major UK banks' total global assets (Chart B). As a result, they are exposed to risks from their operations both in the United Kingdom and abroad, as discussed in Chapters 1 and 2 of this *Review*.

The ability of major UK banks to absorb these risks depends not only on the robustness of their UK operations but also on their strength on a global, consolidated basis. Hence, Chapter 3 of the *Review* assesses their resilience by analysing profitability, capitalisation, liquidity and links with other members of the group, at a global level. As before, smaller UK-resident banks and building societies will also continue to be monitored,⁽²⁾ while large complex financial institutions active in global markets are analysed in Chapter 2.

(1) The following financial groups, in alphabetical order, are currently members of the major UK banks' peer group: Alliance & Leicester, Banco Santander, Barclays, Bradford & Bingley, HBOS, HSBC, Lloyds TSB, Nationwide, Northern Rock and RBS.

(2) See, for example, Box 5 in the December 2002 *Review*, page 75; and Box 6 in the June 2003 *Review*, page 66.

Box 2: The rise in personal insolvencies

Personal insolvencies in England and Wales have increased sharply over the past five years and reached 49,500 in the year to April 2005, a 31% increase on the year to April 2004. This Box considers explanations for this trend.

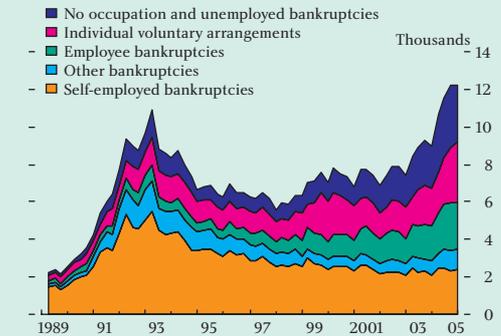
The rise in insolvencies has been concentrated among employees and those with no occupation or who are unemployed. Since 1999, bankruptcies among the self-employed, which are likely to be more directly affected by corporate conditions, have been broadly stable (Chart A), but bankruptcies among employees have increased by 145% and those among the unemployed and those with no occupation have tripled. This has coincided with a rapid increase in unsecured borrowing (Chart 1.8). Since the mid-1990s, that has been associated with higher borrowing per indebted household, rather than an increase in the number of households with unsecured debt.⁽¹⁾ These higher levels of debt have increased the vulnerability of households to income shocks and hence the probability of individuals pursuing insolvency procedures if such a shock materialises. This increased vulnerability may have been more marked for renters with unsecured debt because, as discussed on page 22, homeowners have been cushioned by increases in their housing equity.

While it may be too soon to evaluate their impact fully, changes to bankruptcy legislation introduced last year in England and Wales seem unlikely to have had a large influence on the rise in insolvencies. The upward trend in insolvencies was established well before the change in legislation and, as discussed in the December 2004 issue of the *Review*, the effect of the legal changes on borrowers' incentives seems likely to be slight.

Some lenders have expressed concern that the increase in bankruptcies could be symptomatic of a reduced commitment to repay debt, particularly among younger people. This would be consistent with the sharp increase in debtor bankruptcy petitions over the past year (Chart B). And it is likely that the rise in insolvencies does reflect greater awareness of the options available to distressed households. The increase in calls to debt advice agencies and the number of new debt management plans are also evidence of this (Chart C). But contacts in the debt advice sector report that many people are still unwilling to consider bankruptcy.

Chart A

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

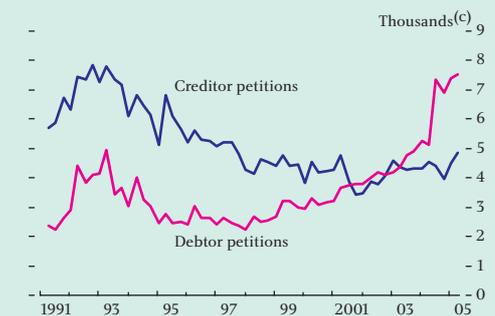


Source: DTI.

- (a) Data for England and Wales, quarterly and not seasonally adjusted.
- (b) Individual voluntary arrangements include deeds of arrangement.
- (c) Other bankruptcies include directors and promoters of companies and those whose occupation is unknown.

Chart B

Bankruptcy petitions^{(a)(b)}

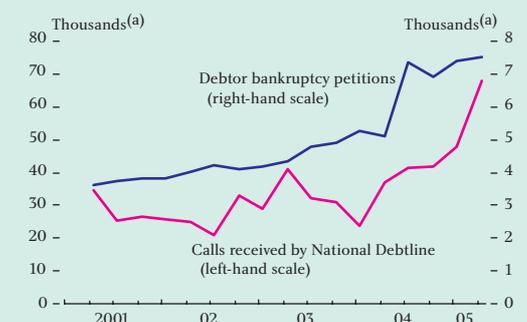


Source: Department for Constitutional Affairs Judicial Statistics.

- (a) Number of bankruptcy petitions registered do not necessarily sum to number of bankruptcy orders made.
- (b) Data for England and Wales.
- (c) Number per quarter.

Chart C

Debtor bankruptcy petitions and calls to National Debtline

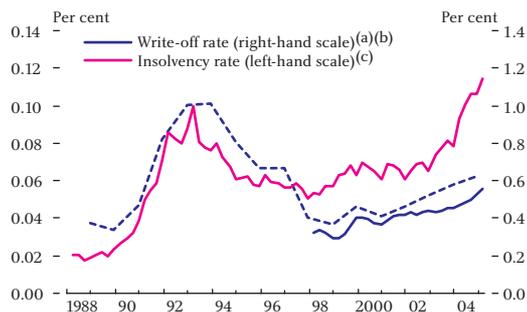


Sources: National Debtline and Department for Constitutional Affairs Judicial Statistics.

- (a) Number per quarter.

(1) See May, O, Tudela, M and Young, G (2004), 'British household indebtedness and financial stress: a household-level picture', Bank of England *Quarterly Bulletin*, Winter.

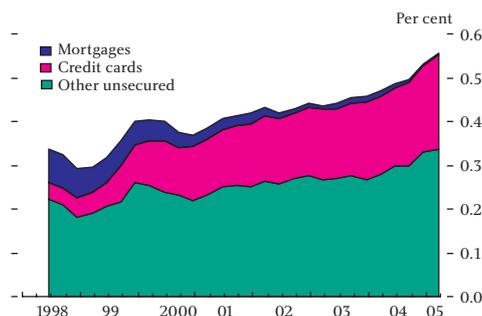
Chart 1.10
Household write-off and insolvency rates



Sources: ONS, DTI and Bank of England.

- (a) Solid line shows annual write-off rate for UK-owned banks, dotted line the rate for all UK-resident banks (interpolated annual data).
(b) Data are for individuals; unincorporated businesses excluded.
(c) Data are for England and Wales, and are annualised.

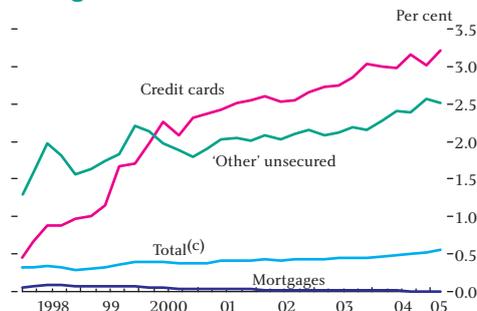
Chart 1.11
Contributions to UK-owned banks' annual household write-off rate^{(a)(b)}



Source: Bank of England.

- (a) Contributions calculated as write-offs for that category of lending divided by total lending.
(b) Data are for individuals; unincorporated businesses excluded.

Chart 1.12
UK-owned banks' annual write-off rates on lending to households^{(a)(b)}



Source: Bank of England.

- (a) From Sep. 1997 to Mar. 2005.
(b) Data are for individuals; unincorporated businesses excluded.
(c) Sum of secured, credit card and other unsecured.

The write-off rate on UK-owned banks' household lending has also increased in recent years, particularly in recent quarters.⁽¹⁾ But the rise has been less pronounced than that for personal insolvencies, and the rate remains well below its early-1990s peak.⁽²⁾ The increase has been smaller partly because the average debt of bankrupts has fallen slightly over the past three years, despite the overall growth of borrowing.⁽³⁾ And lenders' recovery rates may also have risen, as Income Payment Orders and Agreements were used in almost 20% of bankruptcy cases in 2004, about twice as often as in previous years.

During 2004, credit card exposures accounted for over 30% of UK-owned banks' write-offs on their domestic household lending (Chart 1.11). This proportion has trebled since 1998, reflecting both the sharper rise in the credit card write-off rate (Chart 1.12) and the growing stock of such lending. As discussed in some banks' recent trading statements, the scale of the increase has surprised some lenders. But credit card business generally remains profitable; the effective interest rate on credit card lending is currently around 11 percentage points above the cost of banks' funds.

Although accounting for the majority of UK-owned banks' exposures to the UK household sector, mortgage lending made up less than 1% of write-offs in 2004. Arrears on this lending also remain near historical lows and provisions are about a tenth of the level reported during the early 1990s. But market contacts have argued that provisions are unlikely to fall much further and the proportion of mortgages that were three to six months in arrears ticked-up in the second half of 2004 (Chart 1.13). The increase is, however, small relative to previous changes and is not yet conclusive evidence of a change in the trend. Buy-to-let loans have also shown a slight rise in arrears, but again from a very low level.

Financial pressures on households

Growth of debt

The rapid increase in households' borrowing has raised total debt to close to 150% of annualised aggregate post-tax income (Chart 1.14). As discussed in the December Review, debt may continue to increase more rapidly than income over the next few years. Mortgage debt is likely to continue to adjust gradually to the increase in the ratio of house prices relative to earnings over the past few years, at a pace dependent on housing market

(1) Write-offs data are adjusted to reflect any changes in banks' accounting methods. See Cattermole, A (2004), 'UK banks' write-offs of bad debt', *Monetary and Financial Statistics*, Bank of England, September.

(2) The correspondence between the numbers of insolvencies and write-offs is not one-for-one. Lenders report that under a third of UK banks' recent write-offs on their household lending arose from instances where the borrower became bankrupt or insolvent. The majority reflect instances where neither the lender nor the debtor pursues bankruptcy proceedings. Fraud is estimated by some lenders to have accounted for around 10%–20% of write-offs in 2004.

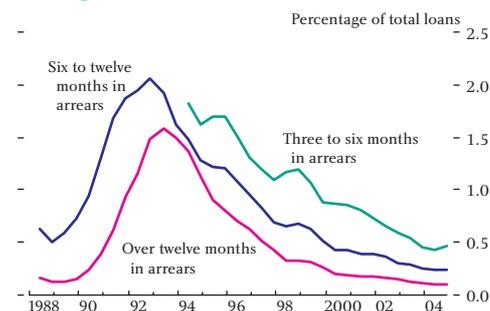
(3) Details of the average debt of bankrupts and the prevalence of Income Payment Orders and Agreements are based on administrative data maintained by the Insolvency Service.

turnover. It would also be likely to increase if homeownership continues to spread, for example as the Government implements its plans to increase the stock of lower-cost housing. The outlook for unsecured debt is less clear. Credit card borrowing growth has eased recently (Chart 1.8). However, the level of unsecured debt relative to household income in the United Kingdom remains almost 20% lower than in the United States, suggesting that there may be scope for further increases.

The average proportion of households' income that is used to service debt has risen further over the past year (Chart 1.15), because of higher borrowing. But the increases in mortgage debt and repayments appear not to have translated into a corresponding increase in financial pressures on households; the proportion of households reporting problems making mortgage repayments (for a given level of payments relative to income) has declined over the past ten years, and mortgage arrears are very low by historical standards.⁽¹⁾ Again, for unsecured debt, the picture is more complicated. The rise in personal insolvencies is likely to reflect problems households have repaying unsecured debt.⁽²⁾ The increase in unsecured debt may have led to an improvement in welfare, if it has helped households to smooth their consumption during temporary periods of lower income. However, it also raises their vulnerability to any future adverse financial shock and it is possible that some households have underestimated this risk.

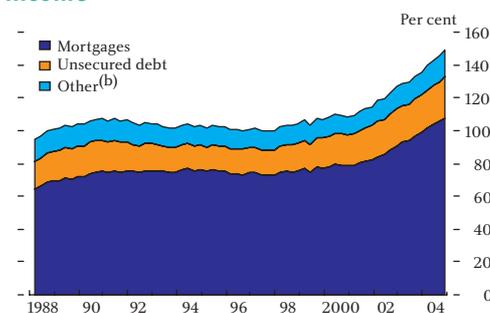
The general rise in unsecured debt may mask a sharper increase among a minority of households.⁽³⁾ As discussed in a recent House of Commons Treasury Committee report,⁽⁴⁾ some households have borrowed so much that they might struggle to meet future debt repayments even in the absence of a major income shock. This credit may have been available because lenders have an incomplete picture of customer characteristics (as discussed below). In addition, a good payment history may well be sufficient to encourage lenders to provide new loans, even though the debt may place a heavy burden on the household. Greater credit availability may help to explain the quadrupling over the past ten years in the number of insolvencies among the employed.

Chart 1.13
UK lenders' arrears on domestic mortgage lending



Source: Council of Mortgage Lenders.

Chart 1.14
Ratio of household sector debt to post-tax income^(a)

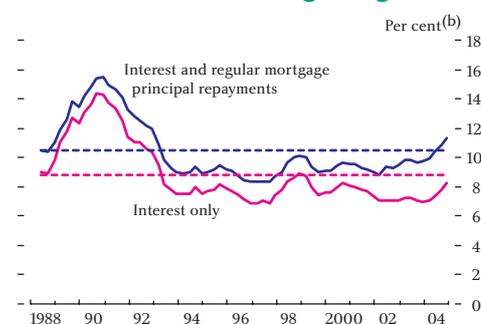


Sources: ONS and Bank calculations.

(a) Percentage of annualised post-tax income.

(b) Households' total financial liabilities excluding secured and unsecured debt (including bills that are due to be paid).

Chart 1.15
Household sector income gearing^(a)



Sources: ONS and Bank calculations.

(a) Dotted lines denote averages from 1988 Q1 to 2004 Q4.

(b) Percentage of post-tax income.

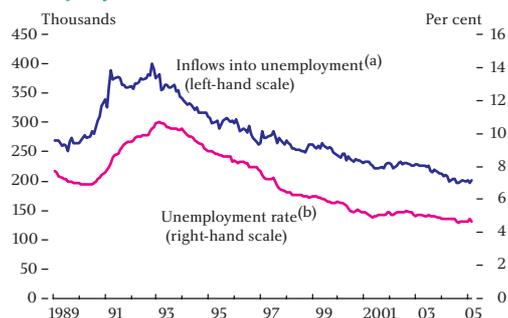
(1) Discussed further in Box 2 of the December 2004 Review (page 20).

(2) Unsecured lending accounted for over 99% of banks' household write-offs in 2004, while the Insolvency Service estimate that only 10% of bankrupt individuals have any secured debt arising from mortgaged property.

(3) May, O, Tudela, M and Young G (2004), 'British household indebtedness and financial stress: a household-level picture', Bank of England *Quarterly Bulletin*, Winter.

(4) House of Commons Treasury Committee (2005), 'Credit card charges and marketing: Second report of session 2004-05'.

Chart 1.16
Unemployment: level and inflows



Sources: ONS and Bank calculations.
(a) Monthly claimant count inflows.
(b) Labour Force Survey measure.

Income and unemployment

Over the past decade, income shocks and unemployment have been the most significant proximate causes of household debt problems.⁽¹⁾ Reassuringly, labour market conditions remain benign. In real terms, households' income grew by about 3% in the year to 2005 Q1. And both the unemployment rate and inflows into unemployment have halved since the early 1990s (Chart 1.16). However, insolvencies amongst those not in employment have roughly doubled over this time, perhaps reflecting the increased take-up of credit and the consequent rise in vulnerability to adverse income shocks.

House prices

Although the average level of UK house prices has changed little in recent months, the financial position of many homeowners has been strengthened by the rise over the previous few years. High levels of housing equity have enabled some homeowners to remortgage to refinance other debts or mortgage arrears. They have also provided others with a cushion of protection from any future negative shocks. Reflecting these factors, a recent survey found that 40% of mortgage holders agreed with the statement, 'My house value has risen so much that I do not worry about other debts I may have.'⁽²⁾ To the extent that accommodation costs move in line with house prices, the increase in house prices has weakened their financial position.⁽³⁾

As discussed in the May *Inflation Report* (page 40), the housing market will probably remain subdued. It is therefore likely that, in the future, fewer households will be able to use housing equity to refinance their debt. And, if loan-to-value (LTV) ratios at house purchase remain unchanged, the average degree of collateralisation across lenders' mortgage books is likely to fall. This suggests that the pressures on households associated with mortgage debt may rise from their current exceptionally low levels.

Lenders' risk management practices

If any of the risks identified above were to crystallise, lenders' losses would depend both on the composition of their assets and the effectiveness of their risk management.

Challenges posed by secured debt

For lenders, the rise in house prices has increased the value of collateral and hence reduced the likely cost of any default. The LTV ratio on the major UK banks' stock of lending averages around 45% (for those banks that disclose figures). Together with the long-term decline in defaults on secured debt, that helps to explain the extremely low level of losses on mortgage

(1) See Coles, A (1992), 'Causes and characteristics of arrears and possessions', *Council of Mortgage Lenders Housing Finance*, No. 13, and Del-Rio, A and Young, G (2005), 'The impact of unsecured debt on financial distress among British households', *Bank of England Working Paper no. 262*.

(2) Market research conducted by Bradford and Bingley in March 2004.

(3) The effects might be mitigated by the extent to which they receive (or expect to receive) bequests from homeowners..

portfolios. In aggregate, lenders seem well protected against adverse movements in house prices, with LTV ratios on new lending continuing to be considerably lower than during the early 1990s (Chart 1.17).

At the same time as LTV ratios have fallen relative to levels in the early 1990s, loan-to-income (LTI) ratios have risen significantly (Chart 1.18). As noted in the August 2002 *Inflation Report*, the decline in inflation over the past decade has allowed borrowers to service larger debts (because of the reduction in front-end loading of mortgage payments). But, more recently, some lenders have reported concerns about affordability with respect to some highly indebted borrowers, and have planned to tighten lending criteria (such as reducing LTI ratios on new lending).

Imposing limits on LTV and LTI ratios are two different ways to manage losses on secured lending. There is little evidence that lenders are writing a significant proportion of loans at both high LTV ratios and high LTI ratios. The FSA tracks such 'higher risk' loans, and data for 2004 Q4 show that such lending remains a small part of total new lending and has risen only slightly in recent years. And, with the decline in nominal interest rates over the past 15 years, a much smaller proportion of new borrowers now have both high income gearing and high LTV ratios than in the late 1980s.⁽¹⁾

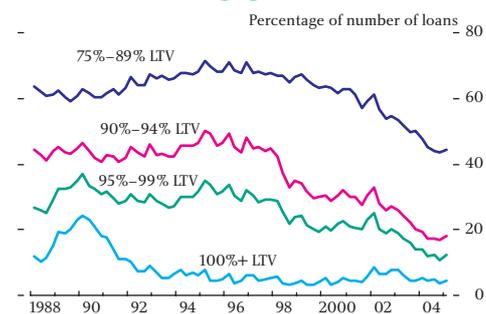
Challenges posed by unsecured debt

The rapid growth in credit card exposures discussed earlier presents risk management challenges for lenders, who need to be able to measure the riskiness of their lending accurately and to price it accordingly.

Accurate credit assessment depends on good data on customer characteristics, particularly those related to borrowers' propensity to repay. But affordability can be difficult to measure when borrowers have relationships with many lenders. Market contacts indicate that some lenders try to reduce credit risk by targeting customers who already have a current account with them (so that they are then able to monitor payments across the customer's account). And an increasing number of lenders are sharing information on good repayment histories as well as information on arrears and defaults, helping lenders assess servicing capability more accurately. The British Bankers' Association (BBA) has intermediated an agreement for all major banks to share data on credit card and loan accounts by the end of 2005. Some sharing of current account data already occurs, although full sharing of data across all portfolios is not planned.

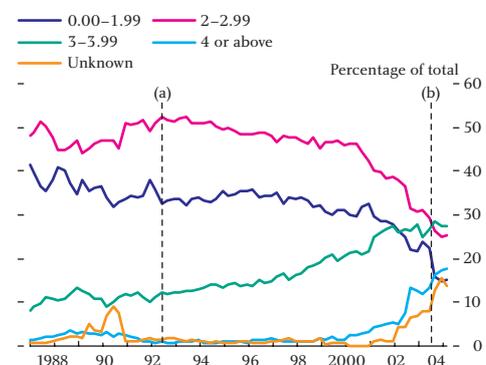
Lenders use the results of their credit assessments either to price their lending to match the perceived riskiness or as the basis of

Chart 1.17
Incidence of higher loan-to-value ratios on new UK retail mortgages^{(a)(b)}



Source: Council of Mortgage Lenders.
(a) Prior to 1993 Q2, estimates based on a survey of building societies only. Data prior to 2002 are based on a 5% sample of mortgage completions.
(b) Data from July 2004 onwards are provisional estimates subject to revisions.

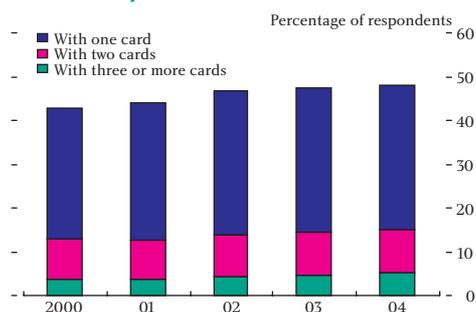
Chart 1.18
UK lenders' new mortgage lending by loan-to-income ratio band



Source: Council of Mortgage Lenders.
(a) Prior to 1993 Q2, estimates based on a survey of building societies only. Data prior to 2002 are based on a 5% sample of mortgage completions.
(b) Data from July 2004 onwards are provisional estimates subject to revisions.

(1) Hancock, M and Wood, R (2004), 'Household secured debt', Bank of England *Quarterly Bulletin*, Autumn.

Chart 1.19
Credit card prevalence^(a)



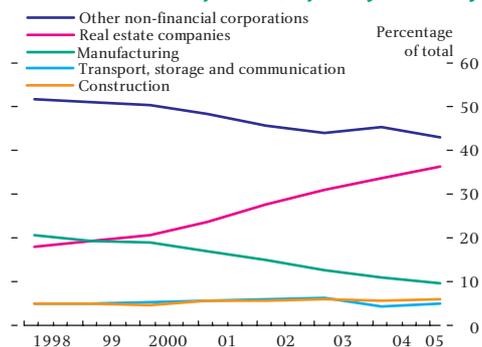
Sources: MORI MFS and Bank calculations.
 (a) The MFS survey is a representative sample of adults aged 16+ in Great Britain. 48,000 individuals are sampled.

quantity rationing — limiting or rejecting applications from higher-risk customers. If lenders do issue unsecured debt to a customer, they can continue to use credit analysis to manage potential credit losses by monitoring factors that may indicate that borrowers are experiencing financial difficulties, such as making only minimum repayments, being over 30 days in arrears, or failing to make agreed payments on arrears. Lenders can then take action to limit loss given default. For example, some lenders have said that they may refer some customers to debt counsellors, increase their debt collection activities as credit quality declines or reduce credit limits.

However, immediate action to limit risk exposures by reducing available credit facilities to indebted households may increase the financial constraints on those households, with possible implications for arrears on their other borrowing. So a strategy to minimise losses across the banking sector as a whole could require some degree of forbearance, particularly as a significant proportion of individuals have multiple credit cards (Chart 1.19). But, were a lender to fear that its competitors would act pre-emptively at the first sign of stress, the lender is less likely to exercise forbearance itself. There is therefore a potential co-ordination problem.

However, signs of stress are limited, so this co-ordination challenge is not an immediate issue. And, while there are risks, the major UK banks' credit assessment techniques have improved over the past decade. This has enabled them to extend credit to a greater number of customers, while helping the banks to be better prepared for an increase in credit losses from current low levels, should such an increase materialise.

Chart 1.20
Major UK banks' stock of lending to non-financial companies, split by industry^(a)



Source: Bank of England.
 (a) Refers to peer group discussed in Box 1, page 18.

1.2 UK corporate credit risks

Lending to UK-resident private non-financial companies (PNFCs) represents almost 7% of the major UK banks' total assets. And, on a global basis, almost 40% of their 'large' exposures to non-financial companies are to UK-owned firms.⁽¹⁾

Exposures of the major UK banks

Major UK banks' lending to UK-resident commercial property companies⁽²⁾ has continued to grow over twice as fast as their other corporate lending; commercial property now accounts for over half of major UK banks' new lending to UK-resident non-financial companies and over a third of the stock of lending. It is these lenders' largest single industrial exposure (Chart 1.20)

(1) For regulatory purposes, 'large' exposures, which are based upon global consolidated lending to all of a firm's operations, irrespective of their location, are defined as any exposures that exceed 10% of eligible capital (Tier 1 plus Tier 2 capital, less any regulatory deductions, eg related to insurance subsidiaries) at any point during the reporting period.

(2) This includes companies involved in the development, buying, selling and renting of real estate.

and has become increasingly concentrated (Chart 1.21). There may also be additional indirect exposures to property, as about a fifth of banks' total corporate lending is to small and medium-sized enterprises (SMEs), which often use property as collateral.

Property also accounts for a significant proportion of major UK banks' large exposures (Chart 1.22), alongside the motor sector and large conglomerates. Such exposures are assessed on a global basis, reflecting the fact that banks lend to both UK and non-UK large companies through both their domestic and overseas operations.

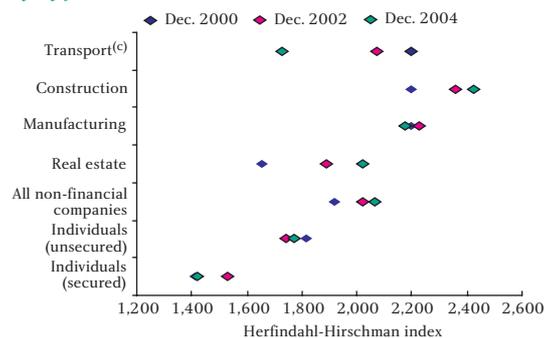
Insolvencies and write-offs

UK company insolvencies have declined steadily since 2003, and the insolvency rate has fallen to its lowest level for 25 years. The write-off rate on corporate lending is also low by historical standards, although it has remained broadly unchanged over recent years (Chart 1.23). Disclosures in published accounts reveal that recovery rates on this lending have recently been higher than expected, with some banks making write-backs on earlier expected bad debts.⁽¹⁾ Stress on banks' commercial property lending remained very low in 2004, with an average annual provision rate of less than 0.1%.

The reduction in company insolvencies has been greater than implied by the historical relationship with companies' debt, profitability and the macroeconomic environment.⁽²⁾

One possible explanation for this is the introduction of the Enterprise Act (effective from September 2003 for companies), which has promoted a more rescue-orientated regime by making it easier for firms in financial difficulties to enter administration. But our contacts do not believe that this has been the only important factor; the rise in administrations has been relatively small and the reduction in insolvencies started before the implementation of the new legal regime. Market contacts instead believe that the fall in the insolvency rate may partly reflect an increase in the willingness of existing creditors to maintain finance to ailing companies. And there remains a strong appetite for distressed debt from other investors. Thus, although financial stress within the corporate sector has been low by normal standards, it is unclear whether it has declined materially in the past two years.

Chart 1.21
Concentration of major UK banks' lending, by type^{(a)(b)}



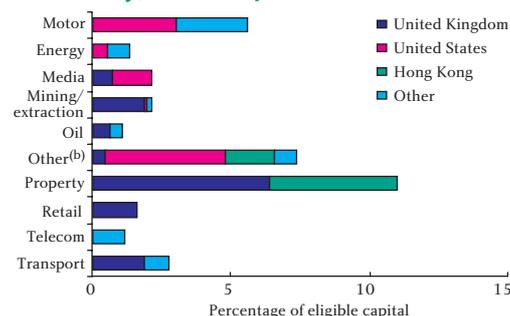
Source: Bank of England.

(a) Refers to peer group discussed in Box 1, page 18.

(b) The Herfindahl-Hirschman Index (HHI) is the sum of the squared percentage market shares. Equal market shares for each of the ten major UK banks would imply an HHI value of 1,000; a monopoly would imply an HHI value of 10,000.

(c) Also includes storage and communications companies.

Chart 1.22
Major UK banks' 'large' exposures to non-financial companies, split by sector and country, end-2004^(a)

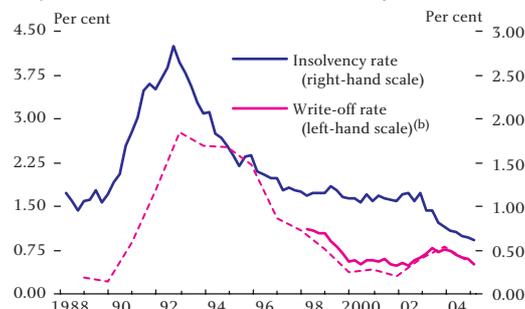


Sources: FSA regulatory returns and Bank calculations.

(a) Refers to peer group as discussed in Box 1, page 18.

(b) Other category includes firms such as manufacturers and conglomerates.

Chart 1.23
Corporate write-off and insolvency rates^(a)



Sources: DTI and Bank of England.

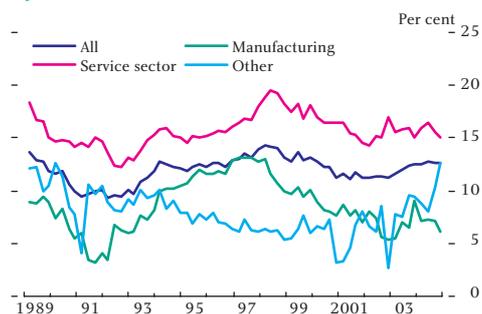
(a) Annual rates.

(b) Solid line shows write-off rate for UK-owned banks, dotted line for all UK-resident banks (interpolated annual data).

(1) Write-offs data are adjusted to reflect any changes in banks' accounting methods. See Cattermole, A (2004), 'UK banks' write-offs of bad debt', *Monetary and Financial Statistics*, Bank of England, September.

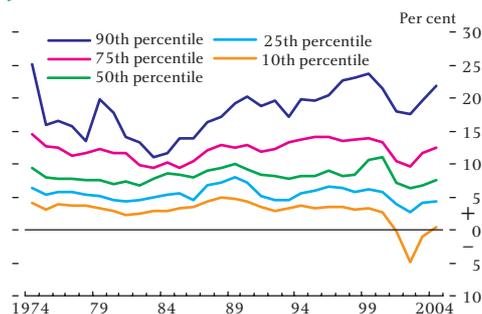
(2) See Bunn, P, Cunningham, A and Drehmann, M (2005), 'Stress testing as a tool for assessing systemic risk', in this issue of the *Review*.

Chart 1.24
Non-oil PNFCs' net rate of return on capital^{(a)(b)}



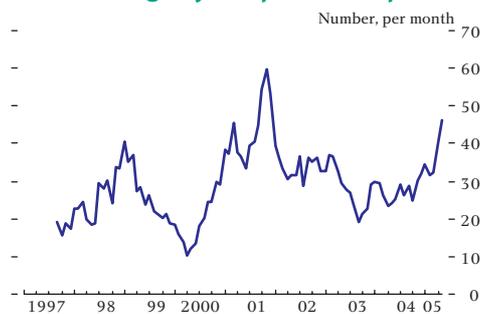
Sources: ONS and Bank of England.
 (a) Net operating surplus/net capital employed.
 (b) Other includes construction, energy supply, agriculture, mining and quarrying, but excludes oil companies.

Chart 1.25
Distribution of operating profit margins of quoted PNFCs^(a)



Source: Thomson Financial Datastream.
 (a) Earnings before interest and taxes divided by turnover, sales-weighted.

Chart 1.26
Profit warnings by UK quoted companies^{(a)(b)}



Sources: Lexis Nexis and Bank of England.
 (a) Includes AIM listed companies.
 (b) Backward-looking three-month average.

Financial pressures on companies

Aggregate profitability

The low levels of write-offs and insolvencies reflect strong profitability among firms. High oil prices have boosted profits among UK oil producers. But the net rate of return on capital among other companies also remains above its long-run average (Chart 1.24). This mainly reflects the high level of profits in the service sector; the net rate of return among manufacturing companies is below its long-run average and fell from 9% in 2003 Q4 to 6% in 2005 Q1. The latest Consensus forecast is that economy-wide profits growth will slow to 5% in 2005, from 8% in 2004.

Disaggregate measures of profitability and dispersion

Although the corporate sector as a whole is relatively profitable by historical standards, that could mask problems in the lower tail of the earnings distribution. Company accounts data for 2004 reveal that there was still a significant minority of firms making low or zero profits (Chart 1.25). But, despite high dispersion by historical standards, profit margins in 2003 and 2004 increased throughout the distribution. And, since the start of the year, share prices have increased in most of the major industrial sectors. But pressures among a minority of companies may have been more pronounced, with causes including: high oil prices (particularly for energy-intensive users, including airlines); competitive pressures (partly driven by the long-term fall in import prices and trade liberalisation); and the slowdown in consumer spending since late 2004.⁽¹⁾ These pressures have contributed to the rise in profit warnings among quoted UK companies (Chart 1.26).

Companies' debt

The robust level of PNFCs' profits in 2004 helped them remain in financial surplus. This contributed to a small reduction in their net debt, with the increase in financial assets more than offsetting a slight rise in gross debt. The small increase in gross debt comprised relatively robust bank borrowing (due to demand from commercial property companies), weak bond issuance and a net repurchase of equity — trends that have continued into the first quarter of 2005 (Chart 1.27).

Firms' total debt, relative to their capital stock or current earnings, remains high by historical standards (Chart 1.28). This follows the increase in borrowing at the beginning of the decade, which was partly used to fund the high volume of merger and acquisition activity and, for the telecoms sector, the 3G mobile phone licences. Company accounts data for 2004 suggest that average gearing has fallen in most major sectors since then, including in those — such as telecommunications — where it had risen most sharply.

(1) These issues are discussed further in the May 2005 *Inflation Report* (pages 14, 32 and 33).

Despite its recent slight reduction, the higher-than-average level of gearing suggests that the corporate sector remains more vulnerable than normal to adverse shocks. And there is little evidence that firms are seeking to reduce gearing further: net equity issuance is negative, and a net balance of only 4% of companies in 2005 Q1 believed that their gearing was too high, down from 6% in 2004 Q3.⁽¹⁾ There appears to be little pressure from investors to reduce gearing; indeed, there has been a rapid increase in highly leveraged private equity transactions (Box 3).

Pension fund deficits continue to put financial pressure on some companies. The total deficit among FTSE 350 companies (excluding the financial sector) was about £60 billion at the end of April, little changed over the past twelve months.⁽²⁾ Projected liabilities on the FRS17 reporting basis were £315 billion, around a third of the size of the firms' traditional on-balance-sheet debt. These pension liabilities increase the responsiveness of firms' share prices to a given unexpected change in their profitability (Box 4).

However, despite high debt and pension commitments, companies in general are having little difficulty in servicing their debt. Robust profitability and low borrowing rates have ensured that income cover remains above average (Chart 1.29). And firms' liquidity has risen to a further record level (Chart 1.30). This may partly reflect stronger-than-expected profits, while market contacts have pointed to the cost of paying down long-term debt early.

Market indicators

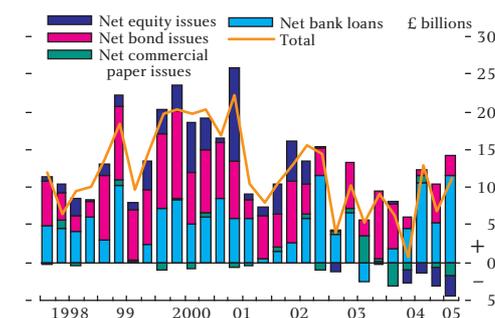
Sterling corporate bond spreads and credit default swap premia remain low, despite the (since partially reversed) tick-up earlier in 2005. And the increase is partly attributable to sterling bonds issued by non-UK companies, such as some in the US motor industry.⁽³⁾ Equity prices have risen slightly over the past six months and the FTSE All-Share index remains about 50% above its trough in 2003. Since then, the likelihood of corporate default (as measured by a model based upon leverage, equity prices and volatilities)⁽⁴⁾ has eased substantially, with the reduction more pronounced among companies with higher debt (Chart 1.31).

Commercial property

Investors have continued to increase their exposure to the commercial property sector. For some, this reflects a desire to reverse a reduction in the weight of property in their portfolios in the early-1990s. The rapid growth of banks' commercial

Chart 1.27

PNFCs' external finance^(a)

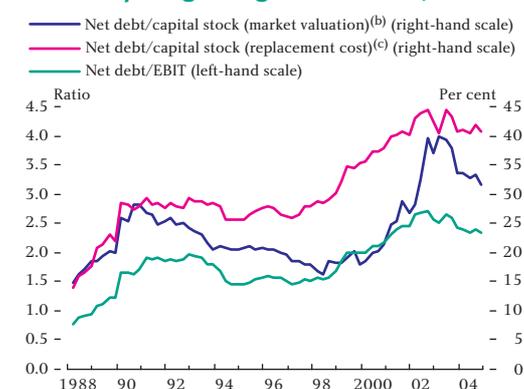


Source: Bank of England.

(a) Excluding securitisations and borrowing by PNFCs from non-resident monetary financial institutions. The components do not sum to the total in each quarter because the total has been seasonally adjusted independently.

Chart 1.28

PNFCs' capital gearing and net debt/EBIT^(a)

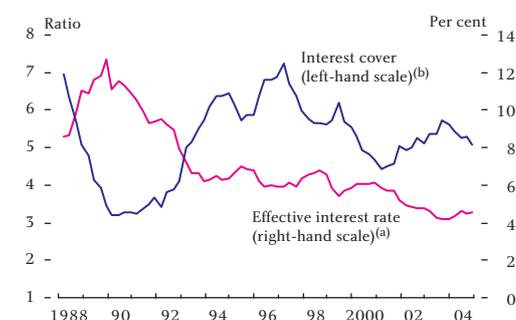


Sources: ONS and Bank calculations.

(a) Earnings before interest and tax (EBIT) is defined as PNFCs' trading profits.
(b) PNFCs' net debt divided by their market value.
(c) PNFCs' net debt divided by the total value of capital at replacement cost.

Chart 1.29

PNFCs' interest cover and effective interest rate



Sources: ONS and Bank calculations.

(a) PNFCs' gross operating surplus over interest payments.
(b) As measured by annualised interest payments as a percentage of gross debt.

(1) The 2005 Q1 survey from the Institute of Chartered Accountants of England and Wales and the 2004 Q3 survey from the Institute of Directors.

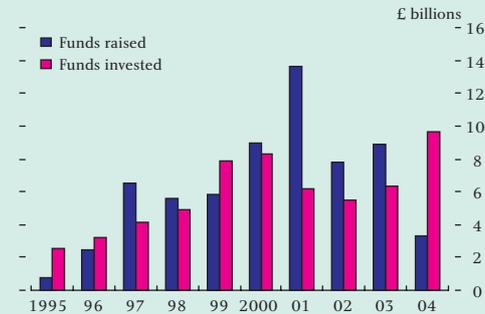
(2) Statistics reported by Watson Wyatt.

(3) About 60% of sterling bonds reported in Merrill Lynch's indices are issued by UK registered companies.

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

Box 3: The UK private equity market

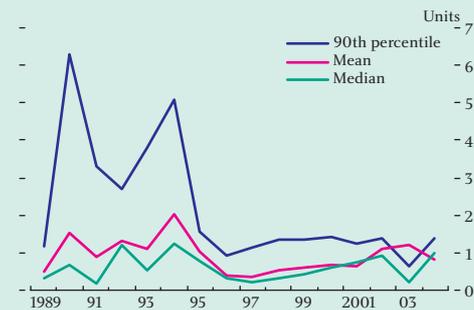
Chart A
Value of funds raised and invested by UK private equity firms^(a)



Source: British Venture Capital Association.

(a) Data refer to BVCA members, estimated to account for 90% of the UK private equity market.

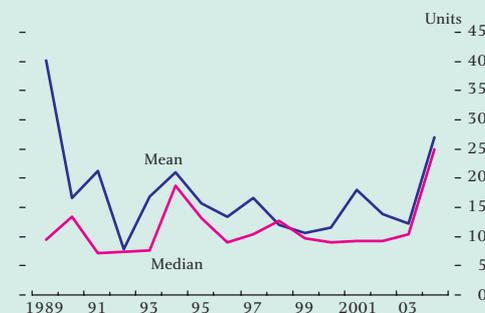
Chart B
Target gearing^{(a)(b)}



Source: Thomson Financial Datastream and Bank calculations.

(a) Total debt to shareholders' equity.
(b) Statistics weighted by transaction values.

Chart C
Transaction values to EBIT^{(a)(b)}



Sources: Thomson Financial Datastream and Bank calculations.

(a) Earnings before interest and taxes.
(b) Statistics weighted by transaction values.

Private equity (PE) investors (including funds of funds,⁽¹⁾ pension funds and banks) provide equity capital to unquoted firms. They typically acquire a controlling stake in businesses, with a view to generating added value and selling at a profit, on average after five years. In the United Kingdom, PE companies have become more prominent over the past nine years (Chart A).

Private equity firms can use their expertise to enforce better management, cut inefficiencies and improve performance. But do PE transactions raise financial stability concerns?

Typically, such transactions involve substantial borrowing, mainly bank debt, to increase the potential returns to the equity investors. This leverage amplifies the effects of the business cycle and so increases risks in a downturn. Market contacts report that the amount of additional gearing provided by the PE deal — as proxied by the share of debt relative to equity financing of these deals — is substantially lower now than in the 1980s, suggesting that the risks are more evenly distributed between new equity investors and lenders. And the original gearing of firms prior to the PE deal, though it has risen over the past few years, remains on average lower than in the early 1990s (Chart B).⁽²⁾ This period coincided with the UK 'buy-out bust', when the number of buy-out exits by receivership was higher than the number of exits by trade sale or flotation.

Are banks correctly pricing the risk intrinsic in lending for such acquisitions? If buy-out prices are too high relative to intrinsic values, the deals could end in default — resulting in unplanned losses to investors and other lenders. Kaplan and Stein⁽³⁾ find evidence linking the early-1990s US buy-out bust with the overheating of this market in the late-1980s. The ratio of transaction value to EBIT (earnings before interest and taxes) is generally regarded as a good measure of how appropriately a business is priced. Data show that, on average, this ratio has risen, and the median is at its highest historical level (Chart C). This suggests that some transactions may indeed reflect unduly optimistic or inconsistent valuations; but very highly priced deals account for a lower share of the market than in 1989, so the mean ratio is lower than it was then.

(1) A fund of funds is a fund taking equity positions in other funds.

(2) Data include bankruptcy, liquidation and going private acquisitions, leveraged buy-outs, management buy-outs and buy-ins, and secondary buy-outs of UK targets by UK acquirers.

(3) Kaplan, S and Stein, J (1993), 'The evolution of buy-out pricing and financial structure in the 1980s', *The Quarterly Journal of Economics*, Vol. 108, Pages 313–57.

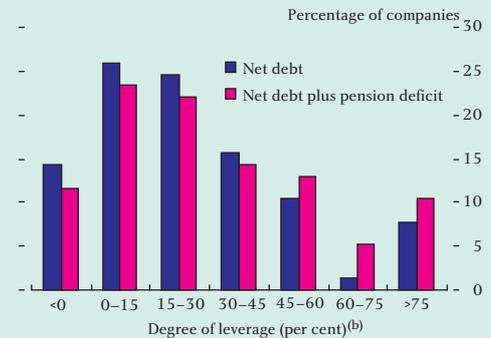
Box 4: Leverage and company pension schemes

The emergence of deficits on defined-benefit pension schemes has added to the vulnerability of the sponsoring companies. Because accrued liabilities of defined-benefit schemes are like debt, they add to the total ‘economic leverage’ of firms. Chart A shows how the distribution of leverage for a sample of non-financial FTSE 100 companies changes when defined-benefit pension deficits and surpluses are added to their ordinary on-balance-sheet net debt; the tail of companies with high leverage increases. Ignoring such deficits would provide an incomplete picture of the health of the UK corporate sector.

The impact of higher leverage on the probability of corporate default is well understood. What is perhaps less apparent is the extent to which any underlying volatility in company valuations is amplified by the additional leverage induced by pension schemes. A standard gearing effect arises because the values of equity assets in pension schemes do not move in line with the debt-like defined-benefit liabilities. Hence the proportional effect of a shock on a company’s market capitalisation is larger, the greater the value of its liabilities, including those in its pension fund. There is also an additional impact because many pension funds are heavily invested in UK equities, so that their value responds to the effect of any shock on the valuation of other UK companies.

The size of these effects can be estimated for the FTSE 100 companies by simulating the response of their market capitalisation to a common 5% decline in the valuation of their underlying business, taking account of the actual size of their pension fund liabilities and other debt, the size of their pension fund assets and the proportion invested in equity. It is estimated that this shock would reduce the market capitalisation of the average company by around 10%.⁽¹⁾ Chart B shows that the distribution of impacts is skewed. For most companies, the simulated impacts on market valuations are less than or equal to 10%; but, for a few, they are more substantial. In many companies, contributions to defined-benefit pension schemes have been raised recently. In addition, greater awareness and better management of the assets and liabilities of schemes should improve their funding positions in the future, and hence the health of the aggregate balance sheet of the UK corporate sector. This will also tend to lower the impact of adverse shocks on corporate share prices.

Chart A
The impact of pension deficits on the ‘economic’ leverage of UK companies^(a)

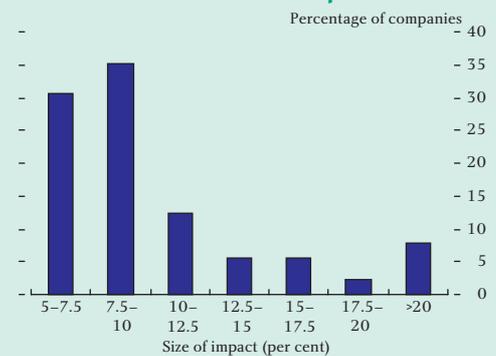


Sources: Individual annual reports, Thomson Financial Datastream and Bank calculations.

(a) As a percentage of market value.

(b) Companies with negative values have more liquid financial assets than liabilities.

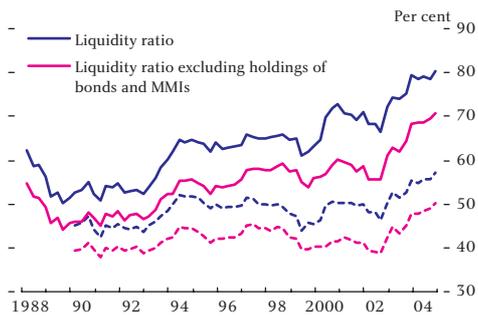
Chart B
Distribution of simulated impacts



Sources: Individual annual reports, Thomson Financial Datastream and Bank calculations.

(1) The calculations are based on constituents of the FTSE 100 for which all relevant data on debt and defined-benefit schemes are available. Such calculations (and others reported in the rest of this Box) are sensitive to equity market levels, bond yields and a range of other assumptions. They are snapshot estimates based on FRS 17 disclosures (as published in company accounts), updated to a common date.

Chart 1.30
Indicators of corporate liquidity^{(a)(b)}



Sources: ONS and Bank of England.

- (a) PNFCs' liquidity = (all currency deposits + money market instruments (MMIs) held + bonds held)/(loans excluding direct investment + MMI issued).
 (b) Dotted lines show relative ratio also divided by bonds issued.

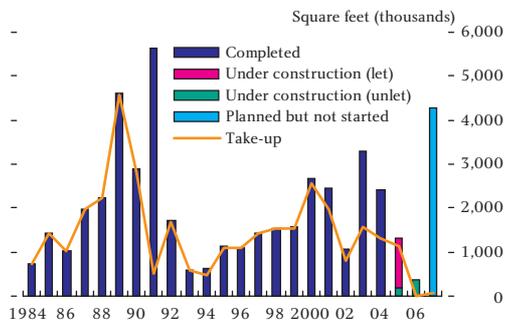
Chart 1.31
One-year implied probability of default for UK-quoted companies^(a)



Sources: Thomson Financial Datastream and Bank calculations.

- (a) Excludes real estate companies.
 (b) Weighted by companies' liabilities.

Chart 1.32
Development pipeline: City offices^(a)



Source: CB Richard Ellis.

- (a) Latest projection is for 2007.

property lending reflects the fact that such investment is typically highly geared. The majority of finance is secured on existing property. However, the fraction allocated to speculative projects increased to 8% in 2004, from 5% in 2002. Although this includes some residential development, and remains considerably below the 30% proportion in the late-1980s,⁽¹⁾ it is possible that speculative activity will pick up further, at least on the basis of planned London office construction (Chart 1.32). And it is likely that some of the funds used for investment in existing properties have been used to refurbish previously untenanted buildings, increasing the stock of available property. But an absence of comprehensive statistics for sectors outside the London office market makes it difficult to gauge the prospective balance between supply and demand.

Strong investor demand has put further upward pressure on commercial property values, which rose by 11% in the year to April 2005. The increase partly reflects the historically low level of long-term interest rates and investors' search for yield. It has been less marked than in previous commercial property cycles (even in real terms) and, over the past few years, prices have increased by less than for residential property. But capital values appear to reflect an expectation that rental growth will pick up. A recent survey of market participants by the Investment Property Forum indicated a mean expectation that nominal rental values would increase by 2.8% per year over the next five years, compared with rental growth of 2.1% in the year to April. There is a risk that these expectations will not be met; rental growth expectations have in the past proved to be excessively optimistic,⁽²⁾ with actual rental growth on average over the past 20 years below the rate of inflation. Also, as noted above, surveys point to a weakening in PNFCs' profits growth, particularly within the retail sector (which accounts for about a third of commercial property lending). Rental growth in the London office market may continue to be depressed by high vacancy levels (Chart 1.33). If there were a downturn in capital and rental growth — and the sector has proved in the past to be highly cyclical (Box 5) — loan-to-value (LTV) covenants could be breached. This could make refinancing more difficult — an important issue given that a quarter of all property loans are due to be repaid in the next three years (Chart 1.34).

Lenders' risk management practices

Discussions with representatives of several of the major UK banks suggest that the spreads on their corporate lending in 2004 and early 2005 declined in line with movements in bond spreads. And, despite their recent tick-up, they remain narrow by historical standards. Non-price terms and conditions on loans

(1) DTZ (2002) 'Money into property'.

(2) Discussions at the Bank's Property Forum. The Forum is described in more detail in Box 6 on Page 72 of the 1999 Bank of England *Financial Stability Review*, November.

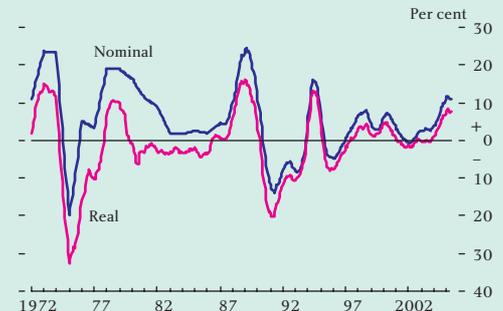
Box 5: Commercial property: historical comparisons

There are some similarities between current conditions in the commercial property sector and those that preceded the mid-1970s and early-1990s property downturns.⁽¹⁾ First, in real terms, the rate of increase in capital values is high by historical standards (Chart A). Second, rapid bank lending growth has increased banks' exposures to the sector (Chart B). And third, despite some recent easing, London office vacancy rates are close to their early-1990s level.

These downturns revealed how rapidly fortunes within the commercial property sector can reverse. Between 1988 and 1992, the fraction of quoted property companies making a loss rose from zero to almost 30%.⁽²⁾ And the United Kingdom is not alone in having experienced pronounced commercial property cycles. Between the peak in commercial property prices in the mid-1980s and their trough in the mid-1990s, the average fall in values across developed countries was 44%, greater than the 27% UK decline.⁽³⁾

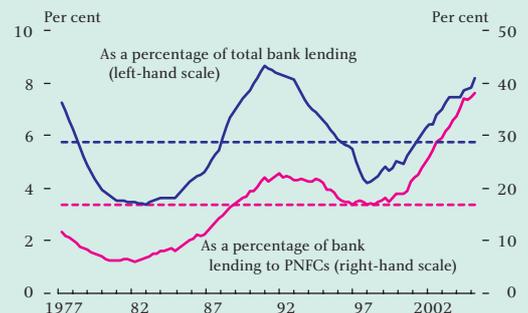
But there are significant differences between current conditions and those that preceded previous downturns. The late-1980s property boom accompanied very strong real GDP growth, which averaged over 5% between late 1987 and 1988, about twice its average rate over the past two years. The rapid economic growth was accompanied by a rise in expectations about future growth (which subsequently proved to be unfounded).⁽⁴⁾ This belief may have contributed to the rise in speculative development, much of which was completed just as the early-1990s recession hit. The early-1970s and late-1980s economic booms were also accompanied by a pronounced rise in inflation, and the subsequent sharp increases in interest rates added to the financial pressures on property companies. It is also possible that the amplitude of commercial property cycles has been lower in recent years (Chart A). And banks' risk management practices have been improved, with closer monitoring of loans, greater use of stress testing and the prospect of 'risk-sensitive' capital requirements under the Basel II framework.

Chart A
Annual growth of commercial property capital values^(a)



Sources: Investment Property Databank, ONS and Bank calculations.
(a) Data are interpolated from annual series from Jan. 1971 to Dec. 1986. Monthly data from 1987.

Chart B
Bank lending to the real estate sector^{(a)(b)}



Source: Bank of England.
(a) Dotted lines represent averages from 1977 Q1.
(b) Data are extrapolated from annual series between 1977 Q1 and 1997 Q3.

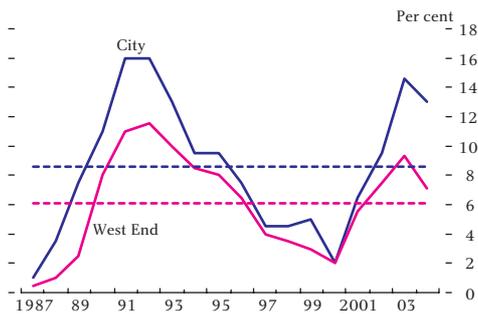
(1) These episodes contributed to the 'fringe' or secondary banks' crisis in the 1970s and the small banks crisis in the 1990s. See Logan, A. (2000), 'The early 1990s small banks crisis: leading indicators', Bank of England *Financial Stability Review*, December.

(2) This change was much sharper than for quoted PNFCs in general, for which the fraction making a loss increased from 3% to 15% over this time.

(3) BIS (2001), *BIS 71st Annual Report*, BIS.

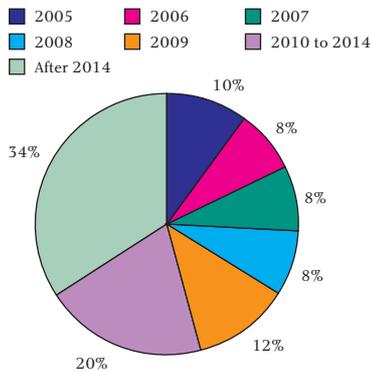
(4) Attanasio, O and Weber, G (1994), 'The UK consumption boom of the late 1980s: aggregate implications of microeconomic evidence', *Economic Journal*, Vol. 104, Issue 427.

Chart 1.33
London office vacancy rates^(a)



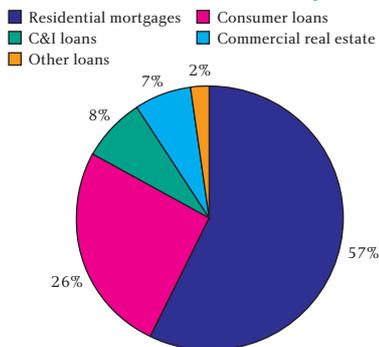
Source: CB Richard Ellis.
(a) Dotted lines represent averages between 1987 and 2004.

Chart 1.34
Proportion of commercial property debt due for repayment^(a)



Source: Macted, W and Porter, T (2005), 'The UK commercial property lending market', De Montfort University.
(a) Includes loans from banks, building societies and insurance companies.

Chart 1.35
Composition of the combined loan portfolios of HSBC North America and Citizens Financial, end-2004



Source: Board of Governors of the Federal Reserve System.

(especially to large firms), including fees and covenant requirements, also remain low.

The easing in lending conditions has been particularly notable for commercial property loans, where maximum average LTVs increased in 2004, while income cover and lending margins fell.⁽¹⁾ In addition, much recent lending has been used to increase the debt secured against existing properties. But, despite this easing in terms, typical maximum LTV ratios on prime new lending remain around 80%, while the recent rise in commercial property capital values provides lenders with additional protection against any future downturn. Rental receipts on let buildings typically exceed interest cover by about 20%–30% (although the risks associated with lending for speculative development are higher). And some lending has provided finance for property companies to buy buildings from firms, who subsequently lease them back ('sale and leaseback'). The risks associated with this lending are likely to be low if it is secured against the rental stream from good quality tenants. Nevertheless, if the unusually low recent rate of corporate and commercial property write-offs mainly reflects the favourable short-term conjuncture, the relaxation in lending terms could lead to a larger-than-expected increase in banks' future losses.

1.3 The United States

UK-owned banks' exposures to borrowers in the United States⁽²⁾ increased by 12% in the second half of 2004, partly reflecting the acquisition by the Royal Bank of Scotland (RBS) of Charter One. At end-2004, claims on the United States accounted for 14% of the assets of UK-owned banks, mostly via US branches and subsidiaries. Box 6 explores the foreign exposures of UK-owned banks in more detail.

Published accounts data suggest that Barclays, HSBC and RBS account for the vast majority of UK-owned banks' local office claims on the United States. Barclays focuses on capital markets and investment banking. By contrast, loans account for over 60% of the assets of both HSBC North America and the main US subsidiary of RBS, Citizens Financial. Residential mortgages represent over half their combined loan portfolio, with credit card and other consumer lending accounting for another quarter (Chart 1.35). UK-owned banks also have significant holdings of residential mortgage-backed securities, so developments in the US household sector are potentially important for the UK financial system.

(1) Macted, W and Porter, T (2005), 'The UK commercial property lending market', De Montfort University.

(2) For comparability, the change in exposures is estimated using data for UK-owned banks' direct exposures; otherwise ultimate risk exposures, which adjust for risk transfers, are used (see Box 6 in this Review).

UK-owned banks have relatively little direct exposure to commercial and industrial firms via their US branches and subsidiaries. However, most of their cross-border claims on the US non-bank private sector are likely to be on non-financial companies. Furthermore, as recent events at General Motors (GM) and Ford have shown, developments in the US corporate sector can have a significant impact on international capital markets (see Chapter 2.1).

Claims on US banks account for 13% of UK-owned banks' claims on the United States (Chart 1.36). Developments in the US financial sector can also affect UK financial stability because large US banks and securities houses are major counterparties for the large UK-owned banks in securities and derivatives markets.

The private non-financial sector

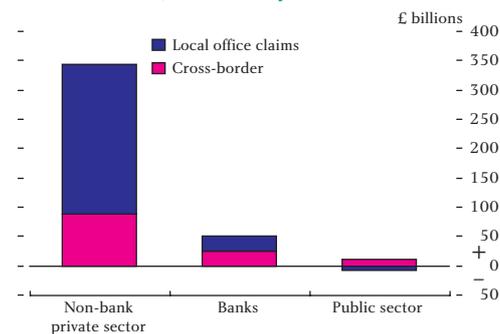
The economic environment for US borrowers is expected to remain benign; the Consensus forecast is for continued robust GDP growth in 2005 and 2006. Financial market participants' expectations of the path of official interest rates have not changed significantly since the December Review, with rates expected to rise gradually from 3% to around 4% by end-2006.

The household sector

Charge-off rates on US residential mortgages have remained low — perhaps not surprising given that the unemployment rate has fallen slightly and house prices have continued to rise rapidly. Non-current⁽¹⁾ loan rates have fallen further since the previous Review (Chart 1.37), despite the increase in short-term interest rates and the continued strong growth in mortgage debt. The increase in the aggregate financial obligations ratio⁽²⁾ of homeowners (Chart 1.38) has been relatively limited — largely because of the preponderance of long-term fixed-rate mortgages.

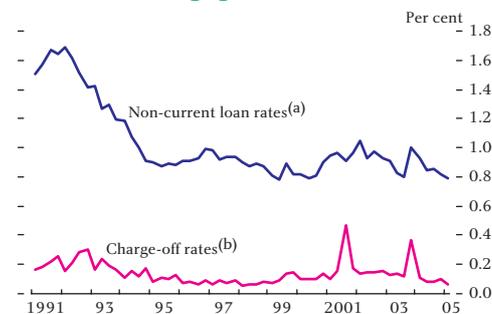
However, since mid-2003, there appears to have been a marked shift in new originations towards adjustable-rate mortgages (ARMs),⁽³⁾ which, if it were sustained, could significantly increase the interest sensitivity of household debt. According to a recent survey by the Mortgage Bankers Association (MBA),⁽⁴⁾ ARMs and interest-only (IO) mortgages accounted for 63% of mortgage originations in the second half of 2004. The ARM share of new mortgages typically increases when the yield curve is upward sloping. Given the impact of the large rise in house prices on affordability, the relatively high ARM share and the increase in IO mortgages may partly reflect the need for some borrowers to minimise their initial mortgage payments. In some states,

Chart 1.36
UK-owned banks' claims on the United States, end-2004^(a)



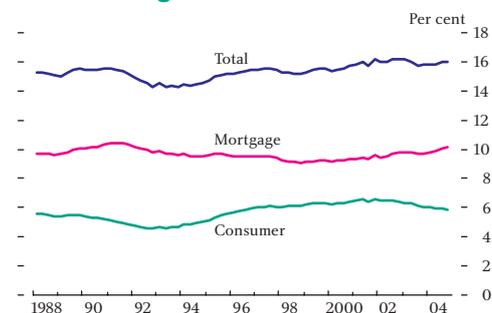
Source: Bank of England.
(a) Ultimate-risk basis.

Chart 1.37
US commercial banks: credit quality of residential mortgages



Source: Federal Deposit Insurance Corporation.
(a) Non-current loans are loans more than 90 days past due or in non-accrual status.
(b) Charge-offs are quarterly annualised rates.

Chart 1.38
Financial obligation ratios of homeowners^(a)



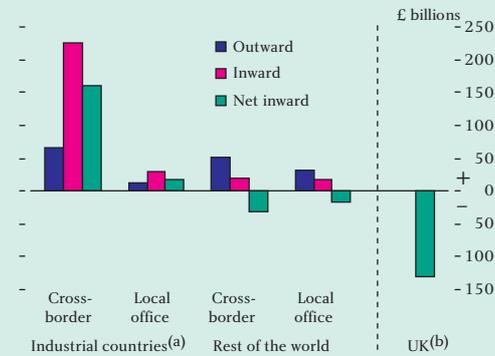
Source: Board of Governors of the Federal Reserve System.
(a) Payments of interest and principal, plus other recurring obligations (such as rent, auto leases, homeowners' insurance and property taxes) as a proportion of personal disposable income.

(1) Non-current loans are defined as loans 90 days past due plus loans in non-accrual status.
(2) Payments of interest and principal, plus other recurring obligations (such as rent, auto leases, homeowners' insurance and property taxes) as a proportion of personal disposable income.
(3) ARMs are similar to UK fixed-rate mortgages, with the interest rate fixed for an initial period before switching to a variable rate.
(4) Mortgage Bankers Association's Single-Family Mortgage Activity Survey.

Box 6: UK-owned banks' foreign exposures: new returns

Chart A

Risk transfers on UK-owned banks' foreign exposures, end-2004

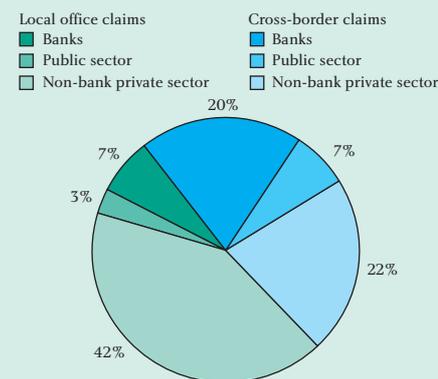


Source: Bank of England.

- (a) Consists of United States, 'Developed Europe' (see note 2 to Table A below, Japan, Canada, and Australia).
 (b) Sum of cross-border and local office.

Chart B

Sectoral split of UK-owned banks' overseas exposures at end-2004, ultimate risk basis^(a)

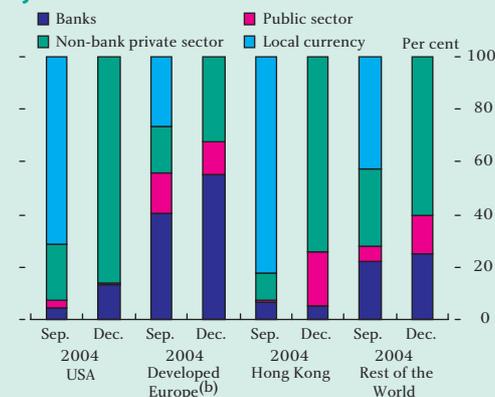


Source: Bank of England.

- (a) Due to rounding, segments do not sum to 100%.

Chart C

UK-owned banks' major regional exposures, by sector^(a)



Source: Bank of England.

- (a) Sep. 2004 data are on an immediate borrower basis, since risk transfers were unavailable for local currency claims; Dec. 2004 data are on an ultimate risk basis.
 (b) See note 2 to Table A below for constituents.

Quarterly data on UK-owned banks' foreign exposures submitted under a new reporting regime were published for the first time in March. The new data split UK-owned banks' foreign exposures into cross-border claims (eg a UK-owned bank's UK office's claims on a Spanish resident) and local office claims (eg a UK-owned bank's Spanish office's claims on a Spanish resident).⁽¹⁾ The new data also enhance disclosure by providing information on both risk transfers and sectoral breakdowns of local office claims for the first time.⁽²⁾

Risk transfers

The new data allow total foreign exposures to be adjusted for risk transfers, where previously this had only been possible for cross-border claims. Risk transfer data allow credit risks to be tracked to the country from which they ultimately emanate. For example, a UK-owned bank could have an exposure to a German-owned firm resident in Ireland. If the German parent has guaranteed the firm's borrowing, then the credit risk ultimately lies in Germany, not Ireland.

Such legally enforceable guarantees of overseas associates are the main source of risk transfers across countries and are mostly associated with banks and other firms (both financial and non-financial). Chart A shows that there is a net transfer of risk to industrial countries. Some of this risk transfer is associated with claims that were originally on borrowers in non-industrial countries, but most relates to claims originally on foreign banks operating in the United Kingdom. These claims on banks give rise to almost all of the net outward risk transfers from the United Kingdom shown in Chart A.

Sectoral breakdowns

Whereas the old data did not separate local office claims by sector, the new data do. Now both cross-border and local office claims can be split into three customer sectors: public bodies; banks; and the non-bank private sector, capturing claims on private firms (including non-bank financial firms) and individuals. Chart B shows that local office claims (the bulk of which are denominated in local currencies) account for over half of UK-owned banks' total foreign claims.

The pale blue bars on Chart C represent the portion of regional claims about which there were previously no sectoral data. Chart C and Table A confirm that the non-bank private sector dominates UK-owned banks' claims on the United States and

(1) Previously, cross-border claims and local office claims in non-local currencies were collected together and called 'international claims'.

(2) For a fuller explanation of the changes and the background against which they were made, see Baker, K. 'Consolidated external claims of UK-owned banks: a new dataset', *Monetary and Financial Statistics*, Bank of England, June 2005.

Hong Kong. In Developed Europe, however, the banking sector is more important.

At end-December 2004, the United States accounted for 34% of UK-owned banks' total foreign exposures, and 86% of those exposures were to the non-bank private sector. A large part of these claims were on US households. Developed Europe accounted for 35% of total foreign exposures, of which 55% were to European banks. In Germany, the second largest country exposure after the United States, the banking sector accounted for 70% of total claims. A substantial portion of these claims are likely originally to have been on German banks' offices in London, but the risk has been transferred to their German headquarters.

Table A

	Total UK foreign claims ⁽¹⁾ on country at end-December 2004		Per cent of which claims on:		
	£ billions	Per cent of total	Banking sector	Public sector	Non-bank private sector
World	1,171	100%	29%	10%	62%
Developed Europe ⁽²⁾	409	35%	55%	12%	32%
Germany	81	7%	70%	14%	16%
Benelux	74	6%	65%	10%	25%
France	71	6%	44%	9%	48%
Ireland	51	4%	28%	0%	72%
Italy	35	3%	38%	36%	26%
Spain	35	3%	28%	12%	60%
United States	398	34%	13%	1%	86%
Emerging markets ⁽³⁾	190	16%	15%	18%	66%
Hong Kong	67	6%	5%	21%	74%
Offshore financial centres ⁽⁴⁾	51	4%	5%	1%	94%
Australia and New Zealand	48	4%	37%	2%	60%
Japan	34	3%	50%	28%	22%

Source: Bank of England.

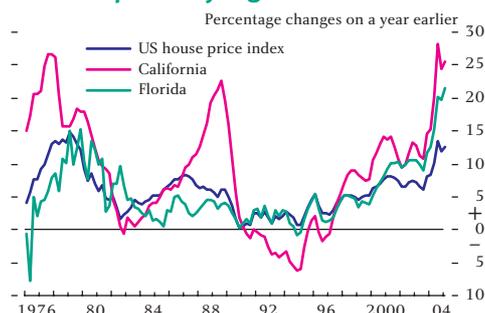
(1) Adjusted for risk transfers.

(2) Euro area plus Denmark, Iceland, Liechtenstein, Norway, Sweden and Switzerland.

(3) Includes Hong Kong and Singapore.

(4) Includes Channel Islands and Isle of Man. Excludes Hong Kong and Singapore.

Chart 1.39
US house prices by region



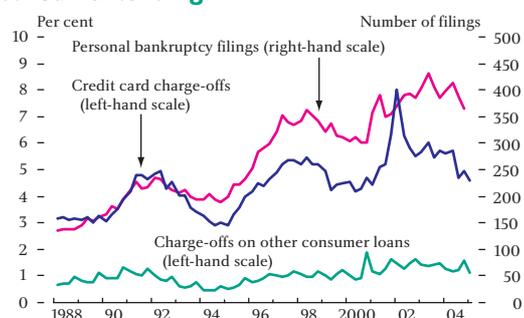
Sources: OFHEO, Thomson Financial Datastream and Bank calculations.

notably California and Florida, annual house price inflation has been over 20% (Chart 1.39).

Another factor in the rise in the ARM share has been the increase in sub-prime and low documentation ('Alt-A') mortgages, which tend to be adjustable rather than fixed-rate. Sub-prime and Alt-A mortgages accounted for nearly one third of new mortgage originations in the second half of 2004.

The average loan-to-value ratio (LTV) for outstanding mortgages is about 44%, so there is an equity cushion which would provide substantial protection for lenders against all but the most extreme declines in house prices. Less than a fifth of new first-lien mortgages in 2004 had LTVs of more than 90%.

Chart 1.40
Personal bankruptcies and charge-offs on consumer lending^(a)

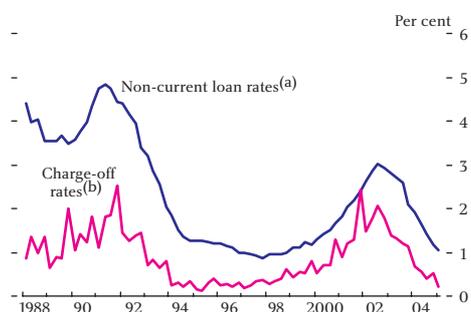


Sources: Federal Deposit Insurance Corporation and Bank calculations.

(a) Charge-offs are quarterly annualised rates.

Charge-off rates on credit cards fell in the second half of last year, reflecting the trend in personal bankruptcies, whereas charge-off rates on other consumer lending have been broadly flat (Chart 1.40). In response to guidance from regulators, several of the major credit card issuers announced plans to increase minimum payments to ensure that the outstanding balance is repaid within a reasonable period. In future, payments must cover all fees and interest charges plus 1% of the outstanding balance. In the short run, the higher minimum repayment is likely to push up arrears and charge-offs.

Chart 1.41
US commercial banks: credit quality of commercial and industrial loans



Source: Federal Deposit Insurance Corporation.

(a) Non-current loans are loans and leases more than 90 days past due or in non-accrual status.

(b) Charge-offs are quarterly annualised rates.

The Bankruptcy Abuse Prevention and Consumer Protection Act, which will take effect in October 2005, tightens up the personal bankruptcy regime and may have a significant impact on personal bankruptcies and charge-off rates on consumer debt. Individuals can currently choose between filing for bankruptcy under Chapter VII or Chapter XIII of the US bankruptcy code. Under Chapter VII, unsecured creditors receive the proceeds from the sale of any non-exempt property but do not have any claim on the individual's future income. In most cases, unsecured creditors receive nothing, as all of the debtor's property is exempt. Under Chapter XIII, debts are repaid from current and future income under a plan, typically for three to five years, agreed with creditors and authorised by the bankruptcy court. Perhaps the most significant change is that the Act allows creditors to ask the bankruptcy court to determine whether the individual has sufficient income for a Chapter XIII repayment plan. This may lead to an improvement in recovery rates, as a greater proportion of individuals have to file under Chapter XIII instead of Chapter VII. However, in the short run, the Act may lead to a rise in bankruptcies as people bring forward their bankruptcy filings to try to avoid the stricter rules.

The non-financial corporate sector

Corporate credit quality improved further in 2005 Q1, with the proportion of non-current C&I loans falling to its lowest level since 1999 and charge-off rates on C&I loans remaining low

(Chart 1.41). Chapter XI bankruptcy filings also remain low. Backward-looking indicators of the health of the corporate sector are generally benign. In 2005 Q1, income gearing and capital gearing at replacement cost were at, or close to, their lowest level since 1998 (Chart 1.42). Corporate sector liquidity was strong at end-March 2005; the ratio of cash and other liquid assets to short-term debt was close to its highest level since the 1950s. However, there are two notable exceptions to this generally benign picture: the auto sector, which has been badly hit by the problems at GM and Ford; and the airlines, which are struggling to cope with the sustained high level of oil prices.

Both GM and Ford have been losing market share in the United States for some time though, until recently, they had been able to maintain profitability through their strong position in the highly profitable sports utility vehicle (SUV) market segment. However, this year, SUV sales have fallen and both GM and Ford have lost market share. Credit default swap (CDS) premia of GM and Ford rose sharply after they issued profit warnings in, respectively, mid-March and mid-April and again after Standard and Poor's (S&P) downgraded their debt to below investment-grade in May, though they fell back more recently (Chart 1.43). These developments had a significant impact on the high-yield bond market, which had to absorb nearly \$50 billion of GM debt⁽¹⁾ (see also Chapter 2.1). The problems at GM and Ford have seriously affected the US auto-parts industry. Delphi and Visteon, the two largest US firms, have been downgraded by at least four notches by the three main rating agencies since the previous *Review*, while five smaller suppliers have filed for Chapter XI.

Most major US passenger airlines have been badly affected by the sustained high level of oil prices. Most of the major airlines recorded further losses in 2005 Q1 and their CDS premia remain high. The direct exposures of UK and US banks are small and mostly secured on aircraft assets, providing some protection in the case of default.

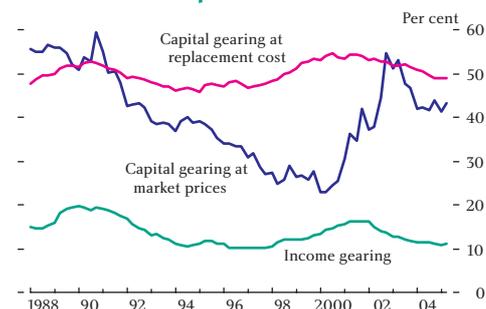
Banking

Overall, the US banking sector remains robust. Published capital ratios are high, profitability is reasonably strong and credit quality continues to improve. However, since the December *Review*, bank share prices have slightly underperformed the S&P 500 and CDS premia for large domestic banks have risen marginally.

The profits of US commercial banks fell slightly in 2004 Q4 but bounced back in 2005 Q1. The first-quarter profits of US commercial banks were boosted by record trading revenues, as fixed-income trading performed very strongly (Chart 1.44).

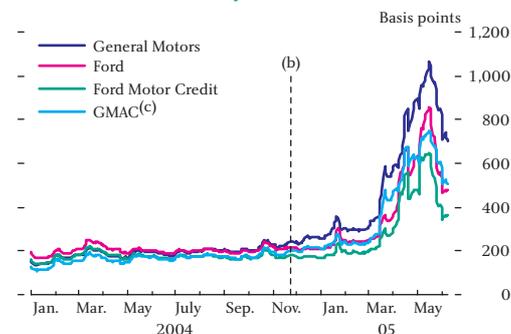
(1) Including the debt of its finance subsidiary, General Motors Acceptance Corporation.

Chart 1.42
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'; 2005 Q1, Bureau of Economic Analysis, Bank calculations and Thomson Financial Datastream.

Chart 1.43
US auto sector CDS premia^(a)



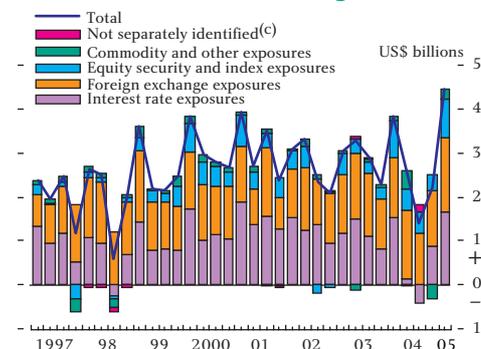
Source: Markit.

(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) Dec. 2004 *Review*.

(c) General Motors Acceptance Corporation.

Chart 1.44
US commercial banks: trading revenue^{(a)(b)}



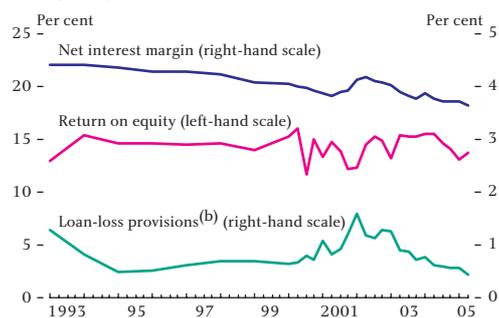
Source: Federal Deposit Insurance Corporation.

(a) Trading revenue comprises fees and gains/losses on positions.

(b) For banks with assets greater than US\$100 million. From March 2000, those with trading assets less than US\$2 million are exempt from reporting requirement.

(c) Trading revenues of banks that are not required to provide a breakdown of their trading revenue.

Chart 1.45
US commercial banks: profitability indicators^(a)

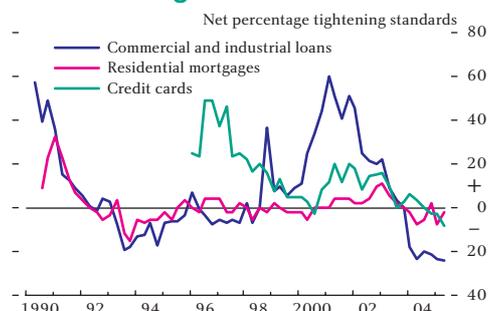


Source: Federal Deposit Insurance Corporation.
 (a) Data points are annual from 1992 to 1999, and quarterly from 2000 Q1 onwards.
 (b) Loan-loss provisions as a percentage of total loans.

However, the recent turmoil in structured credit markets may have affected some second-quarter revenues (Chapter 2.1). The return on equity remained relatively low because of the high level of goodwill arising from mergers (Chart 1.45). Net interest income fell in the first quarter, as a sharp decline in net interest margins more than offset continued loan growth. The decline in net interest margins partly reflected faster repricing of liabilities as short-term interest rates rose. However, net interest margins are at their lowest level for almost 15 years.

Profits continued to benefit from the decline in loan-loss provisions, which fell by a further \$1.4 billion in 2005 Q1. The coverage ratio of loan-loss reserves to non-current loans increased once again because of the continued improvement in loan quality. However, falling loan-loss provisions are unlikely to be a significant source of future profit growth because loan-loss reserves have reached such a low level; the ratio of loan loss reserves to total loans at end-March 2005 was at its lowest level since the mid-1980s. In the three months to April, banks continued to ease C&I lending standards but reported little change in standards for mortgages or credit cards (Chart 1.46).

Chart 1.46
US bank lending conditions

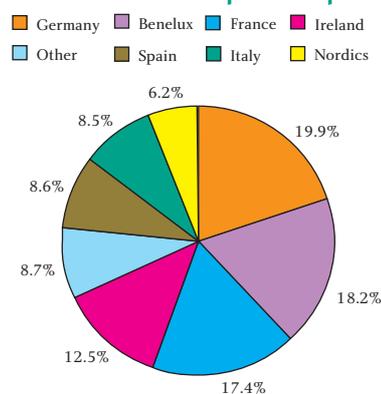


Sources: Board of Governors of the Federal Reserve System: Senior Loan Officer Survey and Thomson Financial Datastream.

1.4 Europe

UK-owned banks' exposures to borrowers in the rest of Europe⁽¹⁾ increased by some 7% in the second half of 2004, more slowly than total overseas exposures, and accounted for some 35% of UK-owned banks' foreign exposures and 15% of UK-owned banks' total assets.⁽²⁾ Exposures to borrowers in Germany, the Benelux area and France account for the majority (Chart 1.47). In recent years, however, exposures have grown rapidly in Ireland and Spain, partly reflecting mergers and acquisitions, but also mirroring the growth in these economies relative to the euro area as a whole. Despite a pickup in euro-area GDP growth in 2005 Q1, Consensus forecasts for euro-area growth have been revised down further, suggesting lower expectations of income growth. Longer-term interest rates have also fallen further, however, which may partially offset any associated rise in financial pressures.

Chart 1.47
UK-owned banks' total foreign claims on borrowers in developed Europe^{(a)(b)}



Source: Bank of England.
 (a) 'Other' includes Austria, Greece, Liechtenstein, Portugal, and Switzerland.
 (b) Data are reported on an ultimate risk basis, at end-Dec. 2004.

More than half of UK-owned banks' total claims on Europe are on banks, compared with less than a seventh for the United States. That partly reflects greater participation by non-UK European banks in London's wholesale markets; at the end of April 2005, they accounted for over 40% of UK-resident bank assets. This pattern of exposures implies that the impact of

(1) Defined as the euro area plus Denmark, Iceland, Liechtenstein, Norway, Sweden and Switzerland.
 (2) For comparability, changes in foreign exposures are estimated using data for UK-owned banks' direct exposures; otherwise ultimate risk exposures, which adjust for credit risk transfers are used (see Box 6 in this Review, which also covers changes to the dataset covering foreign exposures over time).

European household and corporate credit risk on UK-owned banks is more indirect than that of corresponding US risks.

The household sector

Euro-area banks' loans to euro-area households have risen briskly in recent years (Chart 1.48), to account for some 18% of euro-area banks' assets. Write-offs and write-downs on bank lending to households in 2004 Q4 and 2005 Q1 were little changed on a year earlier, and the available data suggest that the share of non-performing loans remained low (Chart 1.49).

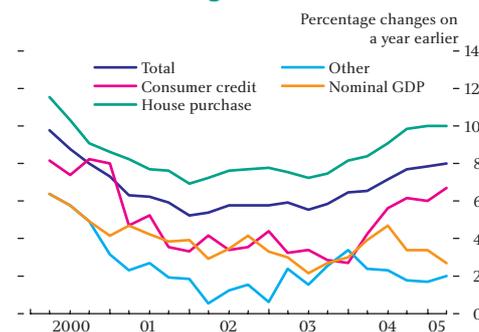
The increase in lending has largely reflected rising lending for house purchase in some countries, associated with rapid rises in house prices, low interest rates, and strong competition among lenders. Consumer credit growth has also picked up over the past year. Household debt-to-income ratios rose further in 2004 in a number of countries, including Spain and Ireland. That has raised households' vulnerability to unexpected falls in income. But in Germany, household borrowing growth has remained sluggish. And for the euro area overall, the household debt-to-income ratio remains well below that of the United Kingdom and the United States. Income gearing is likely to have remained moderate overall, given rising nominal income and low interest rates; and unemployment has been broadly flat. But it has become more common to charge variable interest rates on lending, raising the interest-rate sensitivity of debt servicing.

The corporate sector

The data do not allow for UK-owned banks' lending to the European corporate and household sectors to be identified separately,⁽¹⁾ but corporate exposures are likely to be the larger of the two. Cross-border lending — which is likely to be predominantly corporate lending — accounts for almost half of all UK-owned banks' lending to the private non-bank sector; and corporate lending is also likely to account for a significant share of lending by local offices. Bank borrowing accounts for a larger share of the debt of euro-area non-financial corporations (NFCs) than for their UK counterparts; and euro-area banks' loans to euro-area NFCs account for some 14% of total euro-area banks' assets. Write-offs and writedowns on banks' corporate lending were lower in 2004 Q4 and 2005 Q1 than a year earlier. The number of bankruptcies has remained high in some countries (Chart 1.50), however, reflecting difficult conditions for smaller firms, although UK-owned banks' exposures to these companies are likely to be limited.

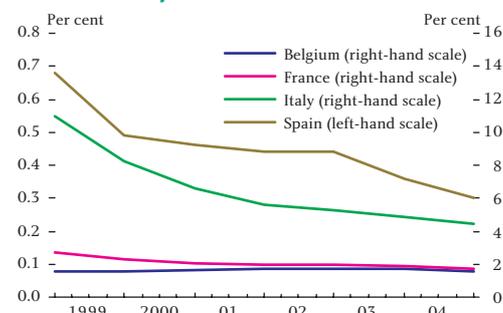
The annual rate of corporate lending growth rose further in 2005 Q1, to 5.9%. Net bond issuance also edged up, though equity issuance has remained weak. Banks continued to report muted loan demand, according to the European Central Bank's

Chart 1.48
Household lending in the euro area



Sources: European Central Bank and Eurostat.

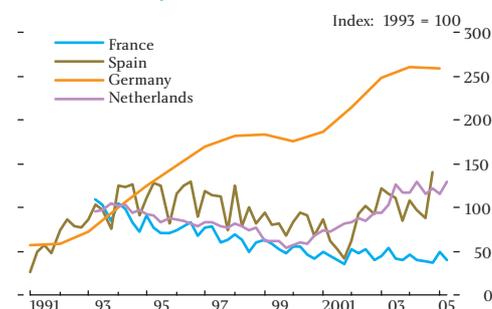
Chart 1.49
Non-performing loans to households in selected European countries^(a)



Sources: Banca d'Italia, Banque de France, Banco de España, Belgostat, and Bank calculations.

(a) For Belgium, France and Italy, ratios of non-performing household loans to total household loans. For Spain, ratio of non-performing mortgage loans to households to total mortgage loans to households.

Chart 1.50
Number of corporate bankruptcies in selected European countries^(a)

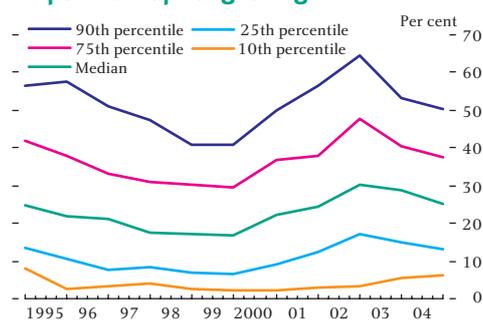


Sources: Central Bureau Voor De Statistiek, INSEE, Ministerio De Economia Y Hacienda, Statistisches Bundesamt and Thomson Financial Datastream.

(a) For France, Netherlands and Spain, quarterly data; for Germany, annual data.

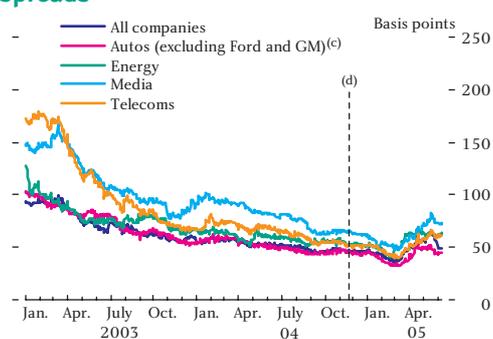
(1) See Box 6 in this Review, which looks at UK-owned banks' new returns on foreign exposures.

Chart 1.51
Distribution of large European non-financial companies' capital gearing^(a)



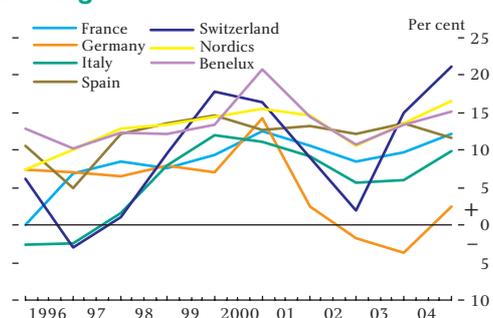
Sources: Standard & Poor's Compustat and Bank calculations.
 (a) Capital gearing at market value for non-financial companies in the S&P Euro Plus index.

Chart 1.52
Euro-denominated investment-grade credit spreads^{(a)(b)}



Sources: Merrill Lynch and Bank calculations.
 (a) Mainly European companies.
 (b) Weighted average option-adjusted duration-matched spread over a government bond spline curve.
 (c) Median spread of constituent bonds in the autos index.
 (d) Dec. 2004 *Review*.

Chart 1.53
Post-tax return on equity of major European banking sectors^(a)



Sources: Bureau van Dijk Bankscope and Bank calculations.
 (a) Unconsolidated annual accounts data for top 100 (non-UK) European banks by assets in each year; 2004 sample consists of the 70 banks from the 2003 sample that had reported to date.

(ECB) April 2005 bank lending survey, reflecting the use of internal finance and continued weak fixed investment. In Spain and Ireland, lending to the property and construction sectors has remained robust, adding to banks' exposures to real estate markets. Gross European syndicated lending rose markedly over the year to 2005 Q1, largely reflecting increased refinancing. Lending to highly geared borrowers, associated with private equity activity, has risen over recent years and remained strong in 2004 Q4 and 2005 Q1. However, capital gearing has fallen in the past two years (Chart 1.51), reflecting some balance sheet adjustment and higher equity prices. Income gearing is likely to have remained moderate, although, as for households, a greater use of variable-rate (and short-term fixed-rate) borrowing in recent years may have increased the interest-rate sensitivity of debt servicing.⁽¹⁾

European corporate credit spreads have edged higher since the December *Review* (Chart 1.52). But equity prices have risen and equity price volatility has fallen, implying, other things equal, a fall in default risk. And, in 2004 Q4, the number of ratings upgrades exceeded the number of downgrades for the first time since 1998. Earnings among large quoted companies have increased further in recent quarters, although high oil prices may have added to the pressures facing some firms.

The banking sectors⁽²⁾

Exposures to banks in the rest of Europe have broadly doubled in the past four years, to account for 8% of UK-owned banks' total assets; they also account for most of the major UK banks' large exposures to international borrowers.⁽³⁾ Although these exposures are greater than those to other European companies, they are likely to be less risky, as banks are generally more highly rated. The profitability of large European banks improved further in 2004 and 2005 Q1 (Chart 1.53), and solvency ratios remained generally satisfactory.

UK-owned banks' exposures to the German banking sector represent their largest exposure to any overseas banking sector. Although German commercial bank profitability picked up in 2005 Q1, the recovery has lagged that in other countries, and profitability of core domestic businesses has remained weak, reflecting stagnant lending and strong competition. Competitive pressures have been intensified by the scaling back of some large German banks' international operations to focus more on the domestic corporate market, and by efforts by some foreign banks — some UK-owned — to increase lending. For public sector

(1) See Box on pages 46–48 of the ECB's *Financial Stability Review*, June 2005.
 (2) '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 both the Benelux and Nordic regions.
 (3) For regulatory purposes, 'large' exposures are defined as any exposures that exceed 10% of eligible capital (Tier 1 plus Tier 2 capital, less any regulatory deductions, eg related to insurance subsidiaries) at any point during the reporting period.

banks, competitive pressures will be intensified over the longer term by the loss of state guarantees on 19 July. Landesbanks have responded by building closer links with savings banks and increasing liquidity buffers. Some banks in Germany have sold non-performing loans to third parties, which may increase those banks' profitability in future.

European banks' profitability may be vulnerable to any slowdown in lending or increase in credit risk, given narrow interest margins and low provisioning levels. Loan-to-value ratios on new mortgage lending have risen in recent years, and banks reported an easing of lending standards in the ECB's April 2005 survey (Chart 1.54). Against a background of intense competition in prime brokerage, with a number of banks attempting to enter or increase their share of the market, some banks — perhaps particularly the newer entrants — are said to have eased terms and conditions. And large banks' value-at-risk measures point to higher interest-rate risks among some banks in 2004. European banks continue to rely heavily on market finance to fill customer funding gaps, and the average funding gap across euro-area banks appears greater than for their UK counterparts. European banks' CDS premia have generally edged up since the December *Review* (Chart 1.55), but they remain low, and the balance of ratings changes for banks has been positive.

1.5 Japan

Data on UK-owned banks' overseas exposures (Box 6) suggest that the direct exposure of the UK financial system to Japan is limited. But, although risks have declined, Japan still has a very fragile financial system. If public sector finances remain weak, that could lead to a rising risk premium in government bond markets. Any worsening of Japanese financial fragility could affect international financial markets, and hence UK financial stability.

Economic data were weaker than expected in late 2004, but real GDP grew strongly in 2005 Q1 and Consensus forecasts suggest continued growth in 2005 and 2006.

Japan's non-financial sectors

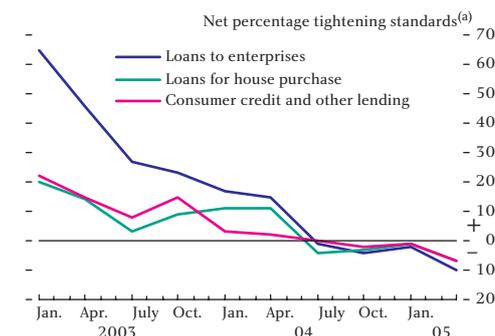
The household sector

Personal bankruptcies have continued to fall (Chart 1.56). Household sector credit quality is supported by falling unemployment and net financial assets of over 200% of GDP. Private sector bank lending to households is limited.

The private non-financial corporate sector

Despite the 'soft patch' in 2004, corporate credit quality has continued to improve. Liabilities of bankrupt firms were 29% lower in the year to March than in the previous year

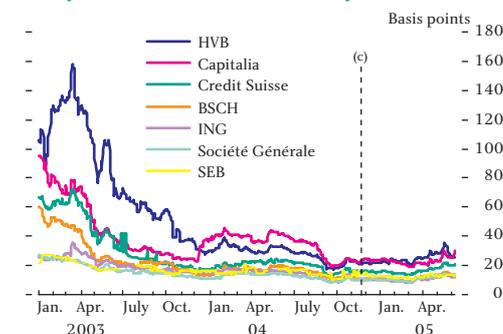
Chart 1.54
Euro-area banks' credit standards for lending



Source: ECB bank lending survey.

(a) The difference between the sum of 'tightened considerably' and 'tightened somewhat' and the sum of 'eased somewhat' and 'eased considerably'.

Chart 1.55
CDS premia for selected European banks(a)(b)



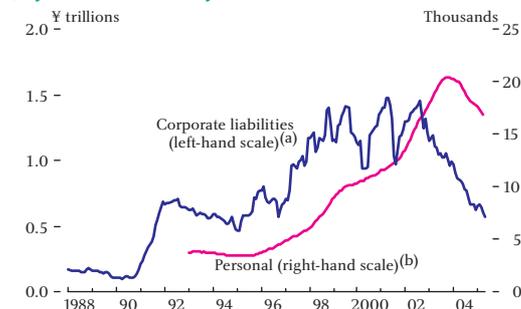
Source: Markit.

(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) Banks with the highest average CDS premia of large banks from each banking sector over the period of the chart.

(c) Dec. 2004 *Review*.

Chart 1.56
Japanese bankruptcies

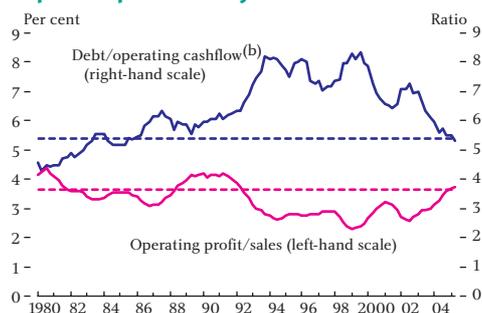


Sources: Japanese Supreme Court and Thomson Financial Datastream.

(a) Twelve-month moving average of liabilities of failed companies minus debt of failed life insurers.

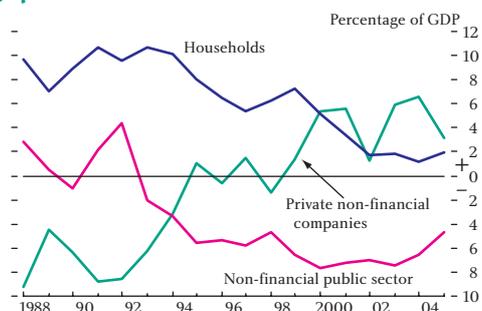
(b) Twelve-month moving average.

Chart 1.57
Corporate profitability and indebtedness^(a)



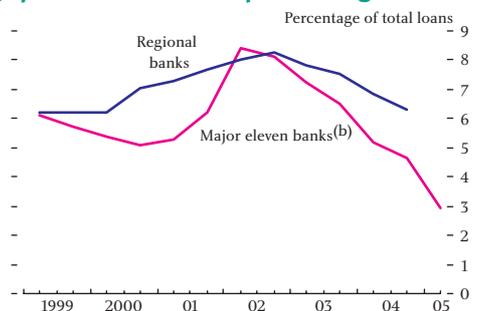
Sources: Ministry of Finance corporate survey and Bank calculations.
 (a) Dotted lines represent the average values between 1980 Q1 and 1989 Q4.
 (b) Gross debt divided by sum of operating profits plus depreciation in the previous year.

Chart 1.58
Japanese sectoral financial balances^{(a)(b)}



Sources: Bank of Japan, Japanese Cabinet Office and Bank calculations.
 (a) Financial years.
 (b) 2004 data are provisional.

Chart 1.59
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 Chuo Mitsui Trust, Resona Bank and Sumitomo Trust.

(Chart 1.56), and rating upgrades continue to outnumber downgrades.

Most measures of corporate sector profitability and indebtedness (Chart 1.57) have now improved to close to their pre-1990 averages. The sector continues to run a surplus of saving over investment of 3% of GDP, increasing holdings of cash and reducing debt (Chart 1.58). It is unclear when firms will be comfortable with their reduced levels of gearing, allowing their demand for credit to rise.

Japan's banking system

Recent *Reviews* have noted a sustained reduction in the fragility of the Japanese banking system. This was illustrated at the beginning of April, when the reintroduction of the ¥10 million cap on insurance of demand deposits passed off smoothly. Unlike three years ago, when insurance on time deposits was capped, there were no large shifts in deposits ahead of the change, suggesting that increased confidence in the banking system is widely shared.

All major banks met the Japanese Financial Services Agency's (JFSA's) target of halving non-performing loan (NPL) ratios from their peak by March 2005 (Chart 1.59). Although NPL problems may linger in lending to smaller companies and at some regional banks (which were not covered by the JFSA target), the systemic risk posed by poor loan quality seems to have been greatly reduced.

Market risk may have declined slightly. In aggregate, the major bank groups reduced their equity holdings from 96% to 87% of Tier 1 capital in fiscal 2004. And the recent rapid growth in major bank holdings of government bonds levelled off in 2004.

Capital buffers have also been strengthened (Chart 1.60). UFJ, previously the most weakly capitalised of the major banks, will merge with MTFG in October. However, some banks continue to rely on deferred tax assets (DTAs) — tax credits which may not be realisable in a crisis⁽¹⁾ — to meet capital requirements.

But higher profitability should improve capital quality. In the year to March, Japan's major banks recorded their first aggregate net profit since 2000 (Chart 1.61), thanks to lower losses on bad debts. This allowed some banks to use DTAs to offset tax payments. The improved health of the corporate sector suggests that loan losses will remain low, and there may be write-backs of provisions. This should allow banks to continue to reduce DTAs.⁽²⁾ Any rise in capital ratios may be limited, as the banks

(1) See June 2003 *Review*, page 41.

(2) Also, a bank's on-balance-sheet DTAs are limited by forecast pre-tax profits. Higher pre-tax profits will thus allow increases in on-balance-sheet DTAs, raising reported profits.

are keen to repay government preferred shares before their mandatory conversion to common stock.

Operating profitability, though, remains weak (Chart 1.61). Corporate lending is still falling, albeit at a slower pace, because of lack of demand, and interest margins are thin. Retail lending, at higher margins, is growing, but remains less than a quarter of major bank lending. The major banks' relatively small retail networks may limit growth in this market, and increased competition may erode margins. The banks have had some success in increasing fee income (Chart 1.61), mainly from sales of retail investment products. Fees now account for a quarter of operating income, and may rise further with deregulation of securities and insurance sales.

The marked improvement in balance sheets has seen Standard and Poor's upgrade most major banks by three notches (to A) since April 2004. Nevertheless, the Japanese banking system remains vulnerable to shocks. The major banks are less well capitalised than their international peers, and income remains depressed by low interest rates and falling loan volumes. Standard and Poor's also recently estimated that, although the stock of NPLs has declined, banks' loan spreads remain too low to cover a rate of credit losses similar to that of the major US banks, and described bank credit risk pricing systems as 'underdeveloped'.

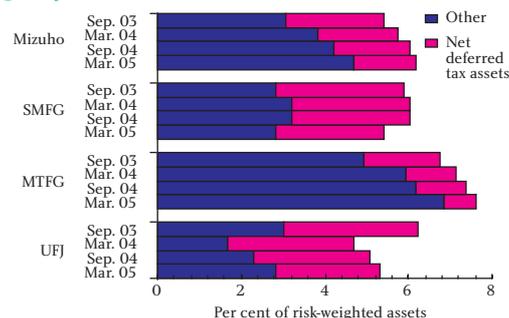
1.6 Emerging market economies

UK-owned banks' foreign claims on emerging market economies (EMEs) rose by 17% during 2004 and, at the year's end, accounted for one fifth of their total foreign claims.⁽¹⁾ Three quarters of these loans are made by local affiliates rather than cross border. Claims rose particularly rapidly on emerging Europe (24%) and the Middle East and Africa (25%), albeit from a low base; emerging Asia still accounts for almost three quarters of UK-owned banks' aggregate claims on EMEs (Chart 1.62). Exposures are likely to increase significantly again this year following Standard Chartered's recent purchase of Korea First Bank and Barclays' acquisition of a majority stake in ABSA in South Africa.

Flows to EMEs intermediated through capital markets have also continued to expand rapidly over the past year. According to the Institute of International Finance (IIF), equity flows to EMEs from all developed economies last year were buoyant, while non-bank debt flows were almost back to pre-Asian crisis levels.⁽²⁾ Equity

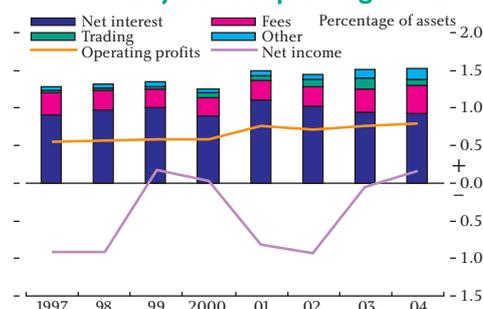
(1) EMEs are defined here as countries in central and eastern Europe, Latin America, the Middle East, Africa and Asia (other than Japan).
 (2) There are no regular or timely data of capital market intermediation by creditor country, but the most recent Coordinated Portfolio Investment Survey (CPIS) by the IMF shows that the stock of portfolio investments in EMEs from the UK were US\$267 billion at end-2003.

Chart 1.60
Tier 1 capital of major Japanese banking groups^(a)



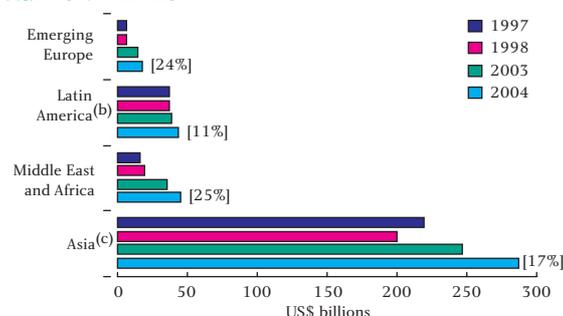
Sources: Published accounts and Bank calculations.
 (a) Consolidated.

Chart 1.61
Sources of major bank operating income^{(a)(b)}



Sources: Bank of Japan and published accounts.
 (a) City banks, trust banks and long-term credit banks.
 (b) Unconsolidated aggregate basis.

Chart 1.62
UK-owned banks' consolidated foreign claims on EMEs^(a)



Source: Bank of England.
 (a) Claims are end-year, on an immediate borrower basis. Figures in brackets are the percentage change in claims during 2004.
 (b) Latin America includes the Caribbean.
 (c) Asia includes Hong Kong and Singapore.

Table 1.A
Net private sector financial flows to EMEs
by region^(a)

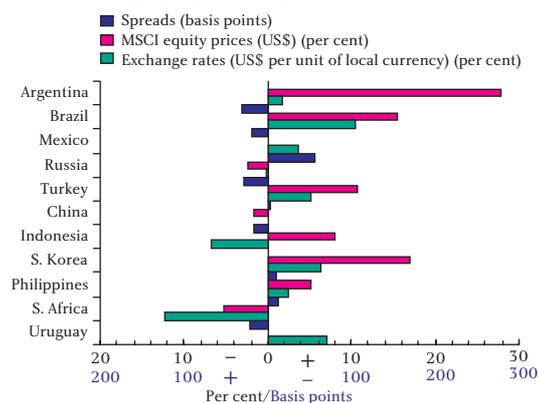
(US\$ billions)	2002	2003	2004e	2005f
Latin America				
Equity investment	35.0	21.7	35.1	35.4
Private creditors	-12.4	2.3	-5.1	7.5
Banks	-7.0	-9.7	-15.0	-4.2
Non-banks	-5.3	12.0	9.9	11.7
Asia				
Equity investment	59.5	91.6	103.9	109.5
Private creditors	0.9	25.2	52.1	24.9
Banks	-1.0	13.8	35.9	12.9
Non-banks	2.0	11.4	16.2	12.0
Europe				
Equity investment	22.3	7.6	29.1	31.4
Private creditors	13.4	54.9	78.3	91.0
Banks	4.2	28.2	32.7	37.1
Non-banks	9.2	26.7	45.6	53.8
Total^(b)				
Equity investment	118.8	125.1	176.7	184.9
Private creditors	1.6	82.5	126.7	125.9
Banks	-3.9	30.6	54.2	46.2
Non-banks	5.4	51.9	72.5	79.7
Total external financing	120.4	207.6	303.4	310.7

Source: Institute of International Finance, 'Capital flows to emerging market economies', 31 Mar. 2005.

(a) Equity investment equals the sum of direct and portfolio investment.

(b) Total also includes Africa and the Middle East.
 e = estimate. f = forecast.

Chart 1.63
Asset price changes since December 2004
Review for selected EMEs^{(a)(b)}



Sources: Bloomberg, JPMorgan Chase & Co. and Morgan Stanley Capital International Inc.

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

(b) The spread for Korea, and equity prices for Mexico and Uruguay, are not included, because of lack of data. Spreads for Argentina were excluded since liabilities included defaulted debt over the review period.

investments have been strongest in Asia, whereas lending has been concentrated in emerging Europe. Debt and equity flows have remained strong so far during 2005, reflecting a continuation of the 'search for yield' by investors (see Chapter 2). And the IIF predicts that total net capital inflows into EMEs for the year as a whole will be slightly higher than last year (Table 1.A).

Most EMEs recorded very strong GDP growth in 2004, supported by a 10% increase in world trade, continuing low global real interest rates and, for primary producers, rising (non-agricultural) commodity prices. Exchange rate appreciation against the US dollar since the previous Review has also reduced vulnerabilities somewhat for a number of EMEs with large US dollar-denominated debts, such as Brazil, the Philippines and Turkey (Chart 1.63). Some governments have also further improved their debt structures by reducing debts denominated in, or linked to, foreign currency.⁽¹⁾ Against this background, there have been a number of further credit rating upgrades over the past six months, especially in Latin America and Asia.⁽²⁾

Rising short-term world interest rates, continuing high oil prices, and slower growth of the world economy suggest that GDP growth for most EMEs will slow somewhat this year. So far, the increase in oil prices seems to have been mainly due to stronger world demand, particularly from China. Until now, the adverse impact on output in oil importing EMEs, especially in Asia, seems to have been balanced by rising demand for exports. Inflation rates are now rising, though, in Asia and Latin America and, in response, domestic nominal interest rates have been increased in several countries (albeit usually by less than the increase in inflation) (Chart 1.64). Annual GDP growth fell in most EMEs in the first quarter of this year and the latest IMF and private sector Consensus forecasts both project lower but still robust GDP growth in EMEs for this year as a whole — at over 4% in all regions (Chart 1.65).

The main near to medium-term risks remain external, especially an unexpectedly sharp rise in US interest rates, a slowdown in US GDP growth or an abrupt decline of domestic demand growth in China.

The interest rate and exchange rate environment

The orderly depreciation of the US dollar has so far benefited many EMEs, especially those that have large dollar debts and are not reliant on the US export market (such as Turkey and

(1) In Brazil, the share of total public sector debt denominated in local currency rose from 62% at end-2003 to 77% at end-2004 and to 84% by end-March 2005; in Turkey, it rose by 5 percentage points between end-2003 and end-2004.

(2) An exception has been the Philippines, which has been downgraded by both Moody's and S&P because of concerns over the size of public debt and lack of progress in improving its fiscal balance.

Brazil).⁽¹⁾ But a disorderly fall, if accompanied by significantly higher US interest rates and lower world growth, could substantially increase EMEs' external financing costs and, in *extremis*, prevent market access for some EMEs.

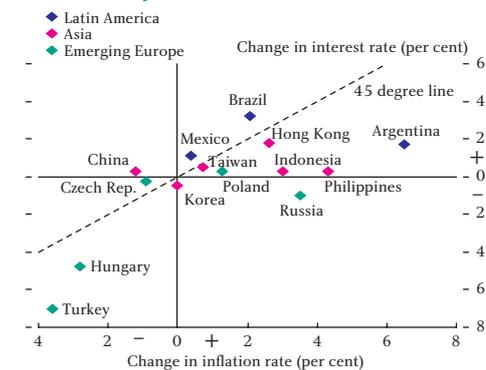
Most EMEs would be able to withstand any such short-term liquidity shock in the near term. Two thirds of EMEs' sovereign external financing needs for 2005 were already achieved by the end of May. With many EMEs now running current account surpluses, foreign exchange reserves have also been building up strongly, especially in Asia (Box 7). The cushion of foreign exchange reserves to cover the annual gross external financing requirement (GEFR)⁽²⁾ is much higher now in most EMEs than it was before the Asian crisis (Chart 1.66).⁽³⁾ This has occurred despite the move towards more flexible exchange rates, which has reduced the need for reserves cover.⁽⁴⁾ However, some countries in emerging Europe, where current account deficits and short-term external debt financing remain high, are more vulnerable.⁽⁵⁾ But UK-owned banks' exposures to this region remain small — less than 5% of their total claims on EMEs (Chart 1.62).

Although the short-term liquidity position looks favourable for most EMEs, the medium-term government solvency position looks less so. Despite very strong output growth recently, primary fiscal surpluses have increased only a little, or fallen, in a number of EMEs, and government debt/GDP ratios have remained well above 40% in many countries (Chart 1.67). A sustained period of lower output growth, combined with lower commodity prices, would probably result in still higher government debts, especially in the absence of offsetting fiscal adjustment. The latter will be difficult to achieve in some of the more vulnerable EMEs — in Latin America and emerging Europe — where general elections are due by end-2006. But UK-owned banks' exposures to EMEs are concentrated mainly in the non-bank private sector, particularly through local offices (Chart 1.68). There would only be an impact if there were spillovers from the fragility of government balance sheets to other sectors.⁽⁶⁾

Since the Asian crisis, the ratio of corporate debt to GDP has fallen in Asia and Latin America, but has risen somewhat in

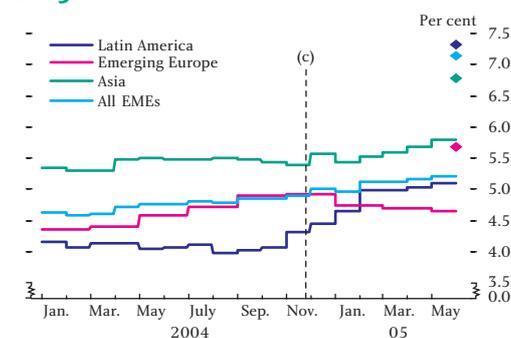
(1) In Turkey, for example, at the end of 2003, almost two thirds of external debt of more than one year residual maturity was denominated in US dollars, whereas the United States accounted for only 8% of exports of goods.
 (2) The GEFR is debt of less than one year original maturity, amortisation on longer-term debt plus the current account deficit.
 (3) The Financial Stability Forum Working Group on Capital Flows (2000) emphasised the importance of foreign exchange cover for short-term balance of payments financing.
 (4) According to the IMF (2004), the share of EMEs with free-floating exchange rates increased from around 5% at end-1996 to 40% at end-2003 (*World Economic Outlook*, Chapter II, September).
 (5) Turkey, though, has some insurance following the recent renewal of its Stand-By Arrangement with the IMF.
 (6) Sovereign debt crises, though, usually do not occur without a broader financial crisis. For example, in a sample of 106 sovereign defaults, Reinhart (2002) found that the probability of a currency crisis occurring within the subsequent two years was 70% ('Default, currency crises and sovereign credit ratings', *NBER Working Paper*, No 8738).

Chart 1.64
Change in interest rates^(a) and annual inflation rates for selected EMEs since March 2004



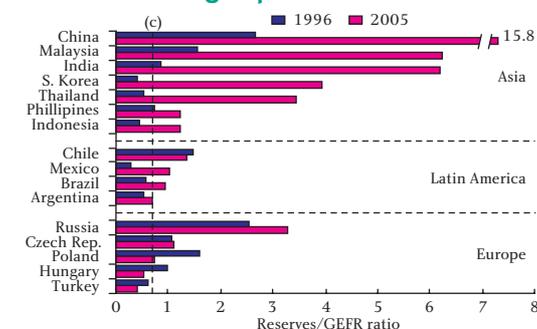
Source: Bloomberg.
 (a) Central bank policy rates.

Chart 1.65
Regional Consensus GDP forecasts, 2005^{(a)(b)}



Sources: Consensus Economics Inc. and IMF.
 (a) An average of countries' monthly 2005 GDP forecasts.
 (b) Bi-monthly forecasts in emerging Europe.
 (c) Dec. 2004 Review.

Chart 1.66
Ratio of foreign currency reserves^(a) to gross external financing requirement^(b)



Source: Institute of International Finance.
 (a) Foreign currency reserves are defined as total reserves excluding gold at end-1996 and end-2004.
 (b) Defined as short-term debt, plus amortisation, plus current account deficit. 2005 figures are forecasts.
 (c) Maximum reserve cover of the three Asian crisis countries (Korea, Thailand, Philippines) prior to the 1997-98 crisis.

Box 7: Accounting for the growth in Asian foreign exchange reserves

Table 1
Asian foreign exchange reserve holdings^(a)

	End-2004		End-Mar. 2005	
	US\$ billions	2004 GDP Per cent	US\$ billions	2004 GDP Per cent
Non-Japan Asia	1,605	36	1,673	38
China	610	37	659	40
Hong Kong	124	75	122	74
India	125	19	155	20
South Korea	199	29	205	30
Malaysia	65	58	71	63
Singapore	113	102	113	102
Taiwan	242	75	251	78
<i>Memo:</i>				
Japan	824	17	819	17
Russia	121	21	134	23

Sources: Bloomberg, IMF and national sources.

(a) Excluding gold, except Singapore; IMF definition.

Foreign exchange reserve holdings in non-Japan Asia (NJA) increased by one third to US\$1.6 trillion during 2004, and by a further US\$68 billion in the first quarter of this year (Table 1). The region now holds over 40% of the world's reserves.⁽¹⁾

This box examines the balance of payments flows that have accounted for the large increase in reserves in several Asian EMEs over recent years and presents a broader measure of the foreign exchange inflow pressure faced by Asian currencies.

Reserves accumulate when countries run surpluses on their aggregated current and capital account positions. In measuring the components of reserve accumulation accounted for by the capital account, it is useful to distinguish between net foreign direct investment (FDI) and net non-FDI flows.⁽²⁾ FDI flows typically reflect long-term investment decisions that are not easily reversible, while non-FDI flows are potentially more volatile.⁽³⁾ Reserves growth is also affected by a change in the value of the currencies in which they are held relative to the currency in which they are measured — typically the US dollar.

Table 2
Contributions to Asian reserve accumulation 1999–2004

	Current account	Capital account	Reserve revaluation ^(a)		Total reserve accumulation	
			FDI	Non-FDI ^(b)	US\$ billions	Per cent GDP
(US\$ billions)						
Annual average 1999–2003						
China	27.0	41.2	-11.5	4.0	60.7	5.1
Hong Kong	11.3	4.1	-10.5	0.8	5.7	3.6
India	1.5	3.3	8.8	1.0	14.3	2.9
Korea	12.5	1.1	5.9	1.4	20.7	4.0
Malaysia	9.8	1.4	-7.7	0.5	3.8	4.2
Singapore	21.8	4.0	-22.2	0.6	4.2	4.7
Taiwan	18.1	-2.7	6.0	1.8	23.3	8.1
<i>Memo:</i>						
Russia	34.1	-0.6	-21.2	0.8	13.1	4.2
2004						
China	69.0	55.6	65.5	16.6	206.7	12.9
Hong Kong	16.0	12.7	-27.1	3.6	5.2	3.1
India	-3.9	4.1	23.9	3.6	27.7	4.2
Korea	27.6	3.4	7.2	5.5	43.7	6.5
Malaysia	15.2	2.3	2.6	1.8	21.9	19.4
Singapore	28.5	5.4	-20.4	3.2	16.5	14.9
Taiwan	19.0	-5.2	14.3	7.0	35.1	10.9
<i>Memo:</i>						
Russia	40.8	0.1	3.6	3.1	47.6	8.3

Sources: Bloomberg, DataStream, IMF, WEO and Bank calculations.

(a) Calculations assume currency breakdown of foreign exchange holdings are equivalent to the end-year values for developing countries as a whole given in the appendix of the IMF *Annual Report* www.imf.org/external/pubs/ft/ar/2004/eng/pdf/file4.pdf. The 2004 breakdown (not yet released) is assumed to be the same as actual in 2003.

(b) Net non-FDI inflows are defined as the component of reserve accumulation that cannot be accounted for by net FDI, the current account and the effect of reserve revaluation.

Since the 1997–98 Asian financial crisis, continuous current account surpluses have made a significant positive contribution to the build-up in reserves in all the large Asian EME reserve holders other than India. And, in 2004, this contribution was much larger than in the preceding years (Table 2).⁽⁴⁾ Net FDI has also made a positive contribution to reserve growth in all Asian countries except Taiwan. In China, in an accounting sense, it contributed around half of the reserve accumulation over the 1999–2004 period. However, the contribution of non-FDI flows has varied significantly across countries. There have been large non-FDI outflows from Hong Kong and Singapore,⁽⁵⁾ whereas there have been inflows to India and Korea since 1998 and, more recently, to Taiwan and China. The positive correlation between non-FDI flows to China and market expectations of renminbi appreciation (as implied by the renminbi non-deliverable forward) suggests that parts of these inflows are speculative (Chart A).⁽⁶⁾

(1) This figure rises to almost two thirds if Japan is included.

(2) Net non-FDI flows are defined as the component of reserve accumulation that cannot be accounted for by net FDI, the current account and the effect of reserve revaluation. They include net borrowing from commercial banks and official creditors, net debt and equity investments, and errors and omissions.

(3) Several studies point to the stability of FDI flows relative to other international capital flows. See for example Ishii, S and Habermeier, K (2002), 'Capital account liberalization and financial sector stability', IMF *Occasional Paper No. 211*.

(4) The depreciation in the US dollar since 2002 has also boosted the US dollar value of non-dollar reserves.

(5) Hong Kong and Singapore differ from other Asian countries since they are major financial centres. Capital, therefore, passes through their jurisdictions to take advantage of the financial services offered.

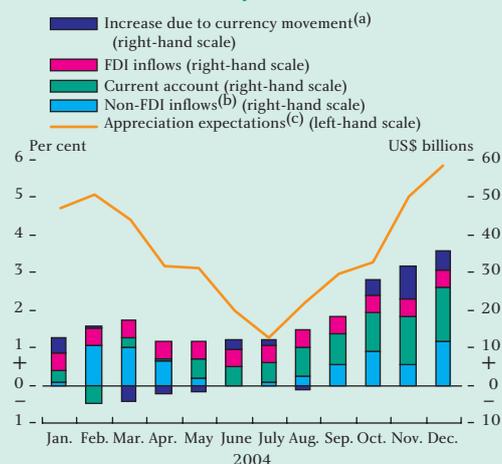
(6) The correlation coefficient between non-FDI flows to China and renminbi non-deliverable forwards for 2004 is 0.64. However, this calculation is based on only twelve observations, so should be treated with caution.

Net balance of payments inflows generally lead to pressure for exchange rates to appreciate. In principle, depending on the currency regime and extent of capital controls, this upward pressure can be relieved through exchange rate intervention (resulting in reserve accumulation), nominal currency appreciation or a reduction in domestic interest rates. Most Asian countries have managed-floating exchange rate regimes, giving them some scope to respond to foreign exchange inflows with a combination of policies. China, Hong Kong and Malaysia, however, maintain explicit or implicit fixed exchange rate pegs and so are restricted to managing upward pressure using intervention or domestic interest rates.⁽¹⁾

Between 1999 and 2003, Asian currencies with managed-floating regimes remained broadly stable against the US dollar (Table 3). Foreign exchange inflow pressure was reflected instead in a build-up in reserves across the region. But during 2004 this pressure increased significantly.⁽²⁾ The Korean won, Indian rupee, Singapore dollar and Taiwan dollar all appreciated. At the same time, there was an even more rapid accumulation of reserves across the region than previously. The build-up in reserves in Korea, India, Singapore and Taiwan would possibly have been greater still if not for exchange rate appreciation. In Korea, the exchange market pressure was also partly reduced by a narrowing in the differential between domestic and US interest rates.

There are typically two main motives for building up reserves: to protect the currency against the risk of sudden capital outflows and to prevent currency appreciation in order to support export-led growth. Given that reserves now far exceed gross external financing requirements in most Asian countries (Chart 1.66 in Chapter 1.6), the marginal benefit of reserve accumulation for insurance appears to be limited. The export-led strategy has been successful in achieving fast output growth rates in the region, but it also means that the maintenance of strong growth is vulnerable to external developments. An exchange rate appreciation may increase real incomes and consumption, and thus stimulate production for the domestic market. In considering future exchange rate policies, authorities will need to take these vulnerabilities and imbalances into account.

Chart A
Contributions to China's reserve accumulation in 2004



Sources: Bloomberg, IMF and Bank calculations.

- (a) Net increase in US\$ value of reserves. Calculations assume currency breakdown of foreign exchange holdings are equivalent to the values for developing countries as a whole given in the appendix of the IMF *Annual Report*.
- (b) Net non-FDI inflows are defined as the component of reserve accumulation that cannot be accounted for by net FDI, the current account and the effect of reserve revaluation.
- (c) Implied by RMB twelve-month NDFs.

Table 3
Monthly average exchange market pressure by component

(Per cent)	Change in reserves ^(a)		Change in exchange rate ^(b)	
	1999–2003	2004	1999–2003	2004
<i>Fixed</i>				
China	0.88	2.15	0.00	0.00
Hong Kong	0.44	0.12	0.00	-0.01
Malaysia	0.71	2.67	0.00	0.00
<i>Managed float</i>				
India	1.20	1.56	-0.12	0.29
Korea	1.29	1.49	0.01	1.03
Singapore	0.36	1.03	-0.06	0.34
Taiwan	1.11	0.91	-0.09	0.45
<i>Memo:</i>				
Russia	1.56	2.95	-0.67	0.44

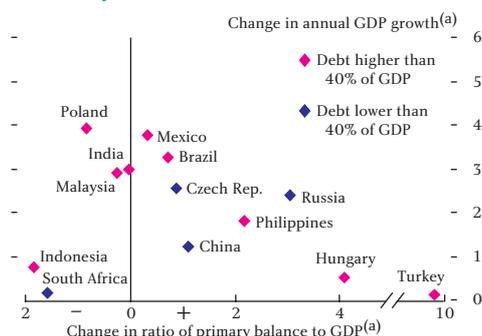
Sources: Bloomberg, Central Bank of China (Taiwan), IMF and Bank calculations.

- (a) Monthly percentage change in the real value of foreign exchange reserves as a fraction of central bank liabilities (to indicate the impact of reserve accumulation on central banks' balance sheets). Real value of foreign exchange reserves is calculated by subtracting reserve revaluation (as calculated in Table 2) from the nominal value of reserves.
- (b) Monthly percentage change in nominal exchange rates against the US dollar (a positive value implies appreciation). Exchange rates are monthly averages.

(1) Hong Kong has a Linked Exchange Rate System under which the currency is pegged to the US dollar with a symmetrical band of +/-0.06%.

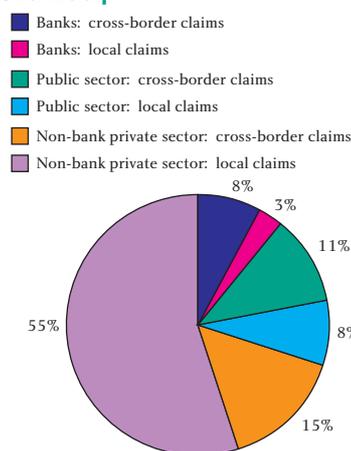
(2) To facilitate cross-country comparison, absolute reserve accumulation is scaled by the size of the central bank's liabilities, indicating the impact of intervention on its balance sheet.

Chart 1.67
Change in government primary balance and GDP growth for selected EMEs, end-2002 to end-2004



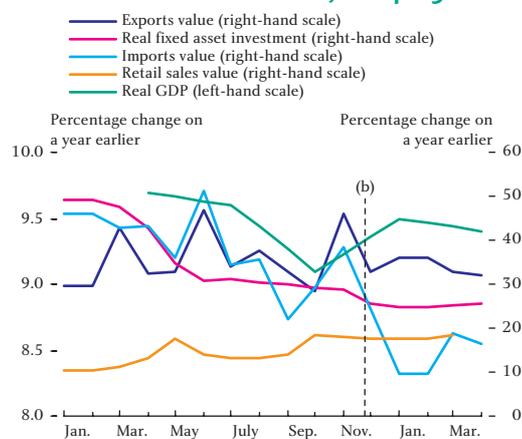
Source: IMF.
(a) Percentage points.

Chart 1.68
UK-owned banks' claims on EMEs, end-2004(a)



Source: Bank of England.
(a) All claims are on an ultimate risk basis.

Chart 1.69
Chinese economic indicators, 2004–05(a)



Sources: Thompson Financial Datastream, China General Administration of Customs, National Bureau of Statistics of China, and OECD.
(a) Data for January and February are averaged to smooth fluctuations caused by the timing of Chinese New Year.
(b) Dec. 2004 *Review*.

emerging Europe (from a low base). However, firm-specific data show that the share of short-term corporate debt in EMEs remains high, and foreign currency mismatches appear to be large, especially in Latin America.⁽¹⁾

Slowdown in China

The near-term risk of a sharp slowdown in the Chinese economy has fallen since the *December Review*, but there remains a significant medium-term risk. A marked slowdown of the Chinese economy would increase further the fragility of the domestic banking system and reduce output growth in the region and also globally.

Annual aggregate output growth has remained strong over the past year — at around 9½% — but domestic demand has become somewhat more balanced. The annual growth in real fixed asset investment has halved since its peak in 2004 Q1, while retail spending growth has picked up (Chart 1.69).

Recent data, though, suggest that the imbalance in China's external accounts is increasing. The trade surplus rose to 4½% of GDP in 2005 Q1, compared with 2%, on average, last year. Combined with strong capital inflows, this resulted in a further large increase in foreign exchange reserves, to US\$660 billion (40% of annual GDP) in March — an increase of over \$16 billion a month, on average, since December (Box 7).

Moreover, the latest data show that the annual growth in bank lending, and particularly investment, remained buoyant in 2005 Q1. The continued strong growth in credit is likely to build up non-performing loans (NPLs) in the future, adding to the current high stock — estimated officially to be 12½% of loans, but much higher according to private sector estimates.⁽²⁾

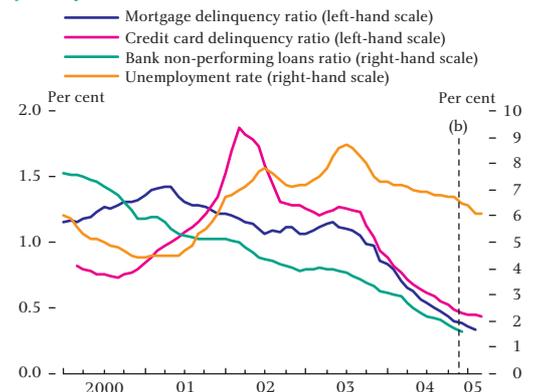
The most tangible impact of any slowdown in China on the UK banking system would be via Hong Kong, where UK-owned banks have substantial claims, mainly on the non-bank private sector.⁽³⁾

The economic recovery in Hong Kong has slowed somewhat since the middle of last year but, nonetheless, indicators of the strength of the banking system remain favourable. Large capital inflows since the previous *Review*, seemingly associated with expectations of renminbi appreciation,⁽⁴⁾ had until recently kept

(1) See IMF *Global Financial Stability Report* (2005), Chapter IV 'Company finance in emerging markets'.
(2) For example, according to UBS, market estimates of NPLs remaining on Chinese banks' books are currently around 25% of outstanding loans ('How to think about China: which way out for the banking system?', May 2005).
(3) However, UK-owned banks' direct claims on China are also now growing rapidly — by 60% during 2004 (albeit from a low base).
(4) Non-deliverable forward rates suggest that financial markets are expecting a renminbi revaluation against the US dollar of over 5% by mid-2006.

Hong Kong interbank interest rates well below US rates.⁽¹⁾ Banks' NPL ratio fell to 1.6% at end-2004 from a peak of 7.6% in the aftermath of the Asian crisis. And NPLs are likely to have fallen further this year, given the decline in the unemployment rate, and in mortgage and credit card delinquency rates (Chart 1.70). One potential vulnerability is the housing market, which accounts for over one quarter of domestic bank loans⁽²⁾ and is a sector to which UK-owned banks have particularly large exposures. By 2005 Q1, house prices had risen by 60% above their trough in mid-2003. Mortgage debt service payments remain a low proportion of income at current interest rates (Chart 1.71)⁽³⁾ but, along with house prices, would be sensitive to any sharp deterioration in the global financial environment.

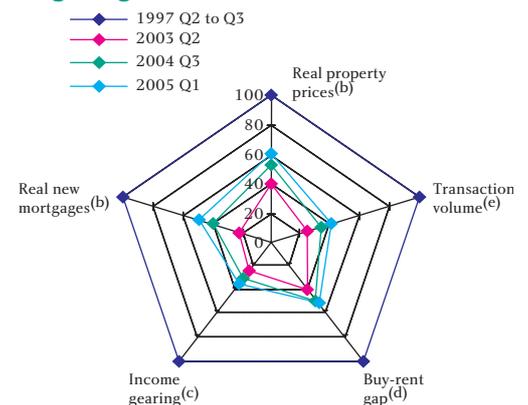
Chart 1.70
Hong Kong: indicators of banks' credit quality^(a)



Sources: Hong Kong Monetary Authority and Hong Kong Census and Statistics Department.

- (a) The delinquency ratio represents the total value of loans more than three months in arrears as a proportion of the total outstanding loans.
- (b) Dec. 2004 Review.

Chart 1.71
Hong Kong real estate indicators^(a)



Source: Hong Kong Monetary Authority.

- (a) All indicators are normalised to 100 in 1997 Q2 to Q3.
- (b) Deflated by the composite CPI.
- (c) Ratio of mortgage repayments to household income.
- (d) Ratio of mortgage repayments to the cost of flat rental.
- (e) Ratio of transaction volume to private housing stock.

(1) However, following the introduction of a narrow (0.6%) trading band around the Hong Kong dollar (HK\$/US\$ 7.80) last month, inflow pressure eased and, consequently, interbank rates have converged on those in the United States.
(2) The share of property loans in total domestic bank credit increases to around 50% if non-residential property is included.
(3) See Chan, N, Peng, W and Fan, K (2005), 'A graphical framework for monitoring the property market in Hong Kong', *Hong Kong Monetary Authority Quarterly Bulletin*, March.

2 Risks in the international financial system: key points

Many of the factors characterising the 'search for yield' emphasised in recent *Reviews* continue to remain in place. Default-risk-free bond yields and forward rates have declined further since December. Moreover, strong demand for credit exposure, the interest in domestic currency denominated emerging market debt, the rise in commodity trading and continued inflows into 'alternative investments' all suggest that investors' appetite for risk remains significant. So the possibility remains that investors may be mispricing risk. Previous *Reviews* have identified two potential adjustment mechanisms. First, credit problems may build up gradually if a sustained mispricing of credit risk has resulted in an over-accumulation of debt. Second, there is the possibility of a sharp correction in asset prices, triggered, perhaps, by a generalised re-evaluation of credit risk, an unexpected rise in official interest rates in the United States or a reassessment of global current account imbalances, that could expose vulnerabilities among market participants. There was, in fact, a period of stress in credit markets in recent months, initially triggered by concerns about General Motors and Ford. This contributed to some re-evaluation of credit quality — credit spreads, particularly in high-yield sectors, have risen as has the cost of default protection for large complex financial institutions (LCFIs).

The consequences in the structured credit and corporate debt markets following the events in the US auto industry illustrate how the crystallisation of apparently idiosyncratic risks can generate sharp movements in a broad range of asset prices. This episode is illustrative of a more general possibility that asset price moves might be exacerbated further if leveraged investors with short holding periods are engaged in crowded trades or dynamic hedging strategies that dictate the selling of an asset when others sell (see Box 9). In its financial stability work, the Bank, relying mainly on market intelligence, will continue to try to identify markets in which active traders are involved in dynamic hedging of positions, particularly when there are questions about the liquidity of the underlying market.

Recent stresses in credit markets, and the possibility of an abrupt unwinding of the 'search for yield', highlight a number of challenges for participants in international financial markets:

- for LCFIs, stress tests of market risks need to explore fully the impact of an unexpected exit of a large trader. There is the possibility that models used in assessing market risk may prove to be incorrectly calibrated, as illustrated by recent events in structured credit markets. A sharp reassessment of the price of risk could place pressures on the future profitability of some LCFIs, which in recent years have been supported by strong returns from their trading activities;
- hedge funds face the challenge of managing any mismatches between the liquidity of their assets and liabilities; and
- the rapid growth of new credit risk transfer products has contributed to delays in trade confirmations and assignments as back offices strive to keep up with the pace. Difficulties ascertaining the nature and scale of exposures may impede the risk management of some firms should a credit event occur.

The major UK banks are particularly active in debt capital markets, such as syndicated lending, leveraged loans and bond issuance, but less so in equity issuance. The risk to banks' capital from these activities depends on the extent to which exposures have been hedged or sold on — banks appear to retain material wholesale credit and market risk exposures. Secondary market activities have also increased. But measured trading book VaR and dealing profits are not very large as a proportion of income. There may, however, be significant market risk in banking books, although the precise extent is hard to gauge.

2 Risks in the international financial system

2.1 International financial markets

The market environment

As discussed in previous *Reviews*, the uncertainties in the global macroeconomic and financial environment that have, for some time, preoccupied policymakers have not been as apparent in market indicators. In particular, the implied volatility, derived from options, of a wide range of asset classes — foreign exchange, bond yields, equities — has remained fairly low (Chart 2.1). Another puzzle has been the low level of future risk-free interest rates implied by government bond yields, which have continued to fall since the December *Review* (Chart 2.2).⁽¹⁾

Combined with continuing policy accommodation in a number of overseas G7 countries and modest returns on industrial-country equities, these unusual features of the environment seem to provide part of the backdrop for the ‘search for yield’ that has now been under way for some time. It can be thought of as a generalised decline in the price of risk, as investors increasingly require smaller expected excess returns to hold risky assets. Research in the Bank⁽²⁾ and elsewhere tends to confirm that investor risk appetite has been higher than usual in the past two or three years (Chart 2.3).

The search for yield’s most tangible manifestation has been the almost monotonic decline in credit spreads through 2004 and into 2005. More recently, credit spreads have risen, prompted partly by developments at General Motors (GM) and Ford, and accompanied by disturbance in the structured credit markets. This has highlighted some useful lessons for risk managers and others in navigating their way through the possible asset price corrections that may lie ahead.

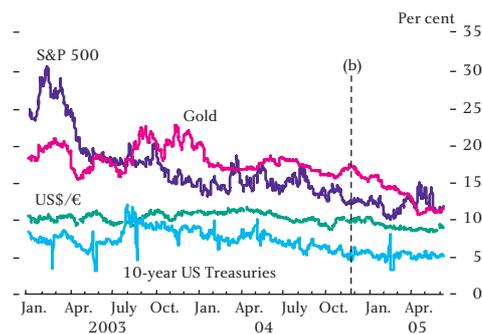
Manifestations of the search for yield

The search for yield is manifest across a very wide range of asset classes. Just a few are mentioned here.

Primary credit markets

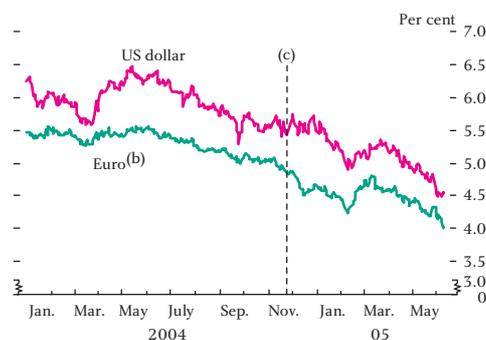
In the syndicated loan markets, gross issuance in both the United States and Europe has remained close to the record levels of 2004. Leveraged-loan market conditions have been buoyant, with terms influenced by leveraged buy-out (LBO) activity sponsored by private equity funds⁽³⁾ (Chart 2.4). Spreads have

Chart 2.1
Implied volatility of financial markets^(a)



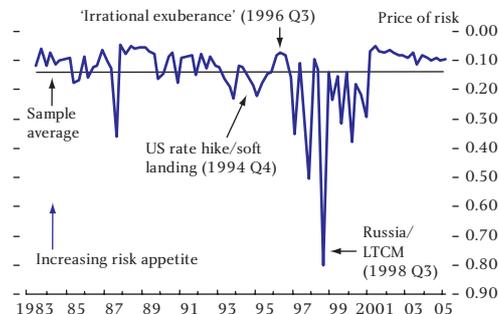
Sources: Bloomberg, New York Mercantile Exchange, Chicago Mercantile Exchange and British Bankers’ Association.
(a) Derived from three-month option prices.
(b) Dec. 2004 *Review*.

Chart 2.2
International ten-year forward interest rates^(a)



Source: Bank calculations.
(a) Calculated from government bond yields.
(b) Derived from German government bonds.
(c) Dec. 2004 *Review*.

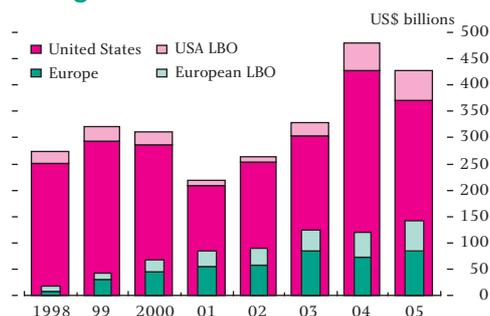
Chart 2.3
Risk appetite^(a)



Sources: Bloomberg, Global Financial Data and Bank calculations.
(a) Variance measure of risk appetite derived from the S&P 500.

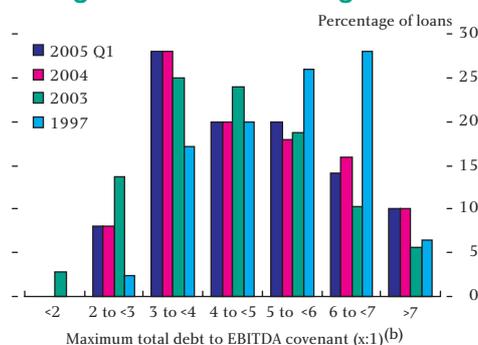
(1) See Box on the fall in global long-term real interest rates, Bank of England *Quarterly Bulletin* (2005), Spring, pages 12–13.
(2) Gai, P and Vause, N (2004), ‘Risk appetite: concept and measurement’, *Financial Stability Review*, December. This study drew on data for the S&P 500.
(3) For a review of the UK private equity industry see Box 3 in Chapter 1 of this *Review*, page 28.

Chart 2.4
Leveraged loan issuance^(a)



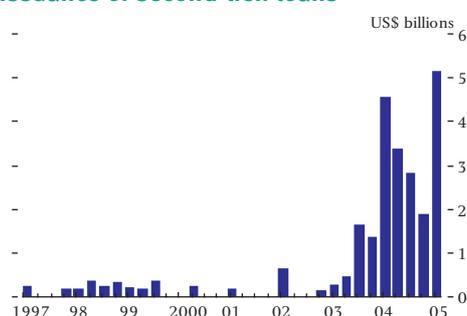
Sources: Loan Pricing Corporation and Bank calculations.
(a) 2005 data are annualised, based on 2005 Q1 data.

Chart 2.5
Leverage covenants for leveraged loans^(a)



Source: Loan Pricing Corporation.
(a) Loans issued with a spread greater than 150 basis points over Libor.
(b) The covenant states the maximum level of debt allowed, as a multiple of the company's earnings before tax, depreciation and amortisation (EBITDA).

Chart 2.6
Issuance of second-lien loans^(a)



Source: Standard & Poor's.
(a) Second-lien loans are typically the most subordinated tranche of secured debt in the capital structure of a firm.

continued to fall, particularly in the United States; covenants and collateral requirements have been marginally loosened; and leverage multiples have climbed further. In the United States at least, data on the dispersion of leverage show that an increasing number of new deals were being issued with covenants permitting high debt-to-earnings multiples (Chart 2.5). Debt-to-equity ratios have not reached the excesses of the late-1980s, although early refinancings to extract equity via dividend payments are allegedly more common. For financial stability, this is probably significant only if banks hold significant loan exposures. There is some anecdotal evidence of that (see Chapter 2.4). But it has also been possible lately for dealmakers to distribute risky parts of the capital structure beyond the banking system. In particular, hedge fund participation increased through 2004 and into 2005, via second-lien loans (Chart 2.6) and Payment In Kind (PIK) securities.⁽¹⁾ On the downside, this may have been one of the factors contributing to what market contacts widely regard as a degree of potentially excessive enthusiasm.

Emerging market economies

Declining risk premia in emerging market economy (EME) bond markets appear to have encouraged investors to extend into domestic-currency denominated bonds. Issuance increased substantially over the past year (Chart 2.7), attracting both foreign institutional asset managers and hedge funds. The development of domestic-currency capital markets is, in principle, positive, as they provide a channel for intermediation between domestic borrowers and investors without entailing foreign exchange risk. And, for debtor countries, they create a mechanism for foreign currency risk on international capital flows to be borne by overseas lenders rather than by the EME borrowers themselves.⁽²⁾ Indeed, contacts suggest that, for many international investors, explicit exposure to the exchange rate is one of their main motivations, involving a carry trade⁽³⁾ and accompanied by more active trading of options on EME currencies. Activity in some EME local capital markets, notably Brazil, is described by contacts as 'crowded'.

Meanwhile, equity prices in many EMEs have risen strongly, and there have been strong flows of capital into US mutual funds dedicated to EMEs — over US\$3.5 billion since the previous Review.

Commodity markets

Partly associated with rapid economic growth in some EMEs, notably China, the sustained rise in commodity prices seems to

(1) PIK securities are a type of bond or loan that pays interest in the form of additional bonds/loans, instead of cash. PIKs have frequently been used to help finance takeovers.
(2) This was one of the recommendations of the G-22 study produced in the aftermath of the Asian Crisis (Report of the Working Group on International Financial Crises, October 1998).
(3) See, for example, pages 54–55, Bank of England *Financial Stability Review* (2004), December and Box on carry trades in the foreign exchange market, Bank of England *Quarterly Bulletin* (2004), Winter.

have drawn a much wider range of investors and traders into these markets, particularly metals. Active traders include hedge funds and investment bank proprietary desks. For institutional investors, the motivation is generally described as to diversify portfolios via investments in, typically, commodity index-linked products. One potential concern, however, is that increased trading and investing in commodities may, at least in degree, reflect a degree of optimism based on extrapolation of recent marked rises in commodities prices. Speculative positions in industrial commodities traded on the US exchanges surged again during the latest period, most notably for copper (Chart 2.8).

Institutional allocations to alternative-investment strategies

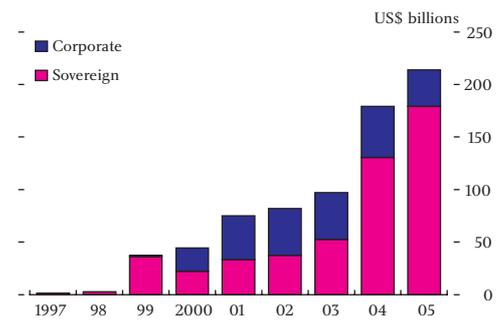
In addition to investments in EMEs and commodities, long-term savings institutions continue to make asset allocations to other 'alternative investments' that have performed well in recent years, including hedge funds, private equity and commercial real estate. Net capital inflows into hedge funds during the first quarter of 2005 were US\$24.6 billion, 50% higher than in the fourth quarter of 2004 (Chart 2.9). And private equity funds continue to attract large commitments. For example, venture capital and buyout funds in the United States have raised over US\$21 billion in recent quarters — levels last seen during the technology 'bubble' in 2000.

This seems to reflect a combination of a desire for greater diversification and a developing approach to asset-liability matching. For some — perhaps particularly defined-benefit pension funds that are matching fixed-income-like liabilities with low-yielding bonds — this can take the form of a move to a so-called 'barbell' or 'core-satellite' approach to asset management. In this, typically, the largest part of the fund is invested in (and perhaps managed passively against) a benchmark comprising a market index or a portfolio tailored to the fund's liabilities, with a smaller part invested in an actively managed range of strategies oriented towards obtaining high absolute returns. Market participants increasingly refer to these two categories in terms of 'beta', to denote the systematic return from passively holding a market index; and 'alpha', to denote excess return that derives from the skill of the active manager.⁽¹⁾ It is too soon to be clear about either the degree of diversification that alternative investments provide or their capacity to generate sustained risk-adjusted excess returns.

Will the search for yield persist?

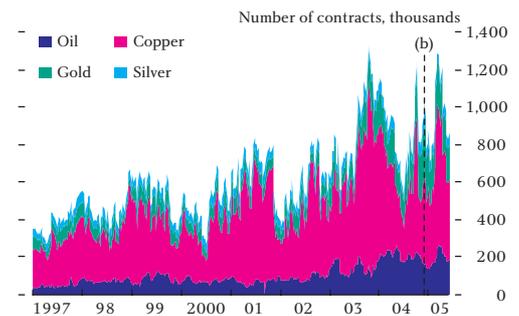
Two broad sets of factors might help to explain the relatively low price of risk. On the one hand, a plausible case can be made that the level of medium-term uncertainty in the macroeconomic environment has decreased. Low and stable inflation, less

Chart 2.7
Issuance of domestic currency bonds by EMEs^(a)



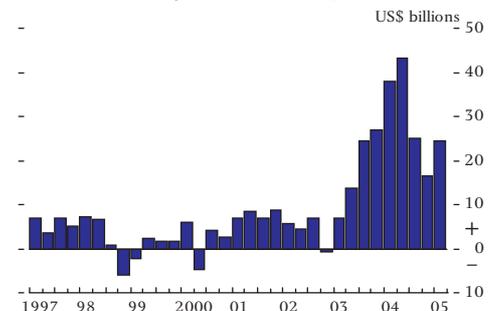
Sources: Dealogic and Bank calculations.
(a) 2005 data are annualised, based on 2005 Q1 data.

Chart 2.8
Speculative positions in commodity futures^(a)



Sources: Commodity Futures Trading Commission and Bank calculations.
(a) Sum of long and short non-commercial positions, ie positions unrelated to commercial hedging activities.
(b) Dec. 2004 Review.

Chart 2.9
Net flows of capital into hedge funds^(a)

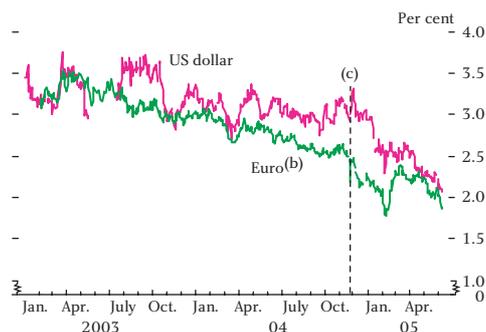


Source: Tremont Capital Management, Inc.
(a) Net flows of capital equal to gross investments minus gross redemptions.

(1) See Box on the search for alpha, Bank of England *Quarterly Bulletin* (2004), Autumn, pages 272–73.

volatility in output growth, less fragile corporate and financial sector balance sheets in industrial countries and stronger EME national balance sheets may each have contributed. In addition, financial innovation, particularly the development of credit and other risk transfer markets, has probably fostered greater dispersion and diversification of risk in recent years. On this view, investor risk appetite may simply have increased to reflect reduced or better diversified risks.

Chart 2.10
International long-term real forward interest rates^(a)



Source: Bank calculations.

- (a) Nine-year real forward rates for the US dollar, and ten-year for the euro, calculated from government bond yields.
- (b) Derived from French and German government bonds.
- (c) Dec. 2004 *Review*.

On the other hand, investors and others may not have adjusted fully to a lower inflation environment, instead comparing expected nominal returns with those achieved when inflation was higher. A risk premium compensating for credit risk on a corporate bond is not comparable with the premium earned in the past on credit-risk-free bonds to compensate for a high expected rate of inflation. Similarly, as risk-free real yields have fallen (Chart 2.10), it is possible that some investors have purchased risky instruments in an attempt to achieve the same real returns as could be earned on risk-free bonds a few years ago. Some may also underestimate new channels for contagion created by innovative financial instruments, or may have unrealistic expectations about the ability of macroeconomic policymakers to offset shocks to the economy. This second set of factors opens up the possibility that market participants are mispricing risk.

Unless or until there is a decisive unwinding of the search for yield, it is extremely difficult to weigh the possible contributions of these two broad sets of factors in explaining the decline in the price of risk. This, and the pervasiveness of the search for yield across a wide range of investors and financial markets, may mean that it is difficult for rational traders to eliminate any market inefficiencies in the pricing of risk. Strategies designed to correct any perceived mispricing may be risky, costly and, given credit constraints, require longer holding periods than the vast majority of market participants are prepared to fund.

Previous *Reviews* have identified two potential adjustment mechanisms that could possibly have implications for stability. First, credit problems may build up gradually if a sustained mispricing of credit risk has resulted in an over-accumulation of debt. Conditions in primary loan markets are directly relevant to this. Second, it has been possible for a while that, at some point, there could be an asset price correction in particular markets, which might spill over to other parts of the system — perhaps particularly if a number of leveraged traders were simultaneously to attempt to exit relatively crowded positions in less liquid markets. Earlier *Reviews*⁽¹⁾ identified a number of uncertainties and sources of downside risk that might, if they crystallised,

(1) For example, page 51, Bank of England *Financial Stability Review* (2004), December.

result in such abrupt asset price corrections. Most of them remain relevant.

They include concerns about the sustainability of the current pattern of global capital flows, particularly given the large external financing needs of the United States and the exchange rate policies of various Asian countries. Foreign portfolio flows into the United States continue to be concentrated in debt instruments (Chart 2.11). These include not only Treasury bonds but also, perhaps increasingly, bonds issued by the government sponsored enterprises (GSEs) such as Fannie Mae and Freddie Mac, mortgage-backed securities and, probably, high-grade corporate bonds, as foreign official investors themselves seem to reach for a little more yield. The risk therefore remains that any reduction in foreign demand for these assets could affect their required return, with actual returns adjusting by some combination of a fall in dollar exchange rates and rises in the yields of these assets.

A second risk remains the possibility of a more rapid tightening of US official interest rates than implied by current yield curves, perhaps prompting a more general re-evaluation of the current low level of medium and longer-term forward rates.

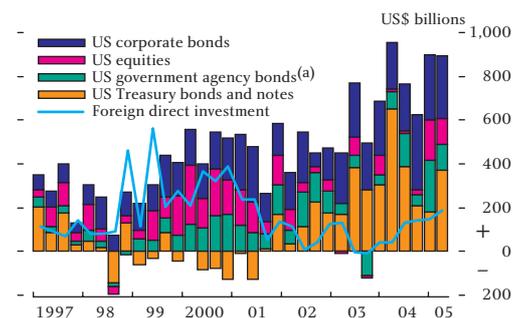
And, third, the December *Review* identified that adjustment might come via the risk of a significant credit event precipitating a more general re-pricing of credit.

Recent stress in credit markets

There was indeed a period of stress in credit markets in recent months, initially triggered by concerns about GM and Ford. Together with a run of weaker-than-expected US macroeconomic data and speculation about possible LBOs releveraging some companies, the GM profit warning in March appeared to be the catalyst for both investment-grade and sub-investment-grade (or high-yield) spreads generally to rise somewhat (Chart 2.12). The subsequent stress took a number of forms in different areas of credit trading and markets.

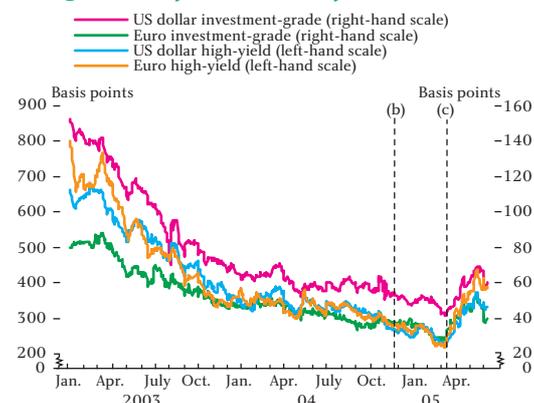
First, some traders, including convertible bond arbitrage hedge funds, are thought to have had long positions in GM bonds against short positions in GM equity. These positions would have suffered losses when, on consecutive days, GM's equity price rose (following the announcement of Kirk Kerkorian's tender for 8.8% of GM shares) and its bond prices fell (following S&P's downgrade of GM to BB) (Chart 2.13). Both events seem to have been a surprise to many market participants. The downgrade, although widely discussed, came earlier than anticipated. And, given that GM debt was trading at wider spreads than the average of B-rated bonds, at least some market participants may have expected its spreads to narrow — rather than widen further — once the uncertainty surrounding the downgrade had dissipated.

Chart 2.11
Foreign net purchases of long-term US securities



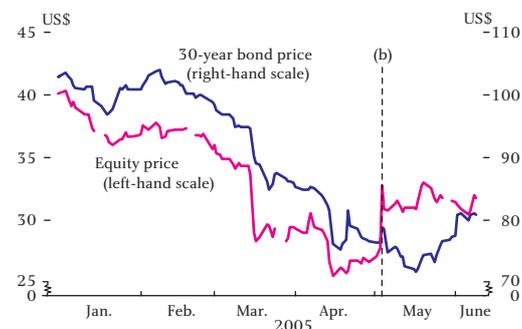
Sources: Board of Governors of the Federal Reserve System.
(a) Includes bonds and mortgage-backed securities issued by Government Sponsored Enterprises.

Chart 2.12
Changes in corporate bond spreads(a)(b)(c)



Source: Merrill Lynch.
(a) Spread over swaps.
(b) Dec. 2004 *Review*.
(c) GM profit warning (16 March).

Chart 2.13
General Motors bond and equity prices(a)



Source: Bloomberg.
(a) Gaps represent days for which there are no data.
(b) Kirk Kerkorian announces his intension to purchase a further equity stake in GM (4 May) and S&P downgrade GMs long-term debt (5 May).

Box 8: Credit correlation trading

Since early 2004, trading of 'standardised' tranches of tradeable credit default swap (CDS) indices — the iTraxx indices in Europe and CDX indices in North America — has grown rapidly.⁽¹⁾ These indices comprise the most liquid names traded in the single-name CDS market; the tranches expose investors to credit losses at different levels of subordination.

Changes in the relative value of these tranches should reflect market views on the expected co-dependence of credit defaults in the underlying index, so-called credit *correlation*. For example, assuming a fixed expected credit loss on the entire index, an investor in an equity tranche would benefit if default correlation rose because greater bunching of those losses would tend to put the more senior tranches at greater risk. So, in principle at least, levels of implied correlation should give some measure of the perceived balance between general credit risk (the clustering of credit events in a macroeconomic downturn) and idiosyncratic credit risk (caused, for example, by a major financial loss at a particular firm).

In practice, however, the market in standardised tranches is still developing and market contacts have suggested that movements in implied correlation have been strongly influenced by supply and demand imbalances across tranches.

The underlying reason for growth in the structured credit market over recent years has been demand to take risk on intermediate (mezzanine) tranches of bespoke credit portfolios by continental European and Asian banks, pension funds and life insurers, as part of the wider 'search for yield'. Creating these tranches synthetically for investors has left dealers having sold significant amounts of mezzanine credit risk. In isolation, this position would incur losses in the event of a general narrowing of credit spreads and/or if the relative value of mezzanine tranches increased, usually associated with a fall in implied correlation. While the exposure to the general level of spreads can be hedged by selling credit protection on some or all of the names in the portfolios, hedging the correlation risk is more difficult. However, increasing liquidity has enabled dealers to hedge some of this correlation exposure by taking risk on the mezzanine tranches of the credit indices.

Responding to this underlying hedging demand from the dealers, a popular trade for credit hedge funds and dealers' proprietary trading desks has been to shed credit risk on mezzanine index tranches and take credit risk on the equity index tranches.

Chart A
Equity and mezzanine tranche spreads of US CDS index^(a)



Source: JPMorgan Chase and Co.

- (a) Five-year on-the-run Dow Jones CDX North America investment grade index (DJ.CDX.NA.IG).
(b) Equity tranches are quoted as an upfront price (a per cent of the notional transaction size). A higher price for credit protection indicates an increase in tranche risk, so the upfront price acts like a spread.

(1) For a brief overview of tradable CDS indices, see 'Markets and operations', Bank of England *Quarterly Bulletin*, Autumn 2004, pages 275–76.

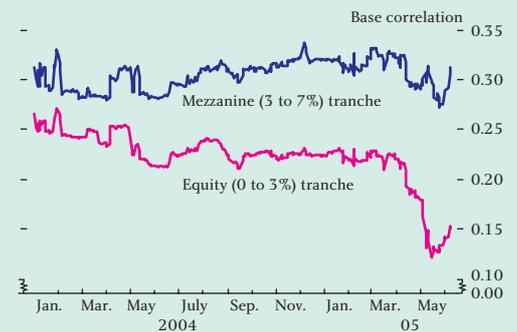
Properly structured, the trade should allow funds to profit from both rises and falls in the overall level of credit spreads, as they have sold protection on the equity tranche, which is more sensitive to general moves in credit spreads — for a given change in value of the underlying index, the change in value of the equity tranche is 15–20 times greater. But the trade is exposed to any fall in the value of the equity tranche relative to the mezzanine tranche, which shows up as a fall in implied default correlation. Some traders are said to have attempted to hedge this risk by buying large amounts of protection on the particular companies whose credit spreads they judged most likely to blow out.

The ratings downgrades of GM and Ford (described in the main text) triggered a sharp fall in the relative value of equity index tranches in early May 2005, apparently as a result of an increase in perceived idiosyncratic credit risk (Chart A). At the same time, the value of mezzanine tranches changed little or rose slightly. These contrary moves were reflected in a sharp fall in implied correlation (Chart B). This ‘dislocation’ between tranches meant that traders with the position described above suffered losses on both legs of the trade.

Market contacts have suggested that the sharp moves in spreads on the tranching indices may have been exacerbated by talk of hedge fund liquidations of positions, with dealers perceiving a ‘crowded trade’. Movements in the values of bespoke CDO tranches were more muted, perhaps supporting the hypothesis that the sharp moves in standardised index tranches were amplified by closing out of speculative positions (Chart C). In this respect, the episode is perhaps an example of how actual or rumoured liquidation of leveraged investors’ positions can exacerbate market stress, a risk that had been identified in previous *Reviews*.⁽¹⁾ However, actual flows are said to have been light.

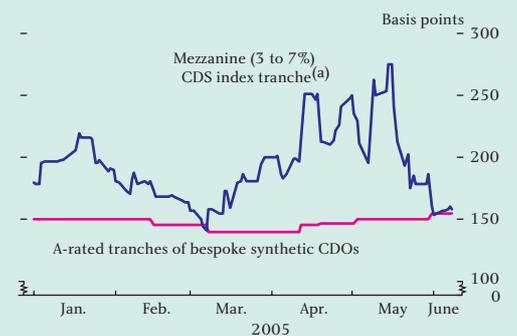
Since the period of stress in mid-May, spreads on the main CDS indices, and on the equity and mezzanine index tranches, have narrowed. But implied correlation on the equity tranche has remained considerably lower than its average level before May (Chart D). This might suggest that the events in early May have triggered a more sustained reappraisal of the risks embedded in the most risky index tranches, or that the movements did in fact reflect an underlying increase in perceived idiosyncratic risk.

Chart B
Base correlation of US CDS index equity and mezzanine tranches^(a)



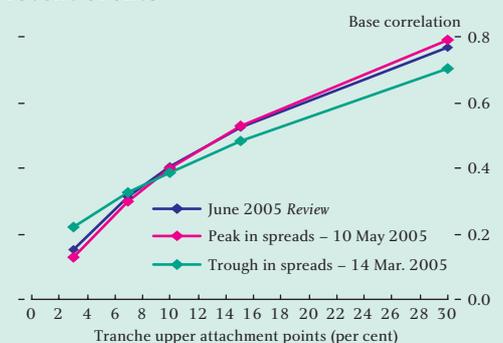
Source: JPMorgan Chase and Co.
(a) Five-year on-the-run Dow Jones CDX North America investment grade index (DJ.CDX.NA.IG).

Chart C
Spreads on A-rated synthetic CDO tranches and US CDS index mezzanine tranche



Source: JPMorgan Chase and Co.
(a) Five-year on-the-run Dow Jones CDX North America investment grade index (DJ.CDX.NA.IG).

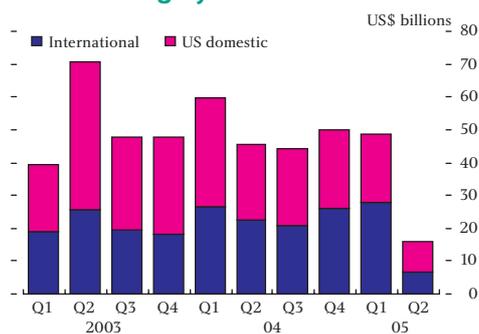
Chart D
US CDS index base correlation skew over recent events^(a)



Source: JPMorgan Chase and Co.
(a) Five-year on-the-run Dow Jones CDX North America investment grade index (DJ.CDX.NA.IG).

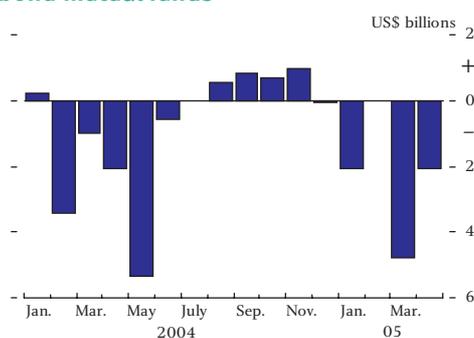
(1) See Box on ‘Hedge fund industry leverage’, Bank of England *Financial Stability Review* (2004), June, page 53.

Chart 2.14
Issuance of high-yield bonds^{(a)(b)}



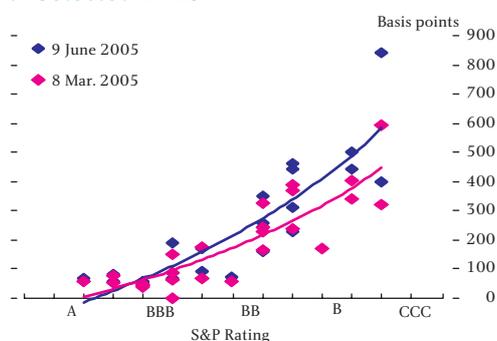
Sources: Thomson SDC and Dealogic.
 (a) Data for 2005 Q2 are up to 10 June 2005.
 (b) Issuance of bonds with a rating of BB+/Ba1 or below.

Chart 2.15
Monthly net asset flows into US high yield bond mutual funds^(a)



Source: Investment Companies Institute.
 (a) Net new cash flow including net exchanges.

Chart 2.16
Sovereign credit rating and bond spreads for selected EMEs^(a)



Sources: JPMorgan Chase & Co. and Standard & Poor's.
 (a) Lines represent logarithmic best-fit lines. Ratings are plotted linearly.

Second, as described in Box 8, there were spillovers in the structured credit market, among so-called correlation traders — a relatively limited number (perhaps 20 or so) of hedge funds and some of the dealers. Market contacts have suggested that this was exacerbated by rumours of liquidation of positions by dealers and funds, consistent with attempts simultaneously to exit from a crowded trade. A number of lessons flow from this episode, as discussed in Chapters 2.2 and 2.3 below.

There appears to have been some, but relatively limited, spillover to the high-yield bond and LBO-financing markets. It seems that a number of LBO-related deals in the pipeline may have taken longer than otherwise to be completed. And some of the riskier features of earlier deals — for example, payment-in-kind notes and second-lien loans — were said to have been more difficult to include.

For a while, the high-yield primary bond market slowed markedly (Chart 2.14), against a background of sustained large net withdrawals from US high yield bond mutual funds (Chart 2.15) and uncertainty about the market impact of GM debt being added to high-yield indices. Difficult conditions in the primary market might represent a risk for originating banks that end up carrying bridge loans on their balance sheets for an extended period. But, most recently, high-yield issuance has resumed, with some heavily oversubscribed deals.

There appears to have been only a limited impact so far on the EME asset class. EME sovereign bond spreads fell to record lows in March, since when there has been a slight correction, especially for lower-rated bonds (Chart 2.16). Contacts have suggested, however, that this owed more to a slight correction of spreads that were unsustainably low, even given the improvement in EME macroeconomic fundamentals, than to a direct spillover from the US high-yield market. Whereas US high-yield spreads have risen by more than 100 basis points since mid-March, EME sovereign spreads are relatively unchanged (Chart 2.17). The suggestion that investors are discriminating more is given some support by generally declining correlations between US high-yield and various EME assets. At current levels, however, EME sovereign bond spreads are still lower than predicted by some models based on fundamentals;⁽¹⁾ and similar comments about less footloose investors becoming involved in EMEs were made in the mid-1990s.

The episode of stress seems not to have triggered a flight to quality in 'risk-free' bond markets. For example, there was no significant widening in swap spreads or in the spread between on and off-the-run Treasury bonds of the kind that characterised

(1) As determined by a Bank of England model of emerging market credit spreads, detailed in 'Understanding capital flows to emerging market economies', Bank of England *Financial Stability Review* (2004), June.

earlier episodes, such as the near-bankruptcy of LTCM in autumn 1998. But there may have been some effect on the level of government bond yields, which fell during this period. To the extent that this represented a reaction to macroeconomic data and revised expectations of the path of monetary policy in the main industrial economies, it may be largely independent of events in credit markets. But a number of market participants have suggested the possibility of a link, with credit concerns spilling over into increased demand for risk-free assets. In the course of unwinding credit carry trades, traders and hedge funds — the majority of which are domiciled in the Caribbean — may have closed out short positions in government bonds, or sold positions in risky assets and bought government bonds (Chart 2.18). A similar point has been made about the rise in the US dollar in this period, which may also have been influenced by the closing out of short positions (Chart 2.19).

Assessment of recent market developments

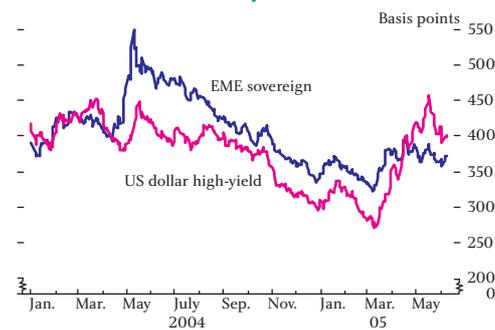
At this short distance, it is difficult to judge the wider significance of May's episode of stress. To the extent that it has prompted a reassessment of some aspects of credit markets that reflected over-optimism, and has increased awareness and understanding of the management of risk in innovative financial instruments, it may on balance be positive for financial stability.

Most recently, credit spreads — including those of GM and Ford — retraced some of their earlier widening. Over the six months since the December *Review*, although lower-rated spreads have risen, higher-rated spreads are little changed. The credit curve is therefore steeper (Chart 2.20). And the recent decline in risk-free bond yields and forward rates may, conceivably, provide renewed impetus to the search for yield. The outlook is uncertain.

Also, it will be unclear for a while whether the recent unwinding of some credit trading positions has taken liquidity out of the market, in the way in which some commentators suggest the unwinding of Salomon's proprietary desk 'arbitrage' book during 1998 exacerbated the spillovers from LTCM's problems later that summer.

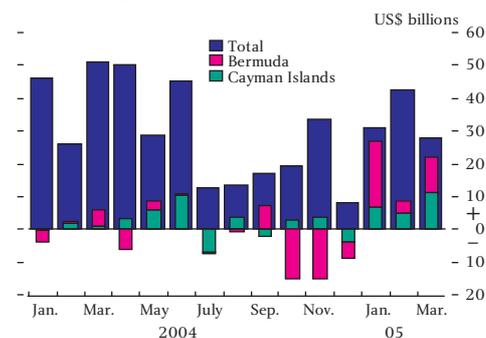
It is clear, however, that May's events have shed light on the possible dynamics of adjustment in today's more complex markets, where optionality is commonplace. As explained in Box 9, traders dynamically hedging short (sold) option exposures — buying or selling fractions of the underlying instruments based on movements in the value of the embedded option — may amplify movements in asset prices. The development of traded markets in tranches of credit portfolios has added optionality to the credit markets, bringing potentially important changes in their dynamics.

Chart 2.17
Movements in bond spreads



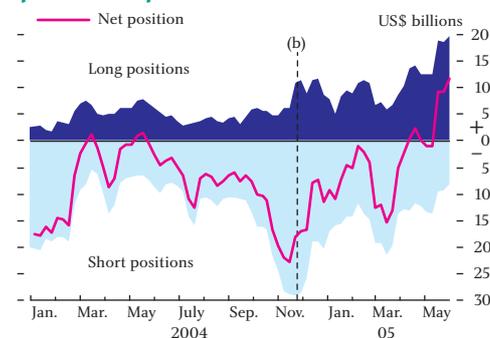
Sources: JPMorgan Chase & Co. and Merrill Lynch.

Chart 2.18
Foreign net purchases of long-term US securities



Sources: United States Treasury Department and Bank calculations.

Chart 2.19
Speculative positions in the US dollar^(a)



Sources: Commodity Futures Trading Commission, Bloomberg and Bank calculations.

- (a) Non-commercial positions, ie those unrelated to commercial hedging activities, in Australian dollars, Canadian dollars, euro, sterling and yen, converted into their US dollar equivalents.
- (b) Dec. 2004 *Review*.

Box 9: Market dynamics and options selling

One measure of the robustness of a financial system is how it would cope with sharp movements in asset prices. They typically follow news about fundamental changes in macroeconomic prospects or the condition of individual borrowers. But their scale and abruptness can also be influenced by 'one way' hedging flows causing prices to move away from fundamentals at least temporarily. This is often associated with 'active' traders having been large net sellers of options, making them 'short' gamma (see below).

In general, options positions (which might be traded options contracts, or economic options embedded in other financial products or trading strategies) are more likely to have a significant influence on market prices if:

- They are large relative to the liquidity of the underlying market.
- The positions of the 'active' options traders in the market, such as dealers and hedge funds, are unbalanced so that they are large net buyers or sellers of options. In aggregate, options positions must balance, but in some markets 'passive' investors, such as households, are large buyers or sellers of options, usually embedded in retail financial products.
- The options are at strike prices close to current market prices (near the money), so that they have high gamma (see below).

If active traders are unable to balance their options books, they will typically hedge the residual position dynamically by buying and selling amounts of the underlying asset (a *delta*). The intention is that the change in the value of the position in the underlying (ie the delta hedge) should broadly offset the change in the value of the options position for small movements in the price of the underlying asset.

But larger movements require the trader to adjust the size of the delta hedge. So-called gamma is a measure of the change in the size of the delta for a given

movement in the price of the underlying asset. Gamma typically increases as the market price moves closer to the strike price, especially if the option is close to maturity, so that it is 'nearer the money'. If active traders have been net buyers of options, they will need to buy the underlying asset to adjust their delta hedge as market prices fall, and to sell as prices rise — they are said to be 'long' gamma. In such circumstances, their hedging flows will tend to dampen asset price movements.

But if active traders have been net sellers of options, and so are 'short' gamma, they will need to sell the underlying asset as prices fall and to buy as prices rise, tending to amplify price movements and therefore increase market volatility.

Historical examples

The following are examples where delta hedging of short options positions appeared to increase volatility:

Portfolio insurance and the 1987 stock market crash

US institutions had, in effect, sold equity index options to investors hedged through so-called portfolio insurance — the formulaic selling of equities and buying of bonds as equity indices fell, often 'hard wired' through automatic trading programmes. They assumed that they would be able to trade without affecting market prices. But the scale of the hedging flows as market prices fell was sufficient to cause prices to fall significantly further. This was widely regarded as one of the key ingredients of the instability that accompanied the 1987 crash.⁽¹⁾

Mortgage convexity hedging and US bond market volatility in 2003⁽²⁾

The structure of the US mortgage market gives households a prepayment option on long-term fixed-rate mortgages. Large-scale refinancing of mortgages in 2000–02 meant that most such options were in a narrow range of strike prices. As long-dated market interest rates rose from these levels in the summer of 2003, those holding mortgage-backed securities or mortgage servicing rights were exposed to significant negative gamma as the likelihood of prepayment reduced.⁽³⁾ Active hedging of this risk

(1) See the Report of the Presidential Task Force on Market Mechanisms 1988.

(2) Mortgage-related hedging was a significant factor in earlier episodes of US bond market volatility in, for example, 1994 and 1999.

(3) See Boxes 4 and 7 in the June 2002 *Review* for discussions of the structure of the US housing finance market and US mortgage convexity hedging.

involved selling bonds or paying fixed in swaps as market interest rates rose, amplifying the price movements.

UK life insurance companies and 2002 UK equity market fall

Many policies written by UK life insurers have guaranteed minimum values at maturity. At the time, many of the companies had large equity holdings, leaving them with a position similar to having sold an equity option to their policyholders. As equity markets fell from 2000, some companies either purchased equity put options or sold equities in order to buy bonds (akin to dynamic hedging).⁽¹⁾ Such sales may, for a while, have amplified falls in UK equity prices.

Current examples

Current examples of unbalanced options positions may include:

Structured notes linked to the US dollar/yen exchange rate

Hedging of options positions embedded in so-called Power Reverse Dual Currency bonds issued mainly to Japanese investors in recent years is said to have left dealers as net sellers of options and therefore short gamma if the yen appreciated against the US dollar beyond around ¥90/US\$.⁽²⁾

Constant proportion portfolio insurance (CPPI) and funds of hedge funds

Market contacts report increasing investment flows into hedge funds through funds of funds based on CPPI structures, which are a variant of portfolio insurance. They involve automatic redemption of investments in funds if the overall net asset value of the funds in the portfolio falls. The underlying hedge funds might, in turn, need to liquidate their own investments. Potential preprogrammed deleveraging of this kind raises questions about the scale of the possible flows in relation to the liquidity of the underlying markets.

Credit portfolio tranches

This is an example where active traders have been net buyers of options, through the transfer of risk on intermediate tranches of credit portfolios to passive investors, such as regional European and Asian banks,

pension funds, life insurers and, increasingly, retail investors. Having shed risk on intermediate tranches, dealers are in effect long an option for movements in overall *portfolio* credit spreads because, as spreads widen, the value of their position increases in a non-linear way (long gamma). If they are hedging this exposure dynamically, they will be sellers of protection on the names in the portfolio as credit spreads widen. Contacts have said that such hedging flows have tended to dampen volatility in market credit spreads at times over the past year. But if traders take risk on equity tranches as well as shedding risk on mezzanine tranches, they are exposed to any increase in *idiosyncratic* risk in the portfolio ie if the credit spread on one or more of the constituents widens without a similar widening in the overall spread on the portfolio.⁽³⁾ Dynamic hedging of this exposure requires them to buy protection on any troubled name as its credit spread widens, potentially amplifying the increase in the spread, while simultaneously selling protection on the other names in the portfolio in order to re-balance their overall hedge.

Summary

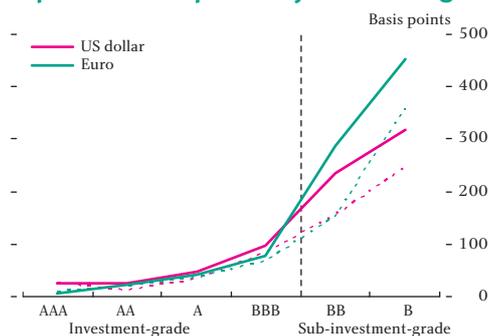
In its financial stability work, the Bank, relying mainly upon market intelligence, will continue to try to identify markets in which active traders have been large net sellers of options and are short gamma, particularly where there are questions about the liquidity of the underlying market.

(1) See the *Financial Stability Review* (2003), June, page 19.

(2) See Box 3 in the *Financial Stability Review* (2003), June, page 43.

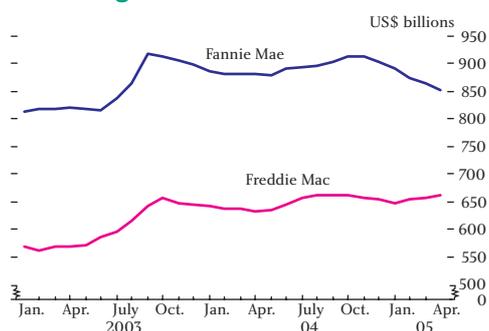
(3) See Box 8 in this *Review*.

Chart 2.20
Corporate bond spreads by credit rating^{(a)(b)}



Source: Merrill Lynch.
 (a) Spread over swaps.
 (b) Spreads as at 9 June 2005 (dashed lines as at Dec. 2004 Review).
 Solid line as at June 2005 Review, dotted line as at Dec. 2004 Review.

Chart 2.21
Retained mortgage portfolios of the US housing GSEs



Source: Published accounts.

In particular, the ‘bought mezzanine tranche protection against sold equity tranche protection’ position described in Box 8, meant that dealers and hedge funds would profit from broadly based changes in aggregate credit spreads (for a given level of implied correlation) but with an exposure to idiosyncratic risk — in sum, a long correlation position. When idiosyncratic risk crystallised via the bad news about GM and Ford, they were forced to scramble to maintain hedges, exacerbating the movements in spreads and in implied correlation. Their position in mezzanine tranches was the opposite of those investors that had sold mezzanine tranche protection. Such investors typically include European and Asian regional banks, insurers and pension funds, which are said to seek mezzanine tranche credit risk partly as a way of diversifying their credit portfolios and also as part of the more general ‘search for yield’ (market participants commonly refer to them as ‘the structured credit bid’). Most are thought to be ‘buy and hold’ investors. It is possible, therefore, that they would not act in a way that amplified a generalised rise in credit spreads unless, perhaps, in an extreme scenario, they attempted to liquidate their investments.

Market intelligence suggests that relatively recent developments in the US mortgage-backed security (MBS) market may also have reduced somewhat the risk of MBS convexity hedging exacerbating moves in the dollar yield curve, as occurred during disorderly conditions in 1994 and 2003.⁽¹⁾ First, Fannie Mae and Freddie Mac, two US Government Sponsored Enterprises, for the moment at least, have reduced or stopped expanding their MBS portfolios (Chart 2.21), and are believed to be hedging their negative convexity exposure more directly (eg via callable bonds and swaptions), and so delta-hedging less aggressively. Second, it is thought that many relatively new investors in the MBS market, perhaps particularly foreign official sector investors, do not hedge their convexity risk — although it is unclear how they will behave if and when mortgage yields fall to the point that many MBS are called.

As discussed in Box 9, LCFI risk managers — and, to the extent feasible, the authorities — should do what they can to monitor the incidence of ‘structural’ short gamma positions among leveraged financial firms with short holding periods. This is potentially important for stress tests that explore the impact of the unexpected exit from a market of a dealer or large trader.

(1) Dynamic hedging of convexity embedded in portfolio holdings of MBS by certain market participants necessitated large-scale selling of US government bonds and entering into ‘pay-fixed’ swap transactions, causing yields and swap rates to rise sharply. See Box 1: ‘The dynamics of US dollar interest rate adjustment’, Bank of England *Financial Stability Review* (2003), December.

2.2 Hedge funds

Recent events also focused attention on the increased role of hedge funds in credit markets, ranging from distressed debt, through leveraged and other lending, to structured credit (Chart 2.22).

Compared with past returns, hedge fund performance has been relatively weak this year (Chart 2.23), although there are uncertainties about the quality of hedge fund databases (see Box 10). Data for May suggest that while most strategies were profitable, convertible arbitrage, fixed-income arbitrage, multi-strategy and short-bias funds reported losses, consistent with some stress in credit markets. However, there were no notable hedge fund failures, and prime broker market contacts have said that margin calls continued to be met.

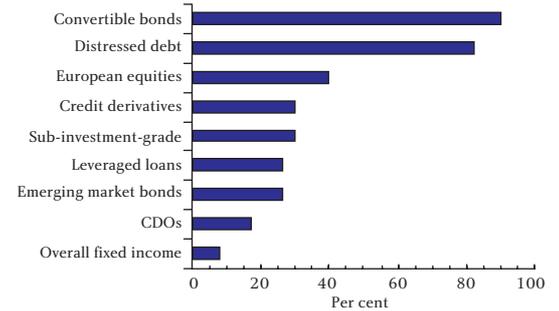
Some market commentators have, though, pointed to a risk of redemptions, which would potentially entail scaling back of positions. To that extent, it is not absolutely clear that the consequences of the recent stress are fully played out. Already in the first quarter, according to published data, convertible bond arbitrage experienced a net outflow, perhaps reflecting medium-term pressures from declining issuance of convertible bonds and from falling equity implied volatility reducing the value of the embedded options (Chart 2.24). Market intelligence suggests that there has been some de-leveraging among funds, possibly as a safeguard against notices from investors to redeem at the end of the second quarter.

Hedge funds are not unusual in being subject to redemptions of capital by investors (Chart 2.25). However, their use of leverage, and the complexity and illiquidity of some of their investment positions, does necessitate careful management of any mismatches between the liquidity of their assets and liabilities.

Funds employ a number of safeguards to manage redemption risks. They include lock-ins, in which new investments in funds may not be redeemed for a set period; redemption schedules, which set a precise schedule (eg monthly, quarterly) for any capital withdrawals, and minimum notice periods; redemption fees, by which lock-ins and redemption schedules may be over-ridden, but subject to a discount on the capital withdrawn; and gates, by which a fund can limit the amount of capital withdrawable over a given time period (eg no more than 25% in a given quarter). Beyond this, funds can also attempt to use indirect measures to manage redemption risk, such as limiting (or not accepting) capital from investors believed to be leveraged or to have short holding periods.

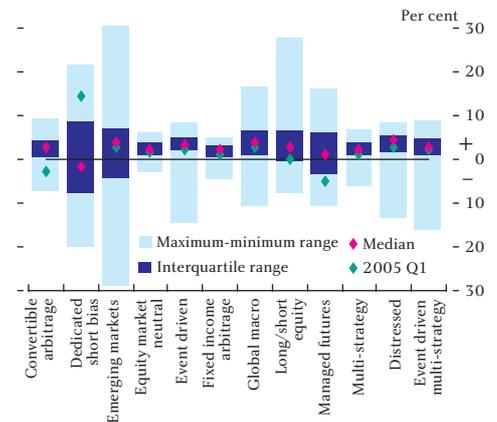
Separately, for a while now, in an environment of intense competition among prime brokers,⁽¹⁾ some funds have

Chart 2.22
An estimate of hedge funds' share of total trading volumes



Sources: Greenwich and Morgan Stanley Research estimates.

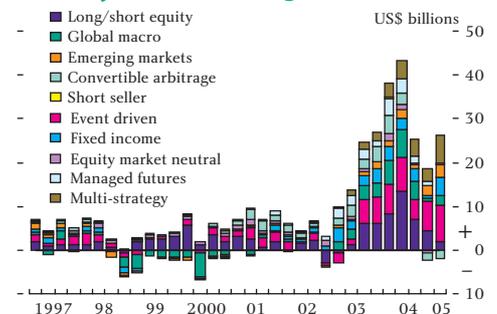
Chart 2.23
Performance of hedge fund strategies^(a)



Sources: CSFB/Tremont and Bank calculations.

(a) Maximum-minimum range, interquartile range and median calculated for 1994 Q1 to 2005 Q1.

Chart 2.24
Quarterly flows into hedge funds



Source: Tremont Capital Management, Inc.

(1) See 'Box 6: Prime Brokerage', Bank of England *Financial Stability Review* (2004), December.

Box 10: Hedge fund data and surveillance

In recent years, there has been rapid growth in the hedge fund industry. It is currently estimated to comprise over 8,000 funds with combined assets under management of over US\$1 trillion.

Commensurate with this growth has been the increasing prominence of funds in financial markets and their significance to regulated financial institutions (largely through prime brokerage and their effect on market liquidity).

Surveillance of the hedge fund industry is thus important, but it is not straightforward. In practice, it involves analysis of industry trends (eg size, flows of investment, performance, leverage) supplemented by market intelligence (on both the hedge funds themselves and their prime brokers) and by regulatory information (including direct or indirect measures of exposure to the sector).

There is little official data on hedge funds, so industry analysis relies on aggregates of data on individual funds. This is available from private data specialists that collect data directly from funds and compile databases. Outputs provide a guide to the size, growth and performance of the industry both as a whole and broken down by strategy. The latter are produced in the form of indices, which assist comparison within the sector and between hedge funds and other investments. However, hedge fund databases are subject to several limitations, which may mean that analysis based solely on their data is not robust.

Biases in performance measurement

Several biases⁽¹⁾ arise in the construction of hedge fund performance indices:

- *Survivorship bias* occurs when considering the performance only of funds that are still in operation at the end of the sample period. If funds drop out of the sample because of poor returns or the existence of 'high-water marks',⁽²⁾ then the historical

performance of surviving funds will be an upwardly biased measure of average performance. Some data providers attempt to correct for survivorship bias by leaving extinct funds in their indices.

- *Self-selection bias* arises because hedge fund reporting is voluntary. Advertising or self-promotion can be an important motive for reporting to a database, providing incentives for some managers to report contingent on performance (eg a series of negative monthly returns may dissuade a manager from reporting).
- *Backfill bias* arises if, when a new fund is added to the database, the historical performance is also imported. Managers may tend to shorten the track record and provide only the most recent and most successful part. Hedge fund database providers often attempt to eliminate this problem by not adding the historical data of new funds to the index.
- *Liquidation bias* arises if disappearing funds do not report performance during the final periods prior to their liquidation. Despite the fact that many data providers try to minimise this effect, it is likely that these funds may lose substantial value after the last report, giving rise to an upward bias.

Index criteria used to determine the inclusion of funds (for example, requiring a minimum size or performance track record) limit the set of funds to which 'industry' performance is attributed.

Analysis by Brooks and Kat⁽³⁾ on the statistical properties of hedge fund indices shows that return distributions are not normal (Gaussian) and, in fact, are not symmetric.⁽⁴⁾ In such cases, standard mean-variance analysis may be unsuitable and common performance measures such as the Sharpe ratio⁽⁵⁾ (risk-adjusted performance) could be overestimated.

(1) Most of these definitions are based on the research paper by Ackermann, C, McEnally, R and Ravenscraft, D (1999), 'The performance of hedge funds: risk, return and incentives', *Journal of Finance*, Vol. 54, No. 3, pages 833–74 and Lhabitant, F (2002), 'Hedge funds, myths and limits', Wiley Finance.

(2) If a 'high-water mark' is present in a performance contract, managers cannot earn performance fees if the fund's value remains below its peak (ie they must recover earlier losses). Sometimes it may prove more profitable to cease operations and start a new fund.

(3) Brooks, C and Kat, H (2002), 'The statistical properties of hedge fund index returns and their implications for investors', *Journal of Alternative Investments*, Fall, pages 26–44.

(4) Their analysis shows that hedge fund indices exhibit negative skewness (values below the mean are fewer but farther from the mean than are values above, long left tail), leptokurtosis (extra probability mass in the tail areas, more extreme values) and show positive autocorrelation.

(5) The (*ex post*) Sharpe ratio is defined as the mean excess return divided by the standard deviation of return.

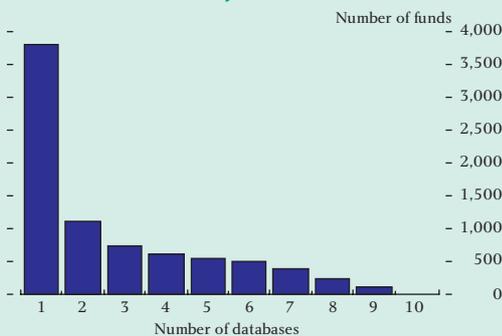
Other limitations of databases

Several other factors affect the usefulness of the databases.

First, coverage of hedge funds by individual databases is incomplete, mainly because of the voluntary nature of hedge fund reporting. The majority of hedge funds seem to report to just one database (Chart A), and some do not report at all. As a result, each database covers a distinct subset of the hedge fund sector and no database gives a complete picture.

Chart A

Number of databases to which hedge funds and fund of funds report



Source: Strategic Financial Solutions, LLC Database Study 2004.

Second, there is no generally agreed definition of a hedge fund. Databases therefore differ in their inclusion of investment vehicles. Some, for example, incorporate commodity trading advisers (CTAs).

Third, the limited level of disclosure by hedge funds may make it difficult to identify precisely the investment strategy followed by a hedge fund manager. Some data providers review strategy categorisations periodically ('best of style' analysis) and may perform due diligence, while others may simply rely on the hedge funds' self-reported style. But the risk of style drift — the tendency of a fund manager to alter the investment style over time — could result in misleading analysis.

Fourth, information on changes in net asset value is provided at the discretion of the fund managers and is not always independently verified. This is more of an issue for the valuation of assets that are infrequently traded, bespoke or highly complex, and so lack clear market valuations. This could create

discrepancies between actual and reported net asset values and lead to an underestimation of their volatility.

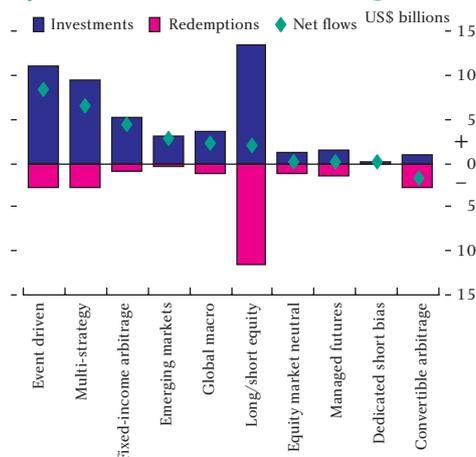
Fifth, meaningful measures of leverage are absent. Few databases attempt to provide such information on a timely, periodic basis. A major obstacle is the conceptual and practical difficulty in measuring leverage in the hedge fund sector. As previous *Reviews* have highlighted,⁽¹⁾ this is due to both the absence of directly observable measures and the fact that leverage can take many different forms.

Assessment

Due to statistical biases, voluntary reporting and partial coverage, hedge fund data are subject to a number of limitations which may distort actual industry returns. If these limitations are not widely recognised, there is the risk that surveillance will be impeded and a misleading impression formed of the hedge fund industry.

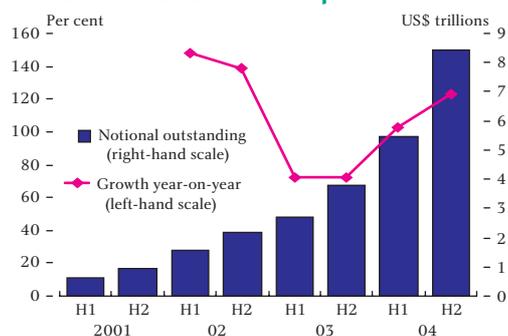
(1) As discussed most recently in 'Box 4: Hedge fund industry leverage' in the June 2004 *Review*, page 53.

Chart 2.25
Capital flows into and out of hedge funds^(a)



Source: Tremont Capital Management, Inc.
 (a) Data are as at 2005 Q1.

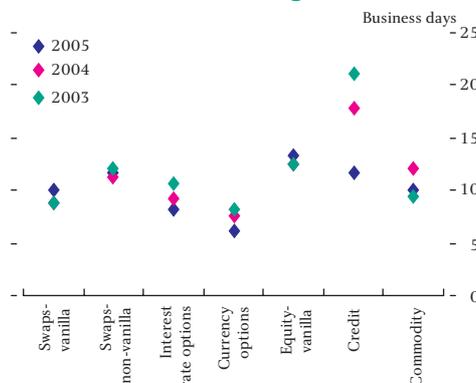
Chart 2.26
Growth in credit default swaps^(a)



Sources: International Swaps and Derivatives Association Market Survey and Bank calculations.

(a) 'Growth' calculated as year-on-year change of notional outstanding.

Chart 2.27
Confirmations outstanding^{(a)(b)}



Source: International Swaps and Derivatives Association 2005 Operations Benchmarking Survey.

(a) Business days' worth of average confirmation volumes sent but not yet finalised.
 (b) Average results based on a sample of over 60 large, medium and small banks, securities dealers and trading units of multinational corporates.

managed to agree extended margin lock-ups, under which a prime broker agrees to keep margin requirements unchanged for a specified period of time, conditional on the fund honouring its obligations. While this may involve some risk for prime brokers, it would help a fund to weather adverse conditions.

Not all funds employ all of these safeguards, and smaller and newly established funds may well be in a relatively weak position to impose them — perhaps particularly on funds of hedge funds investors. Increasingly, fund of fund instruments are based on constant proportion portfolio insurance (CPPI) structures, which automatically make calls on fund liquidity if performance across the fund of funds is poor (see Box 9). However, market contacts suggest that many larger funds have been using a period of strong performance and investor demand to strengthen their liquidity. If so, that may represent a positive development for financial stability, although the picture is unlikely to be uniform, as at least a few are believed to offer investors short-term, even daily, liquidity.

2.3 Large complex financial institutions

Large complex financial institutions (LCFIs)⁽¹⁾ in aggregate remain highly profitable and measures of their financial strength have continued to improve. Recent market developments have, however, highlighted some useful pointers for risk managers at LCFIs and other financial institutions active in international capital markets. The price of default protection rose more for those LCFIs known to be active in prime brokerage or structured credit.

Confirmation and assignments backlog

The previous *Review* noted the fast pace in the growth of credit derivatives and questioned whether back offices could keep up.⁽²⁾ According to market surveys, growth picked up further in 2004 H2 (Chart 2.26) and the backlog in trade confirmations continues to be a problem, notwithstanding industry efforts since the FSA's caution last February (Chart 2.27). Confirmation backlogs potentially leave firms vulnerable if they cannot ascertain the size and nature of their exposures when a credit event occurs. According to market contacts, the problem is exacerbated by some hedge funds assigning trades to third parties without informing the original dealer. If multiplied across LCFIs, hedge funds and into the

(1) The December 2001 *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, JPMorgan Chase & Co., Lehman Brothers, Merrill Lynch, Morgan Stanley, Société Générale and UBS.

(2) See Bank of England *Financial Stability Review* (2004), December, pages 58–59.

wider financial system, this could impede effective risk management in stressed conditions. Initiatives in the vanilla credit derivatives market by the Depository Trust and Clearing Corporation (DTCC) and Swapswire should contribute to reducing the backlog, in conjunction with recommendations by the International Swaps and Derivatives Association (ISDA).⁽¹⁾

Model risk

Market contacts suggest that the recent disruption in structured credit market revealed shortcomings in models used to price structured credit products. More specifically, some models had not been calibrated to allow for the magnitude of movements in the relative price of different index tranches, ie in implied correlation, that were observed in early May. The inability to recalibrate models quickly (some contacts suggest the process can take days) and the lack of reliable price inputs exacerbated the problem, possibly leaving traders unsure of positions or required hedging ratios. Model risk is not reflected in Value-at-Risk (VaR) measures of market risk.

Market risk measures

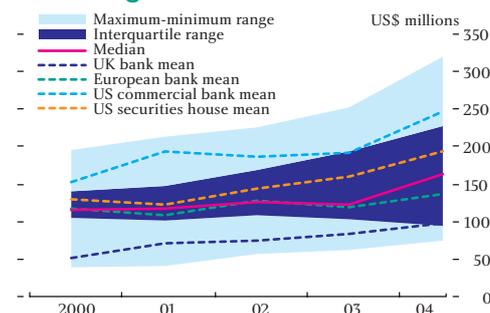
Using VaR, trading book market risk at LCFIs has continued to rise (in absolute terms), while remaining low relative to both profits and equity (Chart 2.28). But, in addition to model risk, VaR does not easily capture liquidity risk, potential 'tail' losses⁽²⁾ and all the 'basis risks' to which firms are left exposed by the intermediation of exotic financial instruments. To get a better picture of risks, LCFIs are developing stress tests. But the use of these techniques across firms is uneven, and stress tests are often based on previous episodes of market dislocation, rather than hypothetical events. Also, firm-specific stress tests are unlikely to provide a complete picture across the financial system.

Throughout 2004, LCFIs generated strong trading revenues for the apparent market risks they chose (Chart 2.29). Several have benefited from high-trading volumes in fixed-income markets, associated with investors' search for yield and the activity of hedge funds. Recent performance has, however, been more variable and the outlook is uncertain.

Legal and regulatory risks

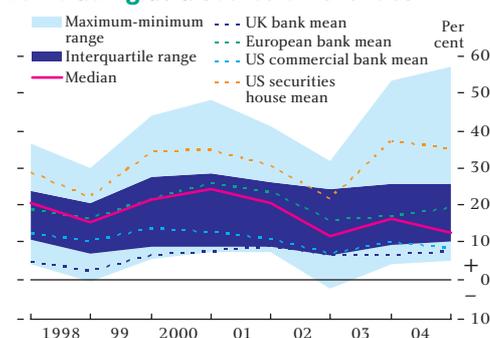
The extent of legal and reputation risks to LCFIs and their counterparties also remains an uncertainty, as discussed in the December Review.⁽³⁾ Since then, further regulatory fines and civil settlements in the United States have underlined the financial impact of this risk. Additionally, several non-bank firms, active in global finance and counterparties to the LCFIs and UK banks,

Chart 2.28
LCFI trading book market risk^(a)



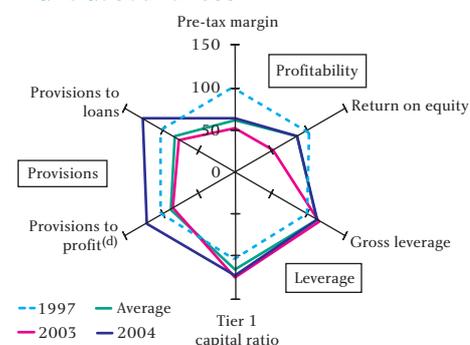
Sources: Company reports and Bank calculations.
(a) LCFI trading book market risk measured as the average daily Value-at-Risk for non-UK LCFIs reporting annual data, adjusted to a ten-day holding period, 99% confidence interval and US\$, as necessary.

Chart 2.29
LCFI trading as a source of revenues^{(a)(b)}



Sources: Bloomberg and Bank calculations.
(a) Proportion of net revenues attributable to trading (both customer and principal activities).
(b) Some LCFIs report principal investment revenues combined with trading revenues.

Chart 2.30
Financial soundness^{(a)(b)(c)}



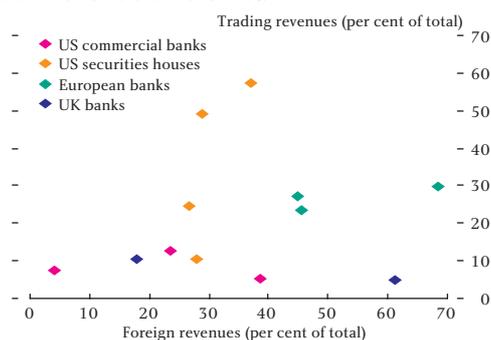
Sources: Bloomberg and Bank calculations.
(a) Unweighted average of LCFI data points.
(b) All ratios are rebased to 1997, ie 1997 = 100. A reading greater than 100 indicates an improvement in that ratio.
(c) Only one US securities house provides data on provisions. None provide data on Tier 1 capital ratios.
(d) Pre-provision operating profit.

(1) The recommendations are detailed in the Strategy and Implementation papers of ISDA's Operations committee, available on ISDA's website: www.isda.org.

(2) VaR gives a limit to expected losses over a certain period to a certain confidence level, and based on past outcomes.

(3) Pages 58–59, *Financial Stability Review* (2004), December.

Chart 2.31
LCFI revenue diversification^{(a)(b)}



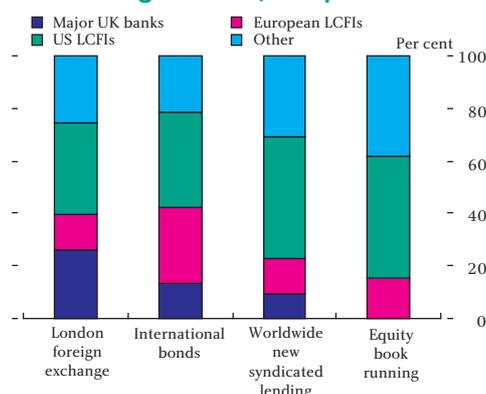
Sources: Bloomberg, company reports and Bank calculations.
 (a) Two LCFIs do not report a breakdown of geographical revenues.
 (b) Some LCFI disclosures only allow an approximate split of geographical revenues.

have restated financial results due to incorrect or improper accounting.

Resilience

Nevertheless, measures derived from financial statements suggest that the resilience of LCFIs continued to improve in 2004 (Chart 2.30). Capital has increased and provisions remain low. One potential current concern is the relative weakness of the domestic operating environment for some LCFIs (see Chapter 1). However, the prospective impact on profitability is mitigated by geographical and business line diversification. LCFIs generate high proportions of their revenues internationally, through foreign lending, financial markets and investment banking activity, rather than by taking domestic credit risk (Chart 2.31).

Chart 2.32
Major UK banks' market share in selected financial league tables, 2004^(a)



Sources: Bank for International Settlements, International Financing Review and Bank calculations.

(a) Refers to peer group as discussed in Box 1, page 18.

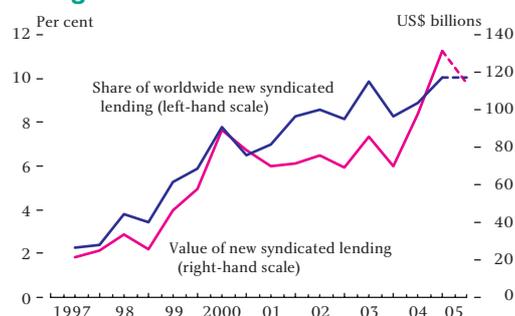
2.4 Implications for the UK financial system

Non-UK LCFIs are important to the UK financial system because of their integral role in the functioning of both global and sterling financial markets and their direct links to many of the major UK banks.

The latest available data on the 'large' exposures of the major UK banks,⁽¹⁾ for 2005 Q1, demonstrate the materiality of counterparty credit risk. Exposures to LCFIs were equivalent to around 85% of the Tier 1 capital of the major UK banks, up around 10 percentage points on six months earlier.

Many UK-resident financial institutions also participate themselves in global markets through a range of activities. In addition to the indirect links discussed in Chapter 3, these include origination (where institutions manage the issuance of financial instruments); secondary market activity (where institutions trade on their own account or on behalf of clients); and their longer-term investment and funding activities.

Chart 2.33
Major UK banks' new worldwide syndicated lending^{(a)(b)(c)(d)}



Source: Dealogic.

(a) Refers to peer group as discussed in Box 1, page 18.
 (b) Includes cancelled loans, but excludes amendments and unsigned loans. Data provided at lending institution level rather than on a consolidated banking group basis.
 (c) Where the actual proportions provided by each syndicate member are unknown, loan amounts have been split equally among participating banks.
 (d) Dashed lines indicate data for 2005 H1 to date.

Origination

One trend in recent years has been the effort by several major UK banks to expand their capital markets and investment banking divisions.

UK-owned banks are particularly active in debt capital markets, such as syndicated lending, leveraged loans and bond issuance, but less so in equity issuance (Chart 2.32). They have taken an increasing share of worldwide syndicated lending (Chart 2.33), ranking among the top underwriters in Europe and also being, to a lesser degree, significant participants in the US corporate loans

(1) For regulatory purposes, 'large' exposures are defined as any exposures that exceed 10% of eligible capital (Tier 1 plus Tier 2 capital, less any regulatory deductions, eg related to insurance subsidiaries) at any point during the reporting period.

market. As described in Chapter 1.2, lenders have been under pressure to allow less strict terms and conditions.

The ultimate risk to financial institutions' capital from these activities depends on the extent to which exposures have been hedged or sold on, which is difficult to assess. Market contacts, and a few UK-owned banks' public disclosures of their economic capital allocations, suggest that they retain material wholesale credit and market risk exposures.

Secondary market activities

Market contacts also suggest that major UK banks are increasing their secondary market activities. The contribution of dealing profits to total income has remained broadly constant in recent years (Chart 2.34).⁽¹⁾ But this is the result of similar increases in both dealing profits and total income. In nominal terms, both dealing profits and the value of market risk exposures, as measured by trading book Value-at-Risk (VaR), have risen since 1999 (Chart 2.35).⁽²⁾ But measured trading book VaR and dealing profits continue to remain low as a proportion of income for the major UK banks, both in absolute terms and compared with other LCFIs (Chart 2.36).

As well as engaging in proprietary trading on their own behalf, financial institutions may also provide trading and settlement services to others. Market contacts report that some UK-owned banks are competing aggressively for hedge fund prime brokerage mandates, especially in fixed income and credit. Risk management may be compromised by competitive pressures so, as noted in the December *Review*, the challenge for prime brokers is to maintain robust risk controls in the face of such competition.

Investment

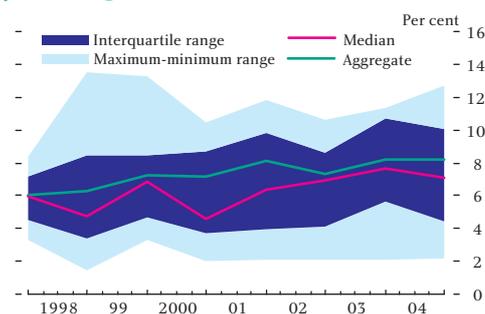
The major UK banks are also significant participants in capital markets as long-term investors through their participation in the insurance sector. They own life insurance funds that take over a fifth of gross UK life insurance premiums and also own several major general insurers. UK-resident life insurers, pension funds and general insurers are exposed to market risk through their asset holdings; hence so are their owners.⁽³⁾

(1) Banks' reported dealing profits will usually include income from both origination and trading activity.

(2) The limits on the usefulness of VaR as a measure of market risk were discussed in Chapter 2.3.

(3) Quantitative estimates based on market prices show that the main channel of contagion between major UK banks and UK life insurers is through banks' direct ownership of life insurers. See Monks, A and Stringa, M 'Inter-industry linkages between UK life insurers and UK banks: an event study' in this *Review*.

Chart 2.34
Major UK banks' dealing profit as a percentage of total income^{(a)(b)}

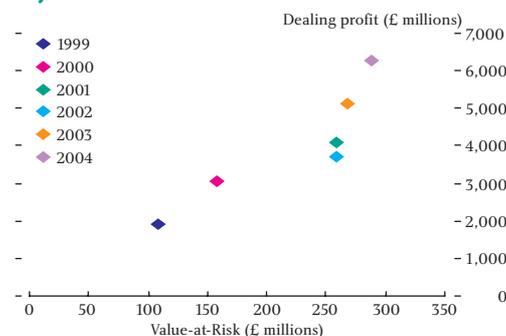


Sources: Published accounts and Bank calculations.

(a) Refers to peer group discussed in Box 1, page 18.

(b) Data for selected major UK banks, where data are available.

Chart 2.35
Major UK banks' risk and return^{(a)(b)}

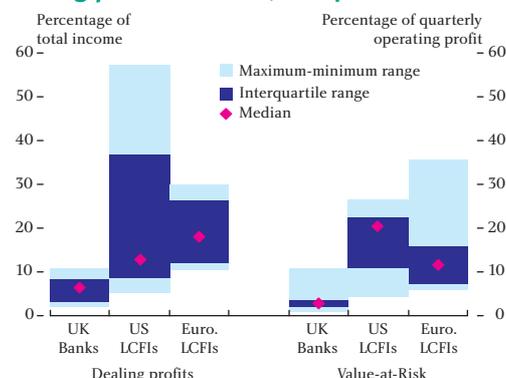


Sources: Published accounts and Bank calculations.

(a) Refers to peer group as discussed in Box 1, page 18.

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

Chart 2.36
Comparison of major UK banks^(a) and LCFIs' dealing profits and VaR, 2004^{(b)(c)}



Source: Published accounts.

(a) Refers to peer group as discussed in Box 1, page 18.

(b) Published VaRs have been adjusted to a ten-day holding period and a 99% confidence interval.

(c) Data for six major UK banks, seven US LCFIs and six European LCFIs.

Risks from capital market activities

As discussed, the success of UK banks in developing the scale of their capital markets and investment banking activities may expose them to increased market risk. There may also be significant market risk in financial institutions' banking books, arising from mismatches between the maturities and interest rate terms of lenders' deposits and lending. While these risks are hard to quantify because of lack of uniform disclosure, limited disclosures by some institutions suggest that market risk is likely to be larger in banking books than in trading books.⁽¹⁾ Banking regulators have recently addressed the similar problem of measuring credit risk in banks' trading book. The Basel/IOSCO Trading Book Review, which is discussed in the article *Strengthening financial infrastructure* in this Review, has proposed a capital treatment for credit risk in the trading book that is consistent with the banking book treatment, while recognising the liquidity of trading book positions.

(1) Public disclosures for one UK-owned bank reported that its 'total' VaR was three times that of its 'trading' VaR.

3 UK financial sector resilience: key points

There continue to be few immediate concerns about the robustness of the UK financial sector. The major UK banks remain profitable, well-capitalised, and liquid. Reflecting these factors, market assessments of the robustness of the UK banking systems have remained positive since the *December Review*. Despite the recent rise in credit default swap premia, the price of default protection continues to be at historically low levels and below those of most other major European and US banks.

Further ahead, however, the UK financial sector faces several challenges:

- the expected slowdown in lending growth and continued competition could place pressure on profit growth, increasing the reliance on non-interest sources of income for further growth. These sources of income, which include asset management, dealing profits, and insurance broking, could be subject to greater uncertainty;
- although banks have responded to the customer ‘funding gap’ — the discrepancy between the stocks of lending and retail deposits — by diversifying their sources of finance and lengthening maturities, some banks remain reliant on short-term wholesale markets. An episode of market stress could, therefore, place some strains on refinancing channels;
- the interbank exposures of the major UK banks are material, and include exposures to the major LCFIs. Shocks to one institution could, therefore, be quickly transmitted across the financial system. Counterparty risks are likely to be exacerbated if there are concentrations of exposures to a small number of institutions; and
- the tiered structure of payments and settlements systems in the United Kingdom means that the exposures between settlement banks and ‘second tier’ financial institutions need to be managed carefully.

3 UK financial sector resilience

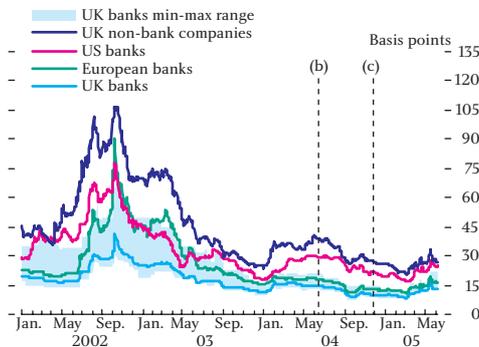
UK financial institutions' lending (Chapter 1) and involvement in capital markets (Chapter 2) give rise to various forms of risk. The robustness of the UK financial system in the face of these risks depends on three main factors: profits and capital to absorb any losses arising were these risks to crystallise; financial institutions' ability to manage their funding and liquidity; and the inter-relationships between financial institutions. The first two factors determine individual institutions' resilience to shocks, while the links within the financial system (both between UK firms and to major global financial institutions) are one channel through which firm-specific difficulties can spread to the rest of the financial sector.

This chapter focuses primarily on the major UK banks, a group of selected large banks, building societies and 'other finance providers' (as discussed in Box 1), but it also touches on other UK-resident non-bank financial sectors where they are relevant to the stability of the UK financial sector as a whole.⁽¹⁾

3.1 Market assessment

Financial market participants appear to have few concerns about the robustness of the major UK banks. There has been a slight rise in the share prices of UK-listed banks since the previous Review, both in absolute terms and relative to the FTSE. And measures of distance to default for UK banks⁽²⁾ — inferred from banks' equity prices — have continued to rise from already high levels. This sanguine outlook is consistent with more direct measures of credit risk. Although credit default swap (CDS) premia have risen slightly since the December 2004 Review, they are still low by historical standards and are below those of most other major US and European banks (Chart 3.1). Credit ratings for the major UK banks are similar to those ten years ago and above those for many internationally active banks (Chart 3.2). Rating agencies have in the past noted that some UK-owned banks face risks from the extent of their reliance on wholesale funding. In the past six months, however, the only ratings actions have been upgrades of some banks' ratings outlooks, partly reflecting actions taken to diversify their funding sources (Chapter 3.3).

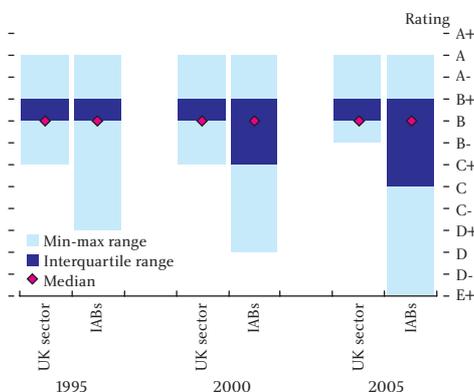
Chart 3.1
Credit default swap premia for major UK banks and non-bank companies^(a)



Sources: Bloomberg, CreditTrade, JPMorgan Chase and Co., Markit, Thomson Financial Datastream and published accounts.

- (a) Data are available for 7 major UK banks, 36 other FTSE 100 companies, 20 continental European banks and 11 US banks, weighted by total assets.
- (b) June 2004 Review.
- (c) Dec. 2004 Review.

Chart 3.2
Moody's Financial Strength Ratings for selected financial institutions^{(a)(b)}



Source: Moody's Investor Service.

- (a) Ratings for the UK sector refer to major UK banks as discussed in Box 1, page 18, ratings for IABs refer to 41 internationally active banks.
- (b) Moody's Bank Financial Strength Ratings are a measure of the likelihood that a bank will require assistance from a third party, such as an official institution.

(1) Alongside building societies and 'other finance providers', some of which are now part of the peer group of major UK banks, the December 2004 Review article 'Assessing risks from UK non-bank financial sectors' also identified insurers and securities dealers as potentially systemic non-bank financial sectors.

(2) This refers to a Merton-style model, similar to that described in Bunn, P (2003), 'Company-accounts-based modelling of business failures', *Financial Stability Review*, December. For the purpose of the model, non-equity liabilities are assumed to comprise only customer deposits.

3.2 Profitability and capitalisation

Profitability

The major UK banks' profitability remains high, with a median return on assets of just over 1% in 2004, up slightly on 2003 (Chart 3.3). The median pre-tax return on equity for the nine listed major UK banks was 22.4% in 2004, up 1.3 percentage points on a year earlier. Pre-tax profit margins increased in 2004, because of reductions in both provisions and cost-income ratios (as total income rose 10% and costs only 8%).

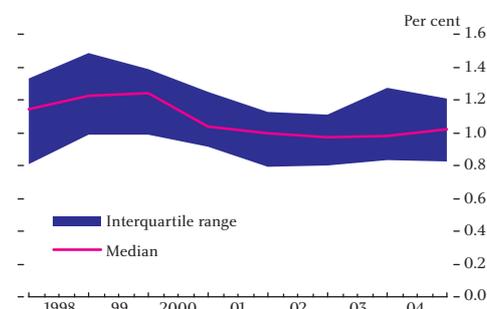
However, investment analysts' forecasts point to a slowdown in the growth in banks' earnings per share. Some bank chief executives argued at accounts presentations that current economic conditions were so benign that it was unlikely that household credit quality would continue to improve, or that household spending would continue to grow at the same rate; hence the potential for further growth in profits was limited. And, as noted in Chapter 1.1, more recent trading statements by some lenders have noted higher-than-expected credit losses for some forms of lending, particularly unsecured debt. However, there is no indication that banks' returns on equity are likely to fall sharply from their current high levels.

If lending growth slows, that may intensify competition, putting further pressure on net interest margins. Median net interest margins fell slightly over 2004 (mostly in the first six months), continuing a long-term decline. Lenders attributed the recent fall in margins to competition and higher funding costs, but noted that the latter had eased in 2004 H2, as wholesale market rates moved closer to base rates (used to price most retail lending). The decline in margins was, however, offset in 2004 by volume growth, and net interest income rose by just under 5%.

If income from lending were to fall as lending growth slowed, the ability of the major UK banks to continue to increase aggregate profits would depend on the robustness of other income sources. Aggregate non-interest income rose by around 16% in 2004, and accounted for over 45% of the total. Within non-interest income, the largest component — net fees and commissions — increased by 10%. But the prospects for future growth in this category are uncertain, because it covers income from a wide variety of sources (including fees on lending and asset management). Dealing profits rose almost 8%, reflecting some banks' expansion of their activities in wholesale markets (Chapter 2.4), but remained broadly flat as a proportion of total income (Chart 3.4).

Although it accounts for only around 7% of the major UK banks' total income, insurance underwriting was one of the fastest growing sources of income during 2004, rising by more than 60% in aggregate. This large rise reflected some institutions'

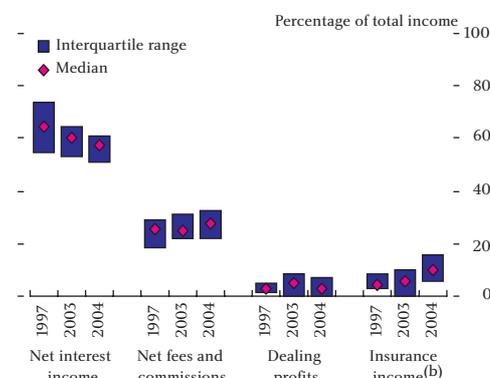
Chart 3.3
Major UK banks' pre-tax return on assets^(a)



Sources: Published accounts and Bank calculations.

(a) Refers to peer group as discussed in Box 1, page 18.

Chart 3.4
Comparison of major UK banks' income sources^(a)

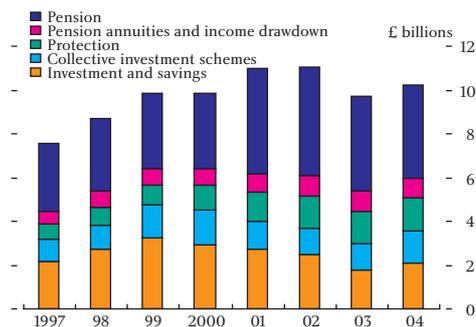


Sources: Published accounts and Bank calculations.

(a) Refers to peer group as discussed in Box 1, page 18.

(b) Insurance underwriting income, as reported in published accounts.

Chart 3.5
Life insurers' UK sales of long-term savings products^{(a)(b)}



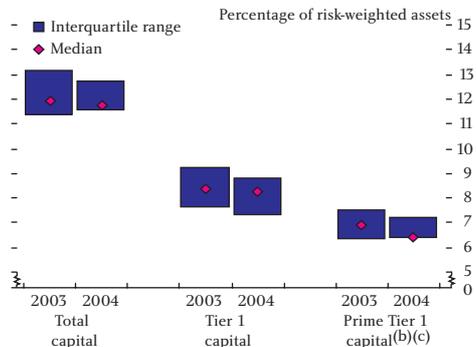
Source: Association of British Insurers.
 (a) Annual premium equivalent basis (ie regular premiums plus a tenth of single premiums).
 (b) New business only, excludes recurring regular premiums.

losses in 2003 (the result of one-off provisions arising from the introduction of the new life insurance solvency regime). But it also reflected banks' expansion into the life and general insurance markets, and a general rise in life insurance sales — although industry activity was still over 8% below its 2002 peaks (Chart 3.5). The rise in sales did, however, mask a continued decline in purchases of with-profits products, with a move towards unit-linked products, which have a lower profit margin. But unit-linked products also expose providers to less market risk, as it is passed on to policyholders.

Capitalisation

The major UK banks remained well capitalised at the end of 2004, with the median reported Tier 1 capital ratio broadly unchanged at 8.3%. Even if non-prime capital instruments were excluded (as some carry debt-servicing obligations), capital ratios would have remained well above regulatory minima (Chart 3.6).

Chart 3.6
Major UK banks' capital ratios^(a)



Sources: Published accounts, FSA regulatory returns and Bank calculations.
 (a) Refers to peer group as discussed in Box 1, page 18.
 (b) Prime Tier 1 comprises ordinary shares, associated reserves and retained earnings.
 (c) Data for selected major UK banks, where data are available.

Stress tests undertaken for the 2002 IMF Financial Sector Assessment Programme (FSAP) suggested that the UK banking sector had a sufficient buffer of profits and capital to absorb losses arising from certain plausible but extreme shocks to the banking system. An accompanying article in this *Review* discusses recent developments in stress testing, and reruns the stress tests used in the IMF FSAP — offering further evidence of the robustness of the major UK banks.⁽¹⁾

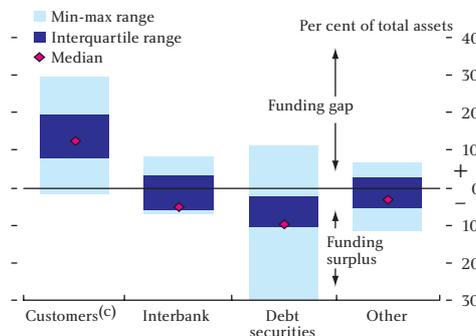
3.3 Funding and liquidity

The role of banks and building societies as monetary intermediaries — transforming deposits into illiquid loans — leaves them vulnerable to liquidity risk. In common with any financial institution active in financial markets, they face market liquidity risk — the risk of being unable to execute a large transaction at prevailing market prices — as discussed in Chapter 2. But they also face funding liquidity risk, as they need to refinance debt and meet liabilities as they fall due. So, even when financial institutions are profitable and well capitalised, a sufficient stock of liquid assets is required to meet potential demands to repay their short-term liabilities.

Funding

The growth of the major UK banks' lending to 'customers' (ie all non-bank borrowers) has been rapid recently (as noted in Chapter 1) and has exceeded the growth of deposits from this sector.⁽²⁾ This has created a 'customer funding gap': the stock of lending to customers exceeds the stock of customer deposits. For

Chart 3.7
Major UK banks' funding gaps, by type of funding, end-2004^{(a)(b)}



Sources: Published accounts and Bank calculations.
 (a) Refers to peer group as discussed in Box 1, page 18.
 (b) Measured as assets less liabilities in the balance sheet categories shown, as a percentage of total assets.
 (c) 'Customers' comprises all non-bank borrowers and depositors.

(1) See Bunn, P, Cunningham, A and Drehmann, M (2005), 'Stress testing as a tool for assessing systemic risks' in this *Review*.

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

many institutions, this gap was over 10% of total assets at end-2004 (Chart 3.7). It has primarily been funded by issuing debt securities, such as certificates of deposit (CDs), and borrowing in the interbank markets. However, wholesale funding is typically more expensive, 'lumpier' and more volatile than retail funding. It is also generally short-term (Chart 3.8) and therefore needs to be refinanced regularly. In times of market-wide stress, or if a firm's rating were downgraded, such short-term wholesale funding could prove more costly to roll over.

Over the past year, major UK banks have increased the contribution that customer deposits make to their funding (Chart 3.9). This is consistent with some lenders' moves to encourage more customer deposits, either through higher interest rates or increased marketing, although switching costs in the current account market may inhibit these efforts.⁽¹⁾ While the increase in customer lending still outpaced that of deposits last year, the difference in growth rates shrank (Chart 3.10).

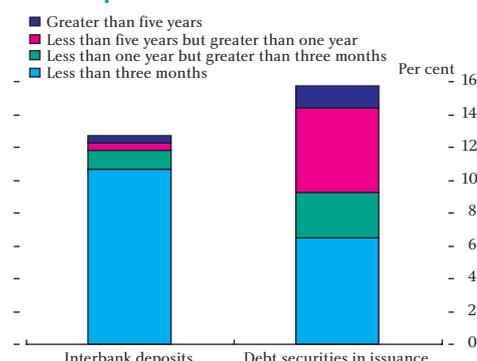
Previous *Reviews* have noted banks' efforts to diversify their funding sources. These have continued, with an expansion of wholesale funding operations outside the United Kingdom, and a lengthening of the average maturity of their debt security issuance (Chart 3.11). For example, the major UK banks have issued £12 billion of covered bonds,⁽²⁾ alongside more traditional forms of securitisation, such as residential-mortgage-backed securities (MBS). The scale of such funding is still small compared with the combined balance sheet of the major UK banks, or the relative scale of the MBS market in the United States. Some of these new sources of funding do, however, have potential implications for the ranking of creditor claims. The FSA has therefore given interim guidance restricting the issuance of covered bonds because of the impact on depositors.⁽³⁾ Further expansion of this funding source may, therefore, be affected by regulatory restrictions.

Liquidity

Financial institutions hold high-quality liquid assets to mitigate the liquidity risk inherent in their balance sheets. Recent regulatory changes require banks to use an array of risk management tools, such as stress testing, to manage liquidity risk.⁽⁴⁾ And market contacts report that the major UK banks place significant weight on the results of stress testing to assess how assets and liabilities would behave in extreme scenarios. But these results are not publicly disclosed, so any assessment of

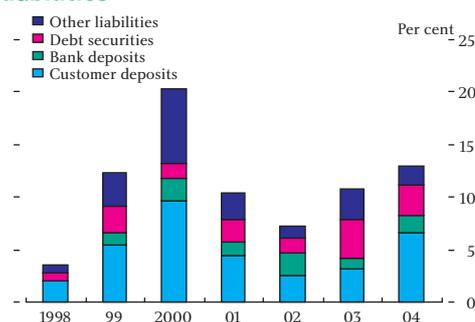
(1) Gondat-Larralde, C and Nier, E (2004), 'The economics of retail banking — an empirical analysis of the UK market for personal current accounts', Bank of England *Quarterly Bulletin*, Summer.
 (2) UK covered bonds are long-term securities (typically with 5 to 15-year maturities) backed by pools of mortgages, similar to the well-established German *pfandbriefe*.
 (3) Covered bonds could weaken the position of depositors in an insolvency, as their holders have a preferential claim to the assets pledged to the covered bond pool. For FSA guidance, see www.bba.org.uk/content/1/c4/45/74/190135.pdf.
 (4) As discussed in Box 1 of the 'Strengthening financial infrastructure' article in the December 2004 *Review*.

Chart 3.8
Major UK banks' maturity breakdown of interbank deposits and debt securities in issuance as a percentage of total liabilities, end-2004^{(a)(b)(c)}



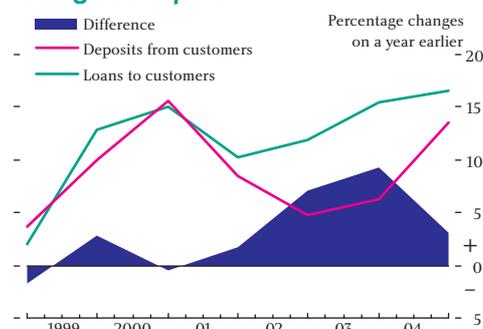
Source: Published accounts.
 (a) Refers to peer group as discussed in Box 1, page 18.
 (b) Data for selected major UK banks, where data are available.
 (c) Debt securities in issuance of maturity less than three months estimated.

Chart 3.9
Annual growth in major UK banks' total liabilities^{(a)(b)}



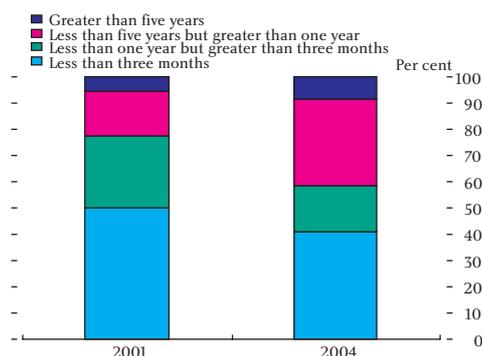
Sources: Published accounts and Bank calculations.
 (a) Refers to peer group as discussed in Box 1, page 18.
 (b) Growth rates have been adjusted for peer group membership changes.

Chart 3.10
Major UK banks' growth in customer lending and deposits^{(a)(b)(c)}



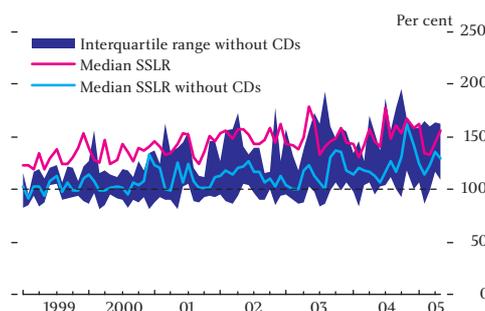
Sources: Published accounts and Bank calculations.
 (a) Refers to peer group as discussed in Box 1, page 18.
 (b) Growth rates have been adjusted for peer group membership changes.
 (c) 'Customers' comprises all non-bank borrowers and depositors.

Chart 3.11
Major UK banks' maturity breakdown of debt securities in issuance^{(a)(b)(c)}



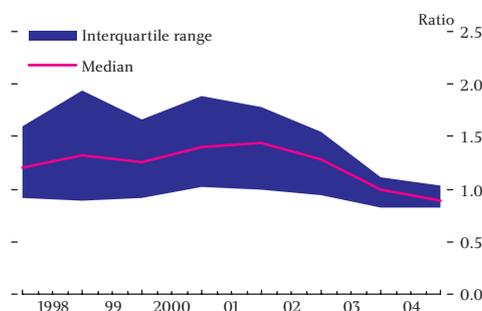
Source: Published accounts.
(a) Refers to peer group as discussed in Box 1, page 18.
(b) Data for selected major UK banks, where data are available.
(c) Debt securities in issuance of maturity less than three months estimated.

Chart 3.12
Major UK banks' sterling stock liquidity ratios^{(a)(b)(c)}



Source: FSA regulatory returns.
(a) Refers to peer group as discussed in Box 1, page 18.
(b) Data for selected major UK banks, where data are available.
(c) The FSA regulatory minima for the sterling stock liquidity ratio is 100 indicated by the dotted line.

Chart 3.13
Major UK banks' 'liquid assets' as a ratio of 'vulnerable liabilities'^{(a)(b)(c)}



Sources: Published accounts and Bank calculations.
(a) Refers to peer group as discussed in Box 1, page 18.
(b) 'Liquid assets' are defined as debt securities, treasury bills, items in the course of collection from other banks, and cash.
(c) 'Vulnerable liabilities' are defined as items in the course of collection, an estimation of debt securities issued with a maturity of under three months, and interbank deposits.

system-wide liquidity risk within the UK financial system is therefore dependent on data from regulatory returns and published accounts.

Regulatory returns show that the major UK banks all hold sufficient liquid assets to meet the sterling stock liquidity ratio (SSLR), the regulatory minimum (Chart 3.12).⁽¹⁾ But the dispersion of SSLRs does suggest a range of styles of liquidity management within the peer group.

The SSLR does not, however, address potential foreign currency outflows. That limits its usefulness for assessing aggregate liquidity risk given that foreign currency liabilities represent about half of the major UK banks' total funding. Non-sterling liabilities and assets are broadly equal in aggregate across the sector, but some institutions' foreign currency liabilities significantly exceed their non-sterling assets; such imbalances are usually due to the use by institutions of long-term non-sterling debt securities to fund an increase in domestic lending, and do not necessarily indicate a significant liquidity risk.⁽²⁾

The ratio of 'liquid assets' to 'vulnerable liabilities', as derived from data in published annual accounts, is an alternative measure of liquidity that includes potential outflows in all currencies, although it is dependent on the definition of 'liquid assets' and 'vulnerable liabilities' used. This ratio fell slightly over 2004 (Chart 3.13), following a significant fall over recent years, as debt securities (which are the largest single component of 'liquid assets') have accumulated at a slower rate than 'vulnerable liabilities'. Despite the fall, the ratio suggests that major UK banks still have sufficient liquid assets to meet around three months of gross wholesale outflows.

3.4 Links between financial institutions

Aggregate measures of resilience are insufficient by themselves to provide a full assessment of the UK financial sector's ability to withstand adverse shocks. Financial institutions are closely interrelated; these links between financial institutions could allow a shock to one institution or group of institutions to be transmitted quickly to the financial system as a whole.

Funding and trading exposures

Counterparty exposures can arise through a variety of channels, such as by extending credit to or holding the securities of a

(1) As noted in previous *Reviews*, the SSLR includes a proportion of banks' holdings of CDs as admissible assets, which may not protect the banking system as a whole in the case of a system-wide liquidity shock. However, even excluding holdings of CDs, the median stock liquidity ratio has remained above 100% since the December *Review*.
(2) Data on financial institutions' derivative exposures suggest that the foreign exchange risk from any mismatch between foreign currency assets and liabilities is typically hedged.

firm.⁽¹⁾ Interbank lending is the largest single form of counterparty exposure between the major UK banks. In total, gross interbank loans and advances were equal to more than twice these institutions' Tier 1 capital at end-2004, up slightly on 2003 (Chart 3.14). Such exposures not only include lending between members of the peer group, but also to other UK-resident banks, such as the subsidiaries of internationally active banks, the large complex financial institutions (LCFIs) discussed in Chapter 2, and smaller UK-owned banks. As noted in Box 6, around 30% of UK-owned banks' ultimate risk foreign claims are against foreign banking sectors.

Bank counterparty exposures can also arise through activities off the balance sheet. These include exposures through over-the-counter (OTC) derivatives, where positive mark-to-market valuations of contracts expose financial institutions to counterparty risk. However, netting and collateral agreements significantly reduce their scale. In 2004, net OTC derivative exposures, which were little changed from 2003, continued to make up only a relatively small share of interbank exposures compared with direct lending between banks (Chart 3.14).

The major UK banks' unconsolidated lending to UK-resident non-bank financial institutions has grown significantly in recent years, and exceeds their global consolidated interbank exposures (Chart 3.14). But these data include intragroup lending not included in the global consolidated interbank lending data. Although exposures to 'other finance providers' are the largest component of lending to UK-resident non-banks (Chart 3.15), much of this lending is to group subsidiaries. The other main exposure is to UK-resident securities dealers, which are subsidiaries of the LCFIs discussed in Chapter 2.3.

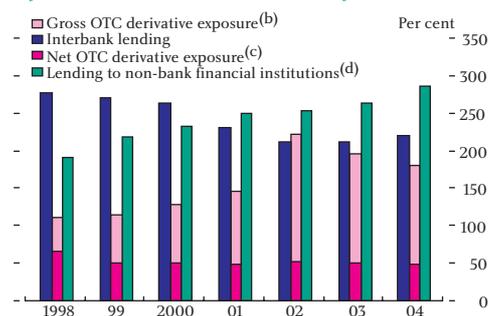
'Large' exposures

Regulatory 'large' exposures data submitted to the FSA captures institutions' total on and off-balance-sheet exposure to major counterparties.⁽²⁾ It shows that, as well as exposures to each other, the major UK banks have significant exposures to LCFIs and internationally active banks (Chart 3.16). However the pattern varies across institutions. For example, exposures to LCFIs are more material for the larger UK-owned banks. Similar large exposure data for the major UK-resident securities dealers show that their large exposures are primarily to other LCFIs, with some exposures to UK-owned banks.

(1) Data on the breakdown of financial institutions' debt holdings of securities are, however, limited. The major UK banks' holdings of debt securities issued by their peers includes CDs, holdings of which are equivalent to around 33% of major UK banks' aggregate Tier 1 capital (for those banks that disclose such figures).

(2) For regulatory purposes, 'large' exposures are defined as any exposures that exceed 10% of eligible capital (Tier 1 plus Tier 2 capital, less any regulatory deductions eg related to insurance subsidiaries) at any point during the reporting period.

Chart 3.14
Major UK banks' selected counterparty exposures relative to Tier 1 capital^(a)



Sources: Bank of England and published accounts.

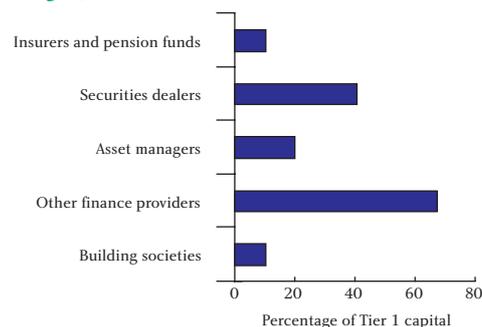
(a) Refers to peer group as discussed in Box 1, page 18.

(b) Gross OTC derivative exposure should be taken as a minimum only; where gross OTC derivative exposure is not disclosed, net exposure has been used.

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

(d) Data includes intragroup lending, converse to the other featured series. Data for selected major UK banks, where data are available.

Chart 3.15
Major UK banks' outstanding lending to UK-resident non-bank financial sectors, 2005 Q1^{(a)(b)}

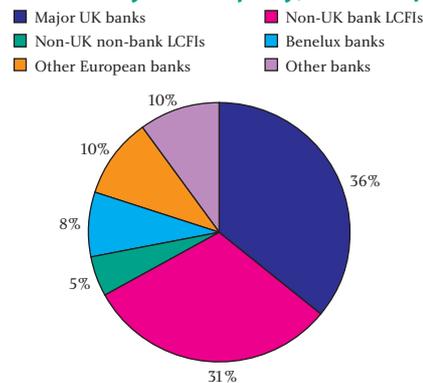


Sources: Bank of England and published accounts.

(a) Refers to peer group as discussed in Box 1, page 18.

(b) Data for selected major UK banks, where data are available.

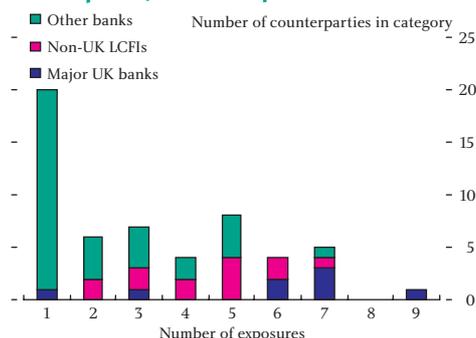
Chart 3.16
Major UK banks' 'large exposures' to banks and LCFIs by counterparty, end-2004^(a)



Source: FSA regulatory returns.

(a) Refers to peer group as discussed in Box 1, page 18.

Chart 3.17
Incidence of common 'large exposure' counterparts, end-2004^(a)

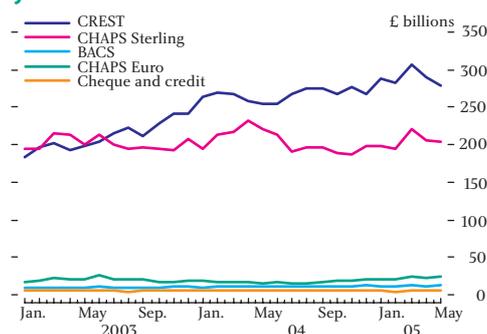


Source: FSA regulatory returns.

(a) Refers to peer group as discussed in Box 1, page 18.

Large exposure data also provide valuable information on the pattern of bilateral counterparty exposures. The number of lenders that have large exposures to a firm may indicate its systemic importance. At end-2004, the ten major UK banks had large exposures to 55 different counterparties. Of these, 20 were counterparties for only one of the major UK banks (Chart 3.17). There were, however, 18 institutions to which five or more of the major UK banks had large exposures. The institutions that appear most frequently on lists of large exposures are the major UK banks themselves and the foreign LCFIs. The major UK banks are therefore linked closely to the major LCFIs, and risks can be transmitted between the two groups of institutions via counterparty exposures and mutual involvement in capital markets.

Chart 3.18
Monthly daily average domestic payments by value



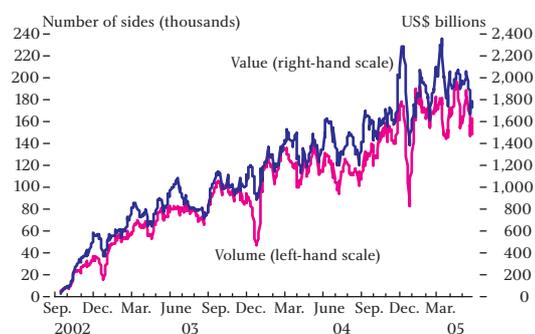
Sources: APACS and CREST.

Payment and settlement system exposures

Many of the major UK banks participate directly in payment and settlement systems, both in the United Kingdom and overseas, giving rise to payment and settlement exposures.

The two largest payment systems by value, CHAPS Sterling (the United Kingdom's large-value sterling interbank payment system) and the embedded payment arrangements supporting CREST (the settlement system for many UK-issued securities) are real-time gross settlement systems (Chart 3.18), so their operation does not give rise to credit exposures between settlement banks. However, in both CHAPS and CREST, there are a small number of settlement, or 'first tier', banks and a larger number of customer, or 'second tier', banks which process their payments through the settlement banks. Exposures can arise if first tier banks extend unsecured credit to the second tier banks for this purpose.

Chart 3.19
Daily volumes and values settled in CLS^{(a)(b)}



Source: CLS Bank International.

(a) Calculated using ten-day moving average.

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

The Continuous Linked Settlement (CLS) system helps reduce foreign exchange settlement risk between system users by settling their transactions on a payment-versus-payment basis. Values of foreign exchange transactions settled in CLS have continued to increase over the past few months (Chart 3.19). Since the previous Review, the number of currencies settled within CLS has increased from 11 to 15, as CLS now settles transactions in the Hong Kong dollar, Korean won, the New Zealand dollar and the South African rand (see Box C in *Strengthening financial infrastructure*).

However, comparing CLS volumes with estimates of total foreign exchange turnover suggests that many foreign exchange transactions are still settled outside CLS.⁽¹⁾ The December 2004 Review noted the interest of central banks and banking supervisors in whether banks are adequately managing the settlement risk that arises in those transactions not settled through CLS.⁽²⁾

(1) The BIS triennial foreign exchange and derivatives survey undertaken in April 2004 indicated that total daily turnover in the global foreign exchange market averaged some US\$1.9 trillion.

(2) Sawyer, D (2004), 'Continuous Linked Settlement (CLS) and foreign exchange settlement risk', Bank of England *Financial Stability Review*, December.

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.

This article concerns measures to ensure that credit risk is managed in such a way that systemic risk is adequately mitigated.

Central banks have long collaborated with supervisors on the design of prudential regulation as a tool for strengthening systemic stability. We report here on the most recent output of that collaboration, the proposals of the BCBS/IOSCO Trading Book Review.

Constructing arrangements to limit credit risks in payment systems also requires co-operation between central banks and regulators. The article describes an arrangement agreed in April 2005 to protect the member banks and users of the United Kingdom's major retail payment systems from potential systemic risk.

The Trading Book Review

The Trading Book Review (TBR) is the product of a joint working group of the Basel Committee and the International Organisation of Securities Commissions (IOSCO). Over the past year, this group has been reviewing the capital treatment of credit and other risks that arise from trading activities, as well as the treatment of credit exposures that are covered by guarantees or credit derivatives. The working group has produced proposals that will bring the treatment of credit risk in the trading book into line with Basel II, and so bridge the gap between Basel II and the current trading book regime established by the 1996 Market Risk Amendment (MRA). The proposals (summarised in Box A) improve the risk sensitivity of minimum capital requirements, and place emphasis on internal models of risk.

The TBR proposals improve the efficiency and effectiveness of capital regulation of trading activities;

and they help to achieve one of the overall objectives of Basel II, by promoting improved risk management techniques. This article discusses particular aspects of the TBR proposals that make an important contribution to the stability of the financial system, and suggests a direction for future work on market liquidity.

Impact on markets for risk

Previous issues of the *Review* have argued that financial stability can be enhanced by the greater dispersion of market and credit risk that is allowed by the growth of markets in such risks. The regulatory authorities should seek to avoid inhibiting the emergence and growth of such markets, whilst also monitoring and mitigating the new risks and vulnerabilities created by new markets. One welcome feature of the TBR is that it removes some regulatory obstacles to the growth of such markets.

The TBR proposals introduce a new internal model approach to measuring counterparty credit risk associated with the use of derivatives. It is based on the concept of 'Expected positive exposure' described in Box A, which is in widespread use in banks' internal risk management. This approach is a great deal more risk-sensitive than the existing one. Not only is it sensitive to the potential credit exposure arising from any individual derivatives transaction, but also to the effect of the important risk mitigation techniques of margining and netting that operate at a portfolio level. As such, at the margin, it makes more attractive the use of derivatives by market participants to manage risks.

Markets in credit risk have facilitated the dispersion of credit risk over the past decade or more. These markets take many forms, including securitisation and

Box A: The Trading Book Review

In June 2004, the Basel Committee on Banking Supervision (BCBS) announced that it would be undertaking immediate work in two areas:

(1) finding a prudentially sound treatment for exposures to 'double default'; (2) applying Basel II to certain exposures arising from trading activities.

Given the interest of both banks and securities firms in these particular issues, the BCBS has worked jointly with the International Organisation of Securities Commissions (IOSCO). The resulting set of proposals,⁽¹⁾ known as the 'Trading Book Review', were issued for public consultation during April and May 2005 and final rules are being prepared in the light of comments received during this consultation period. The proposals cover five areas:

Counterparty credit risk

The treatment of counterparty credit risk in the 1988 Capital Accord is crude and insensitive to risk. It estimates the exposure-at-default (EAD) in a position as the current exposure plus an add-on deemed to reflect the potential future exposure. The Trading Book Review introduces two new, more risk-sensitive approaches to estimating EAD: an internal model approach using the concept of expected positive exposure (EPE); and a new standardised approach which is intermediate between the internal model method, and the existing approach.

The EPE internal model approach estimates the distribution of mark-to-market valuations of future exposures to an individual counterparty by simulating the evolution of all relevant market risk factors over time. It can take full account of margining and netting agreements.⁽²⁾ An overall multiplier is applied to the output of the EPE model, to account for general model risk, and for particular risks that the model is known not to capture.

Double default

The Basel II framework allows firms to use the so-called 'substitution approach' for capital treatment of guaranteed transactions.⁽³⁾ This

approach does not capture well the economic risk of default.

The Trading Book Review proposals identify a range of guaranteed transactions where there is a limited risk of a high correlation existing between the default of the obligor and the default of the guarantor. For these transactions, a 'double default' treatment will be allowed. Capital requirements will be calculated according to a simple formula that has been fitted to the output of an extension of the asymptotic single risk factor (ASRF) model that underlies the internal ratings based (IRB) approach in Basel II. The extension estimates the probability that, in a macroeconomic downturn, both obligor and guarantor will default.

Maturity adjustment

The Trading Book Review has not made substantial changes to the treatment of short maturity exposures. There is some clarification of the scope of short-term transactions that qualify for some limited capital reduction on account of their maturity.

Improvements to the current trading book regime

The Trading Book Review seeks to improve the risk sensitivity of methods for assessing risks within the trading book. The proposals follow the Basel II framework.

The Pillar 1 changes aim to clarify the types of exposures that qualify for a trading book capital charge, provide further guidance on prudent valuation and stress testing, and clarify and strengthen modelling standards. These include:

- stronger, more explicit requirements for prudent valuation methods for trading book positions that take account, in particular, of the potential liquidity of the market for those positions; and
- an explicit requirement for banks using internal models for specific risk⁽⁴⁾ associated with the credit

(1) 'The Application of Basel II to Trading Activities and the Treatment of Double Default Effects'. www.bis.org/publ/bcbs111.pdf.

(2) Recognition of netting is subject to certain legal and operational requirements that are designed, *inter alia*, to deliver sufficient certainty over the legal enforceability of the agreements in all relevant jurisdictions. The Committee does not consider that cross-product netting agreements currently meet these requirements.

(3) Firms using IRB may adjust the probability of default or loss given default to reflect the benefit of the guarantee, provided only that the resulting capital requirement may not be lower than the requirement for a comparable direct exposure to the guarantor.

(4) Specific risk is the risk of an adverse movement in the price of a security owing to factors related to the individual issuer.

quality of securities issuers to model default risk to a soundness standard consistent with that of the Basel II IRB-approach for credit risk, ie a one-year horizon and 99.9% confidence.

The Pillar 2 changes seek to strengthen firms' assessment of their internal capital adequacy for market risk. To improve the robustness of trading book disclosures in Pillar 3 of the Revised Framework, it is proposed that banks also disclose, amongst other things, the internal capital allocation for the trading portfolio and the soundness standard used for modelling purposes.

credit derivative markets. Much effort in the construction of Basel II has gone into a new, risk-sensitive treatment of securitisation. The TBR proposals introduce the 'double default' treatment for credit risks that have been transferred by using guarantees or credit derivatives. This treatment brings capital regulation closer to an accurate reflection of the 'two-name' credit risk that remains in such positions. This should reduce the regulatory incentive to prefer 'single-name' to 'two-name' credit risk.

The TBR proposals are a significant step towards supporting financial innovation by reducing regulatory distortions. However, in calibrating both the counterparty credit risk and double default proposals, the working group has proposed conservative values for certain parameters in the underlying models. This is a justified reaction to limitations of the data available for calibrating the models and uncertainty over their accuracy under stressed conditions, as was noted in the December 2004 *Review*. But this conservatism does have an impact on incentives — 'two-name' credit risk is still subject to a harsher capital treatment than 'single-name' risk, relative to the risk indicated by the respective models.

In future, firms and regulators will be able to improve the effectiveness of the TBR proposals by working to reduce the underlying uncertainties within the models, and hence reduce the need for conservatism. The ultimate goal should be to eliminate altogether the remaining regulatory distortions in the markets for risk transfer.

Unsettled and failed trades

The Trading Book Review proposals set out a uniform treatment of capital requirements for unsettled and failed trades that seeks to reflect the credit risks they create, and to encourage orderly markets. Higher capital requirements are required for transactions that are not settled on a delivery versus payment basis. This reflects the potential credit exposure that could arise if a seller delivers a security but does not receive payment in a timely manner, or *vice versa*.

Market liquidity and capital requirements

A new aspect of the proposals for improvements to the trading book regime is that capital standards for individual risks held by a bank should depend on the liquidity of the markets for trading those risks — in short, the liquidity of those risks.

The proposals are a reaction to the limitations of the soundness standard implemented by the Market Risk Amendment (MRA) in the face of the changing nature of risks in the trading book, and in particular the trend towards the inclusion of less liquid risks. There is an implicit assumption in the MRA that firms will always be able to sell or hedge the risks in their trading books in a short period of time. The inclusion of less liquid risks in the trading book renders this assumption unsound.

In response to this, the TBR proposals include two new elements to address liquidity in financial markets. The first is a requirement for banks to make valuation adjustments, taking into account, amongst other factors, the potential costs of selling or hedging less liquid positions under normal market conditions. These include the consequences of being unable to sell or hedge within a ten-day period, and so having to bear market risk for longer than envisaged by the MRA. The second element is a requirement that the assessment of internal capital adequacy, under Pillar 2 of the Basel framework, covers potential liquidity risk under stressed market scenarios.

These measures will strengthen banks' resilience to losses incurred on less liquid positions during normal and turbulent market conditions. They are a welcome safeguard against the consequences of potential

market dislocations of the type that have been identified in this and previous *Reviews*. However, they do come at a price, which is the divergence of regulatory and accounting valuations, and a corresponding loss of transparency and increase in reporting burden. This is one reason for seeking alternatives to valuation adjustments in the future development of regulation. The remainder of this section presents a possible direction for future work on market liquidity and capital requirements.

Consider the ways in which a firm can react if, as a result of a shock, its capital falls below the level needed to support the risks which it is currently holding. In the short term, it can sell risks in risk transfer markets, in order to bring its capital ratio back to the necessary level. In the long term, it can achieve the same effect by raising new capital. It is implicit in the current regulatory architecture that the former reaction is desirable for trading book risks, and the latter for banking book exposures: this is apparent in the very different assumptions about holding periods and confidence levels that are embedded in the MRA and in Basel II.

From a systemic viewpoint, however, one of the goals of regulation is to safeguard the continued ability of the financial system as a whole to meet the real economy's demand for intermediation between investors and borrowers, and other financial services. The risks that banks hold arise from intermediation: credit risk corresponds to intermediation between borrowers and investors; the market risks that arise from trading activities reflect intermediation between individuals or businesses with differing risk preferences. In the event of a shock or economic downturn, banks will decide between liquidating risks or recapitalising in order to be able to continue to hold risks. The desirable reaction is dictated by the ability of other banks, or indeed agents outside the financial system, to take on those risks, and thus maintain the supply of intermediation.

This is the link with market liquidity. The liquidity of a risk is defined as the liquidity of the market that can be used to gain or hedge exposure to that risk. Risks are the fundamental objects that banks trade and manage. Some of these risks arise from holding (or shorting) assets, many others arise from derivatives contracts. Although the market in a particular asset or derivative contract might be illiquid, some or all of the risks that that position

represents might still be liquid. A seasoned interest rate swap, for example, is illiquid, as is the counterparty credit risk in it, but the interest rate risk in it is usually liquid. The liquidity of a risk defined in this way can be viewed as a measure of the readiness of other agents (within or outside the financial system) to substitute for the intermediation function associated with that risk. If a risk is illiquid, it is hard to find another bank (or agent) able to supply the corresponding intermediation function. Regulation therefore needs to control the probability that the firm will be forced, in response to a shock, to liquidate that risk, which means imposing a high confidence level and a long horizon. If, by contrast, a risk is highly liquid, there are many agents, probably including many outside the financial system, who are willing to take on the risk, and provide the corresponding intermediation function. Regulation need only ensure that the original firm is able to bear short-term market risk whilst liquidating its position.

The liquidity of a risk is therefore a guide to the appropriate confidence level and horizon to apply for calculating capital requirements. Indeed, although two extremes have been described, liquidity is not a binary variable: it varies continuously across risks, and across varying market conditions. A concern raised in *The financial stability conjuncture and outlook* in this and previous *Reviews* is that there is a class of risks which appear liquid under normal market conditions but for which the market is restricted to a limited number of financial intermediaries. Under stressed conditions, such markets may become illiquid. If the goal of regulation is that the financial system as a whole will be able to continue to hold such risks under stressed conditions, then a rather high soundness standard needs to be applied at the level of the individual firm to the calculation of capital requirements for such risks. The extent to which that soundness standard differed from the stringent one applied to illiquid credit risks would depend on the extent to which regulators could have confidence in the maintenance of even a restricted market for such risks under stressed conditions.

In summary, further consideration might be given to developing a common approach for both banking and trading book positions that uses the liquidity of a risk to determine the confidence level and horizon that should be used to calculate the capital requirement for that risk. This approach would provide an

alternative to valuation adjustments as a way of handling risks for which liquidity lies between the two extremes envisaged by the current banking and trading book treatments respectively.

The beginnings of such an approach can be seen in the proposal that firms should adopt a consistent soundness standard for credit risk (equivalent to the 99.9% confidence and one-year horizon standard established by the Basel II internal ratings based (IRB) approach), whether the credit risk is held in the banking or trading book. This is an important innovation. It acknowledges that, whilst the particular credit risks held in individual trading books change frequently, when aggregated across all financial firms, the total amount of credit risk reflects a material contribution to the provision of financial intermediation by the financial system. Capital held by the system in aggregate needs to be sufficient to support that continuing contribution.

Managing risks in deferred net settlement systems: theory and practice

Many of the world's higher-volume payment systems settle on a 'deferred net' basis. In these systems, all the payments over a given period are summed and only the net amount owed by (or to) a member bank is paid (or received) at the end of that period. Compared with immediate or 'real-time' gross settlement of each and every payment, deferred net settlement can be operationally more practical and can reduce the amount of liquidity that the member banks of a payment system need to allocate to that system. One downside is, however, that banks receiving payments on behalf of their customers have often begun or completed the process of crediting customer accounts before they have received any net amount owed to them, thereby exposing them to risk *vis-à-vis* other members of the system.

In the United Kingdom, settlement takes place on a deferred net basis in the BACS and Cheque and Credit Clearings (C&CC), for US dollar transactions in CREST,⁽¹⁾ for LINK, and for the Visa, MasterCard and Maestro card payment schemes. For CREST US dollar transactions and, until August this year, in the Maestro scheme, settlement takes place on a *bilateral net* basis, with the net position between each pair of settlement member banks settled separately

every business day. For the other systems (and from August 2005 for Maestro) all these bilateral positions between settlement members are themselves summed to produce a single *multilateral net* position in which each member either has a net debit or net credit position *vis-à-vis* the other members of the system as a whole.

Multilateral netting can reduce credit risk. For example, if an insolvent bank was in a multilateral net credit position *vis-à-vis* the system, the other members of the system would collectively have no credit exposure to it. Under bilateral netting, by contrast, at least some members could be creditors of the insolvent bank and would thereby have an open exposure.

One difficulty with multilateral net settlement, however, is how to complete settlement in the event of a default by a bank in a net debit position. In this situation, no pay-outs at all can typically be made unless there is a rule to determine how the shortfall in funds and potential loss arising from the defaulting member's failure to pay will be shared across the system. Irrespective of the size of the defaulting member's debit position, settlement will fail. Some banks expecting large net receipts may temporarily receive nothing because of even a small net debtor's failure to pay. If they were planning to use the incoming payment to meet their own obligations, non-receipt could expose them to liquidity risk. Failure to settle also gives rise to operational risk. There may, for example, be prolonged operational disruption if the system has to be closed until settlement has completed.

These risks are, by their nature, systemic. And it is for this reason that the CPSS Core Principles for Systemically Important Payment Systems require that a system in which multilateral netting takes place should have an arrangement to ensure the timely completion of settlement in the event that the member with the largest single net debit settlement obligation is unable to settle.⁽²⁾

A theoretically optimal loss-sharing arrangement

There are three main ways in which it is theoretically possible to deal with a failure to pay by a net debtor in a deferred net settlement system.

(1) Sterling and euro transactions in CREST are settled gross and in real time rather than on a deferred net basis.

(2) The CPSS is the Committee for Payment and Settlement Systems of the G10 central banks. For further details of Core Principle V see www.bis.org/publ/cpss43.pdf and footnote 1 on page 86 of this Review.

Reversing credits to customer accounts

Individual credits to customer accounts can, at least in theory, be reversed. But even if this is possible under contractual agreements between the bank and its customers and applicable national law, reversing credits that have already been made is likely to be operationally difficult or expensive if a significant volume of transactions is involved. It may also carry a high reputational risk for banks. For these reasons, it is unlikely to be acceptable.

Defaulter-pays models

The defaulting settlement member can be made to pay in full (or in part) by requiring full (or partial) collateralisation of net debit positions. If collateral is in a form which is sufficiently liquid even in a crisis, full collateralisation can effectively remove both credit and liquidity risk. But depositing collateral has an opportunity cost, either because the member bank would not otherwise have chosen to hold the assets eligible to be used as collateral, or is unable to use these collateral assets to support other activity. Furthermore, in some net payment systems, it is not practical to put a limit on the size of net debit positions. For example, banks do not have direct control over the total value of cheques written by their customers. In such cases, it may not be possible to achieve full collateralisation. In each payment system, there will be an optimal balance between, on the one hand, reducing risks by requiring collateralisation of positions and, on the other, limiting the opportunity costs of providing collateral.

Survivors-pay models

To the extent that net debit positions are not fully collateralised, credit risks remain. If liquidity is needed to complete settlement, this must be provided from a source other than the defaulter, and the potential losses from the unpaid debit position will need to be shared in some way, normally between surviving members of the system. Some different models for dividing losses are explored in Box B. If losses fall on those members that have underlying bilateral net credit positions *vis-à-vis* the defaulter on

the day of default, credit risk exposure may be concentrated on just a few members. Alternatively, losses could be mutualised in some way, making exposures less concentrated. To the extent that member banks are able to control their bilateral exposure *vis-à-vis* other members, mutualisation may, however, reduce the incentive to do so.⁽¹⁾

A practical solution in the United Kingdom's BACS and Cheque & Credit Clearings

In April 2005, the settlement banks in BACS and C&CC agreed a default arrangement — the *Liquidity Funding and Collateralisation Agreement* — covering these payment systems. It has both a defaulter-pays and survivors-pay element. The Bank's *Payment System Oversight Report 2004* describes how this Agreement will enable BACS and the C&CC broadly to satisfy some of the Core Principles for Systemically Important Payment Systems.⁽²⁾

The defaulter-pays element

Each settlement member contributes collateral in proportion to a measure of the risk it brings to the BACS and C&CC systems.⁽³⁾ The total collateral pool is sized so that it is equal to the largest of the aggregate debit positions of any member over the preceding year — currently a little over £2 billion. In practice, this means individual collateral pool contributions are sufficient fully to cover around half of each individual member's observed debit positions, recognising the trade-off between eliminating credit risk and the opportunity cost of collateral.⁽⁴⁾

The survivors-pay element

In the event of one member's failure to pay, each other member is contractually committed to provide 'liquidity funding' in order to allow settlement to complete. Each member's commitment is proportional to the measure of the risk it brings to the system, up to an individual cap which, when combined with that of other survivors, is sufficient to cover the largest aggregate debit position of any member over the preceding year. In other words, the liquidity commitment is calibrated to the scale of the systemic risk, and each participant's contribution is

(1) Some credit positions may, for example, relate to repayments on loans extended by one member bank to another, but in many retail systems the position is likely to reflect payments to a bank's customers which the receiving bank cannot directly control.

(2) www.bankofengland.co.uk/publications/psor/psor2004.pdf — page 33.

(3) The measure used is the average of the sum of each member's net debit positions in both systems across all three-day periods in a preceding reference year (its 'aggregate debit position'), plus one standard deviation. The central bank, which brings no financial risk to the system, is not required to provide collateral. The Bank of England has, however, agreed to act as security trustee for the collateral.

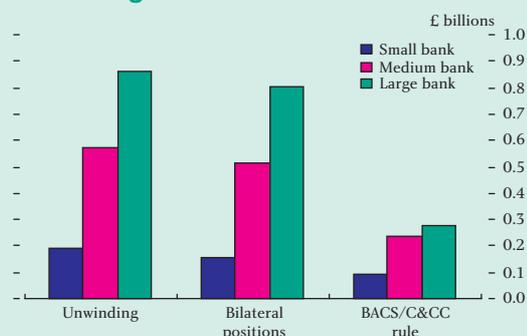
(4) By accepting a range of collateral that includes securities that many banks already hold in their asset portfolios, by setting this range more widely than that eligible for use to raise intraday liquidity to support payments activity in the CHAPS system, and also by ensuring that any eligible assets in the pool can continue to count towards end-of-day regulatory liquidity requirements, the opportunity cost of collateral has been kept low.

Box B: Loss-sharing methods in multilateral net payment systems

Losses arising from a default in a multilateral payment system could theoretically be shared in any number of ways. Charts A and B show simulated loss-sharing according to three feasible methods in a model system with member banks of different size (small, medium and large). It is based on bilateral positions drawn from normal distributions. The results from the repeated simulations are calibrated so that the maximum multilateral net debit position is £2 billion. The losses calculated assume that banks do not post collateral to cover their debit positions, so there is no element of defaulter pays.

In the absence of any arrangement to share losses, it may be necessary to remove payments involving the defaulter and recalculate the multilateral net position among survivors only ('unwinding'). This negates the credit-risk benefit of multilateral netting and is likely to increase the aggregate exposure of surviving members of the system to the defaulter. Charts A and B show that the largest losses occur under unwinding.

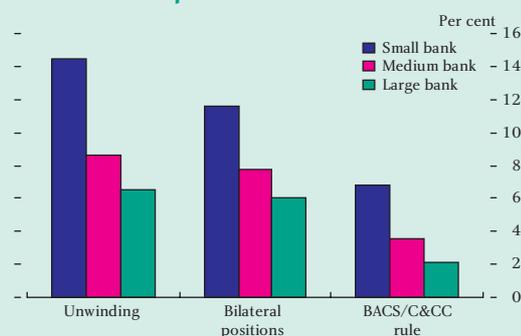
Chart A
Individual banks' maximum losses in simulated loss-sharing rules



Source: Bank calculations.

Alternatively, the multilateral netting may be preserved and losses arising from the multilateral net shortfall shared in proportion to the defaulter's bilateral net debit positions *vis-à-vis* the survivors on the day of default ('bilateral positions'). This preserves the credit risk reduction of multilateral netting, but can still result in an uneven distribution of losses. In the worst cases in the simulations, banks of all three sizes lost only slightly less than under unwinding.

Chart B
Individual banks' maximum simulated losses as a share of capital



Source: Bank calculations.

The BACS/C&CC loss-sharing rule ('BACS/C&CC rule') incorporates an element of mutualisation. Each surviving bank pre-commits to share in any loss in proportion to the risk that it routinely brings to the system even if, on the day of a default, it is not a net receiver of payments from the insolvent member. The simulation indicates how the BACS/C&CC rule reduces the probability of large losses for individual banks in monetary terms as well as in proportion to capital. The reduction in maximum losses for individual banks implied by this rule is considerable by comparison with unwinding or sharing losses according to bilateral positions. This reduces the risk that a default in the clearings could significantly deplete the capital of one of the other member banks, thereby mitigating the systemic risk of contagion. In terms of reducing systemic risk, the arrangement is superior to distributing losses according to bilateral positions on the day.

scaled by a measure of their marginal contribution to this systemic risk. This approach has theoretical appeal. It is also designed with reference to the benchmark recommended in Core Principle V.⁽¹⁾

Liquidity funding is called regardless of whether the defaulter's collateral is sufficient to repay this funding. This collateral would not be sold immediately as a more orderly liquidation is considered likely to result in a higher return than a 'firesale'. If the proceeds of collateral sale are sufficient to repay the liquidity funding, no credit loss is incurred by survivors. But to the extent that collateral proceeds are insufficient to repay liquidity funding, survivors are left with a potential loss proportional to the measure of the risk they bring to the system. Box B shows how this loss-sharing rule compares with other possible rules in terms of limiting systemic risk.

The effects of the Agreement

The *Agreement* helps to ensure that settlement could complete in the event of a default in the BACS or C&CC systems. It thereby protects the public from the disruption the closure of these systems would cause. By putting in place an element of defaulter pays, it mitigates the exposure of the member banks of these systems to credit risk. As Box B shows, it also makes the exposure of individual banks to such a default less potentially uneven and volatile than with some other loss-sharing rules. Although the size of net exposures in BACS and the C&CC is not on its own sufficient to threaten the survival of their member banks, exposures in these systems may be unpredictably high in a crisis situation. Both for this

reason, and because it helps to keep the payment systems open following a default, the BACS and C&CC *Agreement* reduces systemic risk.

In designing the *Agreement*, the Bank and member banks of the clearings co-operated with the FSA to ensure that the risk-reducing arrangement, and the guarantees of liquidity funding that underpin it, do not incur a capital charge. The Bank also worked with the FSA to ensure that assets held as part of the collateral pool could continue to count towards prudential liquidity requirements under current regulations. This helps to reduce the opportunity cost of providing that collateral.

Conclusions

This article has described two areas where co-ordination and co-operation between regulators of financial firms, central banks responsible for financial stability and the oversight of payment systems, and the financial industry, has achieved positive results. There are many other areas where such joint work is desirable. Examples include: understanding the impact of liquidity regulation, including its effect on payment systems; establishing arrangements for the effective regulation and oversight of firms that operate across borders; and ensuring the appropriate management of foreign exchange settlement risk.⁽²⁾ Taking these issues forward will continue to require effective co-operation between regulators and overseers, including in the relevant international committees, such as the Basel Committee on Banking Supervision and the Committee on Payment and Settlement Systems.

(1) 'A system in which multilateral netting takes place should, at a minimum, be capable of ensuring the timely completion of daily settlements in the event of an inability to settle by the participant with the largest single settlement obligation.'

(2) Progress on some of these issues is reported in Box C, while more detail can be found in previous *Reviews*. For a discussion of foreign exchange settlement risk, see the December 2003 *Review*, page 91, and December 2004 *Review*, pages 86–92. The June 2004 *Review*, page 69, considers how best to regulate and oversee financial infrastructure firms that provide cross-border services.

Box C: Update on initiatives in the financial infrastructure

Issue	Significance	Progress
International Accounting Standards	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 ensuring reliable information is provided to users of financial statements. ⁽¹⁾	On 19 April, the International Accounting Standards Board (IASB) voted in favour of a revised specification of the fair value option in the International Accounting Standard for the measurement of financial instruments (IAS 39). The option allows certain instruments to be measured at fair value rather than at amortised cost. As noted in the December 2004 <i>Review</i> , the European Union (EU) adopted a version of IAS 39 in November 2004 which included two carve outs from the IASB standard. The IASB decision should lead to the removal of the EU carve out which prohibits use of the option to fair value liabilities.
European Union Capital Requirements Directive	Bank capital requirements help to mitigate the moral hazard and externalities inherent in banking activities. It is hoped that one of the major benefits of the more risk sensitive Basel II framework will be the strengthening of banks' risk management practices across the EU.	The Basel II Framework is being implemented in the EU through the Capital Requirements Directive (a recasting of two existing banking directives). Agreement was reached among national finance ministries at the 7 December 2004 ECOFIN and the Directive text is now being considered by the European Parliament. In the United States, the results of a Quantitative Impact Study (QIS4) have led the regulatory agencies to postpone their Notice of Proposed Rulemaking scheduled for mid-2005. However, the United States is continuing to target 1 January 2008 for final implementation.
Definition of capital	Ensuring the integrity of the capital buffer and working towards its common application across the EU represents a significant financial stability objective. Effective capital design can help prevent losses from resulting in insolvency, enhances market discipline and protects insured depositors.	The European Commission Working Group on Own Funds has started its preparations to be able to contribute to the Basel review of regulatory capital, which is expected to commence in Summer 2005. The Working Group is considering what the guiding policy, principles and concepts behind the revision of the definition of own funds should be. Technical and specialist advice will be provided by the Committee of European Banking Supervisors.
Supervision of multinational institutions	Ensuring effective and efficient arrangements for the supervision of cross-border institutions and infrastructure is central to managing potential risks as financial services markets become more integrated.	Recent contributions to the debate on the appropriate model for supervision of cross-border firms have come from the UK tripartite paper on the EU financial services market, ⁽²⁾ a report on co-operative oversight by the Committee on Payment and Settlement Systems of the G10 central banks ⁽³⁾ and the Commission's Green Paper on the Post-FSAP agenda. ⁽⁴⁾

(1) The impact of accounting standards on financial stability was discussed in Michael, I, 'Accounting and financial stability' in the June 2004 *Review*.

(2) www.bankofengland.co.uk/publications/other/europe/fsapjan05.pdf.

(3) www.bis.org/publ/cpss68.pdf.

(4) www.europa.eu.int/comm/internal_market/finances/actionplan/index_en.htm#actionplan.

Issue	Significance	Progress
Co-operative regulation and oversight of the LCH.Clearnet Group	The two central counterparties within the LCH.Clearnet Group (LCH.Clearnet Ltd and LCH.Clearnet SA) play a key role in reducing risks in the financial markets they serve. The national authorities responsible for regulation and oversight of these central counterparties need to ensure the Group as a whole is managing risk appropriately.	The eleven authorities, including the Bank and FSA, involved in regulation and oversight of LCH.Clearnet Group or one of its subsidiaries, signed a Memorandum of Understanding (MoU) in February 2005. The MoU establishes a framework for co-operation between the authorities to enable effective supervision and oversight while seeking to avoid unnecessary burdens on the Group as a whole.
Bank of England provision of concentration bank services to LCH.Clearnet Ltd.	The payment arrangements through which LCH.Clearnet Ltd collects and disburses the margin funds its members must provide involve the concentration of funds on unsecured deposit. Transferring the concentration bank role to the Bank of England will remove any risk that the concentration bank might itself be unable to provide funds in a financial crisis situation.	The Bank and LCH.Clearnet Ltd have agreed that the Bank will later this year become concentration bank for LCH.Clearnet Ltd's sterling and euro payments. As part of the project, the timing for collection of margin payments from member banks has been tightened, reducing the duration of the central counterparty's settlement exposures to its members and the banks involved in its payments arrangements. By reducing unnecessary risk exposures of LCH.Clearnet Ltd, this benefits all institutions that seek to reduce risk by using the central counterparty.
Co-operative regulation and oversight of the Euroclear Group	<p>The Euroclear Group comprises the national Central Securities Depositories (CSDs) for the United Kingdom, France and the Netherlands as well as the international CSD, Euroclear Bank.</p> <p>The operational reliability of CSDs is fundamental to both financial stability and to the implementation of monetary policy operations.</p>	<p>The new Euroclear Group corporate structure came into effect on 1 January 2005. A Memorandum of Understanding for co-operative regulation and oversight of Euroclear SA has been signed by all relevant authorities including the Bank and FSA. This framework is also being translated into a detailed programme of work, including monitoring of the two key IT projects being undertaken by the Group — the building of a Single Settlement Engine (SSE) and the development of the Group's data centres (both projects to go live in 2006).</p> <p>The Bank is working closely with CREST on the migration of CREST processing to the SSE, and with Euroclear and other affected central banks on the plans to integrate central bank money settlement of securities transactions within the SSE.</p>

Issue	Significance	Progress
Co-operative oversight of SWIFT	SWIFT is an industry-owned co-operative providing secure messaging services to over 7,600 financial institutions and 100 market infrastructures in 203 countries. SWIFT is a fundamental part of the global financial infrastructure. More SWIFT traffic is sent from the United Kingdom than from any other country.	SWIFT is overseen through a co-operative arrangement involving all the G10 central banks and led by the National Bank of Belgium (NBB). ⁽¹⁾ Between September 2004 and February 2005, the NBB and each of the other G10 central banks finalised Memoranda of Understanding covering information-sharing arrangements and the relationship between them in respect of SWIFT oversight.
Foreign exchange settlement risk and CLS	The CLS (Continuous Linked Settlement) system significantly reduces settlement risk in foreign exchange transactions.	<p>Foreign exchange transactions involving four new currencies (the Hong Kong dollar, Korean won, New Zealand dollar and South African rand) started settling in CLS in December 2004, bringing the total number of currencies in the system to 15.</p> <p>The December 2004 <i>Review</i> described how a large proportion of foreign exchange settlement was still taking place outside CLS. Although there has since been some increase in participation in CLS and the values settled through the system, G10 central banks continue to assess the case for further action to ensure the success of the G10 strategy to reduce foreign exchange settlement risk, and to take a particular interest in how this risk is managed for transactions that are not settled through CLS.</p>
Shorter clearing cycles	The United Kingdom's three-day clearing cycle for the majority of both electronic and paper-based retail payments is longer than in most other G10 countries. In addition to benefits to bank customers, shorter clearing cycles would shorten the duration of exposures between settlement banks and so lower aggregate settlement risk.	The banking industry has agreed, following discussion in the OFT-chaired Payment Systems Task Force, to reduce clearance times for certain types of electronic payments. A Task Force Working Group report, published in May, ⁽²⁾ identified demand for a faster retail payment service and recommended the introduction of a new same-day or next-day clearing cycle for certain payments. APACS, the UK payments association, has established an 'Implementation Group' to determine how the new service will work in practice and report back to the Task Force by end-2005. The industry plans to introduce the new service within a further two years of that date.

(1) Further details of oversight arrangements for SWIFT may be found in the NBB's 2005 *Financial Stability Review*.
(2) www.ofc.gov.uk/NR/rdonlyres/6A1BE3AB-F702-4292-84C9-D59BE816E966/0/ofc789b.pdf.



Resolving sovereign debt crises: the market-based approach and the role of the IMF

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Resolving sovereign debt crises occasionally requires renegotiation of debts to private creditors, typically in conjunction with an IMF programme. Market mechanisms to facilitate debt renegotiations have improved in recent years but more needs to be done to make the process efficient and equitable. IMF policies specifying the circumstances in which the Fund can lend set the context for debt restructuring negotiations; these policies need to be improved before the market-based approach to crisis resolution can work effectively.

SOVEREIGN DEBT CRISES in emerging market economies are not unusual and often impose significant costs on the parties directly involved. Moreover, historical episodes such as the Barings crisis in the 1890s, the Latin American debt crises of the 1980s, and the collapse of LTCM in 1998 show that sovereign debt crises also have the potential to catalyse instability in the global financial system.

The challenge in restructuring sovereign debts

Restructuring sovereign debts to private creditors has always been a difficult and time-consuming process. In the absence of a formal restructuring mechanism, the process has evolved as the nature of the sovereign debt market has changed. Private markets and the official sector have had to respond ‘on the run’ to specific problems thrown up by each new case.

Any mechanism for restructuring sovereign debt has to deal with several inherent features of the market including:

- limited ability to enforce debt contracts;
- weak inter-creditor co-ordination; and
- information asymmetries.

Each of these features is a matter of degree and is present to some extent in other debt markets as well.

Box 1 explains the particular effects they have on the resolution of sovereign debt crises.

In 2002, the IMF proposed the creation of a Sovereign Debt Restructuring Mechanism (SDRM) to act as a formal resolution framework. Several forms of the SDRM were developed, all based around the use of statutory powers to implement a debt restructuring embedded within an IMF programme.⁽¹⁾ When the SDRM failed to attract sufficient support, attention turned instead to enhancing market mechanisms in order to improve specific aspects of the crisis resolution process — the so-called ‘market-based approach’.

Pursuit of the market-based approach, though, does not imply that the IMF has no role to play in resolving sovereign debt crises. Indeed, since the onset of the 1980s Latin American debt crises, official sector policies and actions have exerted significant influence over the incentives of sovereign debtors and private creditors, both before and during a debt restructuring.

One objective of IMF programme support for member countries experiencing debt servicing problems is to overcome the inefficiencies created by the lack of an effective framework for dealing with sovereign debt crises. In negotiations with a member over the conditionality associated with a programme, the Fund typically sets out the financial parameters for

(1) For an overview of the SDRM proposals, see Krueger (2002).

Box 1: Structural features of the sovereign debt market

Enforcement

The existence of any debt market relies on some means of ensuring that borrowers have an incentive to repay and/or creditors can recover value after default. Without this, creditors would refuse to lend, and the market would collapse.

For corporate debt, contract law and domestic bankruptcy and insolvency procedures provide a legal framework for effective enforcement. If a corporate debtor fails to repay, then its creditors can seize and sell the borrower's assets, thus creating a powerful incentive to repay. A sovereign state, by contrast, is not subject to a higher power that can transfer value from borrower to lender. Using military force to support creditors' claims (so-called 'gunboat diplomacy'), as occurred in, for example, Guatemala in 1913, is no longer acceptable. An implication of this lack of a higher power, highlighted by Eaton and Gersovitz (1981), is that it is *willingness* rather than *ability* to pay which is a defining characteristic of sovereign debt.

Therefore, while an international bankruptcy court could establish a legal framework for sovereign debt restructuring, it would still lack the enforcement powers of a domestic bankruptcy system. In practice, creditors have little difficulty in securing court judgements ordering the sovereign to repay after a default. But enforcing these judgements is much more difficult because the principle of sovereign immunity severely constrains the ability of creditors to seize sovereign assets held in foreign jurisdictions. Litigation in foreign courts can, however, impose a financial cost on a sovereign debtor and act as an incentive to repay. For example, a sovereign debtor may be forced to engage legal advisors or redirect international payment flows to avoid their seizure by judgement creditors. A sovereign acting unreasonably should expect to face a large number of law suits. But, as in a domestic context, litigation is an inefficient way of applying market discipline because it imposes deadweight costs on both sides.

This lack of contract enforceability has important consequences for the sovereign debt market. It

curtails, for example, borrowing on a collateralised basis because pledged assets have limited value unless they can be seized with certainty. It is also very difficult, if not impossible, to implement a seniority structure in sovereign lending.

Another important implication of limited enforcement is that sovereign debts are restructured by negotiation rather than adjudication. The outcome of these negotiations is critically dependent on the relative bargaining strengths of the two sides, which in turn depend on the costs of not concluding a restructuring deal. Other things being equal, the higher the cost to debtors of failing to secure a deal, the more advantageous is the bargaining position of creditors (and *vice versa*).

In this regard, economic theory has struggled to explain what costs sovereign debtors incur when outstanding debts are not resolved.⁽¹⁾ Eaton and Gersovitz (1981) argue that countries with unresolved debts are excluded from international markets and cannot borrow money to smooth out future shocks. Bulow and Rogoff (1989) suggest that sovereigns with unresolved debts face restrictions on their international trade. Cole and Kehoe (1996) emphasise the wider costs to a sovereign's reputation of breaking a contract. Dooley (2000) rejects all these arguments, suggesting instead that it is the direct economic cost to debtors associated with default that gives the incentive to resolve debts.

The question of why sovereigns repay and renegotiate is crucial because it sets a limit on what the official sector can do to alleviate the cost of a crisis. Interventions which raise the risk of default ultimately increase the cost of borrowing to the debtor and may lead to the exclusion from debt markets of sovereigns perceived to be high credit risk.

Inter-creditor co-ordination

The outcome of a sovereign debt restructuring and the efficiency of the process by which agreement is reached are also affected by the extent to which creditors can co-ordinate their actions.⁽²⁾ Collectively, creditors are best off if a comprehensive

(1) Eaton and Fernandez (1995) provide a comprehensive review of the literature on sovereign debt.

(2) See Buchheit and Gulati (2002) and Haldane *et al* (2005a).

agreement can be reached in which the debtor agrees to pay the maximum amount consistent with medium-term debt sustainability. In theory, this could be achieved if a representative creditor with full information makes a ‘take-it-or-leave-it’ offer to the debtor.

But individual creditors, acting independently, can have an incentive to ‘hold out’ during the restructuring phase in the hope of securing more favourable treatment once a deal has been agreed with the majority of creditors. If the overall acceptance rate is sufficiently high and debt sustainability is restored, then the debtor may still have sufficient scope to pay a small group of hold-out creditors in full on the original terms. The debtor’s incentive to pay hold-outs in full is increased if the hold-outs can credibly threaten to disrupt or delay any deal through legal action. In all recent cases excluding Argentina (where it is too early to tell), debtors have found it prudent either to re-open their offers or pay hold-out creditors in full.

However, this is not a sustainable strategy. If hold-outs are paid in full, and those accepting take a hair-cut, then hold-out behaviour will increase. The hold-out strategy is individually rational but (potentially) self-defeating because debt sustainability cannot be restored if the acceptance rate is too low.

Creditors also have a collective interest to deny market access until a debtor has made an acceptable offer. But individual creditors have an incentive to lend if the interest rate is high enough because new loans are outside the restructuring process.

Available information

During restructuring negotiations, the bargaining strategies of a sovereign debtor and its creditors will be influenced by the amount of private information available to each party. Sovereign debtors might know more about the future prospects for the economy and creditors might know more about the cost of undertaking legal action. Rubenstein (1985) shows that incomplete information of this kind can lead to prolonged restructuring negotiations because it is rational for both parties to attempt to exploit any informational superiority. Both sides will attempt to use the outcome of each negotiation round to infer additional information about the preferences of the other side. A sovereign debt restructuring is analogous to negotiating over the relative share of a pie which is shrinking. At any point, each party wants the largest share that it can get but a bigger share for one comes at the expense of the other. If the two sides cannot agree, the pie they are negotiating over will be smaller next time. Each side must balance the prospect of a bigger share of a smaller pie tomorrow against what is offered today.

Interaction

The consequences of weak creditor co-ordination, lack of enforcement and limited access to useful information interact. With no ‘shadow of the law’, the incentives to complete restructuring negotiations are weakened; creditors may be less willing to accept an offer if they are concerned that ‘hold-outs’ will subsequently receive a better offer; and information asymmetries can undermine mutual trust during a negotiation. The expected outcome of a debt restructuring can also affect the probability of a crisis because creditors may be more willing to run if potential losses are high.⁽¹⁾

(1) The inter-relationship between *ex-post* debt restructuring and the *ex-ante* dynamics of capital flows is analysed by Haldane *et al* (2005b).

resolving a crisis. By endorsing a member’s policy programme, the Fund’s actions can also play a powerful signalling role.

One crucial way in which the Fund influences the debt restructuring process is through its lending-into-arrears (LIA) policy. Until 1989, IMF access policy prohibited the Fund from extending new lending to a country that had fallen into arrears on

payments to other creditors. However, this policy precluded the Fund from providing financial assistance even when a member was making every effort to restructure its debts and improve its repayment capacity. It also effectively gave private creditors a veto over IMF lending.

In response to concerns that this approach was unnecessarily restrictive, the IMF introduced, in 1989,

an LIA policy that allowed the provision of financial assistance in the presence of arrears under certain conditions. The new policy had opposing effects on the crisis resolution process. On the one hand, having a financial relationship with the Fund creates a commitment mechanism for resolving a crisis, compensating to some extent for the lack of enforceability over sovereigns. On the other hand, the provision of financial assistance relaxes the liquidity squeeze the sovereign faces, possibly reducing the incentive to strike a deal quickly.

There is, therefore, a complex inter-relationship between market-based restructuring mechanisms and the actions of the IMF. The Fund lends, in part, because of deficiencies in the market. But how the Fund develops a programme and the judgements it makes in implementing its LIA policy set the conditions for negotiation between a sovereign and its private creditors. As the nature of the market evolves, the mechanisms to resolve crises and the IMF policies that support them need to be revised. The challenge in recent years has been to develop a framework for restructuring sovereign debt in cases where bonds form a substantial component of outstanding claims. Box 2 describes the conduct of a number of recent sovereign bond restructurings.

The next two sections of this article briefly review recent developments in market mechanisms for restructuring sovereign debt and changes to IMF access policies. The final section argues that, despite this progress, there is still further work to be done to develop a stronger framework for resolving sovereign debt crises.

Recent market-based reforms

When the SDRM was abandoned in 2003, the official sector hoped that the combination of market-based reforms, particularly to the contractual terms under which sovereign debt is issued, and the then recently agreed changes to IMF lending policies could facilitate efficient debt restructuring and strengthen the crisis resolution framework. A G10 Working Group on Contractual Clauses was established to consider potential improvements in sovereign bond documentation.⁽¹⁾ Seven private sector trade associations also developed their own 'model features'

for sovereign contracts.⁽²⁾ As described by Drage and Hovaguimian (2004), these initiatives precipitated a number of contractual innovations that have strengthened elements of the debt restructuring process (these have, however, yet to be tested in a crisis).

As is well known, the major developments have occurred in inter-creditor co-ordination. The use of majority amendment clauses has been standard market practice for sovereign bonds issued under New York law since March 2003, and progress is being made towards introducing them into German law bonds in the near future. These clauses effectively prevent hold-outs by allowing a super-majority (normally 75%) of bondholders to approve an amendment to the financial terms of a bond. A creditor would thus have to purchase at least 25% of the bonds to gain a blocking position. Acceleration thresholds, which limit the ability of individual creditors to initiate litigation against the debtor by requiring a minimum percentage of bondholders to agree to accelerate a bond, have also become a common feature of sovereign bond contracts.

A limited number of recent bond issues have also attempted to improve creditor co-ordination by including engagement provisions. These clauses formalise the process of setting up creditor committees by allowing a specified majority of bondholders to appoint a committee to negotiate on their behalf. But the effectiveness of these committees is likely to be limited when, as is typical, they are limited to making recommendations to bondholders and do not have the power to commit to a restructuring deal.

Aggregation clauses, which allow the contractual terms of a group of bonds to be changed simultaneously, can facilitate co-ordination across a much wider range of a sovereign's creditors. Uruguay in 2003 and both Argentina and the Dominican Republic earlier this year have included aggregation clauses in bonds issued as part of debt exchanges. However, market participants have yet to identify (or employ) a suitable means of introducing these clauses outside a restructuring. One possible approach would be to establish medium-term note programmes;

(1) The Report of the G10 Working Group was published in March 2003. See Bank for International Settlements (2003).

(2) The draft model clauses (dated 31 January 2003) prepared jointly by the Institute of International Finance, the International Primary Market Association, the Emerging Markets Creditors Association, EMTA (the Trade Association for the Emerging Markets), the Securities Industry Association, the International Securities Market Association, and the Bond Market Association are available at www.emta.org/ndevelop/Final_merged.pdf.

Box 2: Recent sovereign bond restructurings

Since 1998, at least seven emerging market economies — Argentina, the Dominican Republic, Ecuador, Pakistan, Russia, Ukraine and Uruguay — have restructured their international bonds. Table 1 summarises the key features of these restructurings.

In three cases, the restructuring was completed after the country concerned had fallen into arrears on its payments to creditors. The remaining four restructurings represented pre-emptive actions aimed at restoring debt sustainability and avoiding outright default.

All seven restructurings involved the country making an exchange offer. Bondholders were given the opportunity to exchange their old bonds for newly issued bonds with lower net present value (NPV). An alternative approach is to seek bondholders' agreement to change the financial terms of existing debt instruments. The introduction of majority amendment clauses into sovereign bond contracts governed by New York law should allow more restructurings to be concluded this way in future.⁽¹⁾

Several points can be observed from Table 1. First, the reduction in net present value (NPV) has typically been greatest in post-default restructurings. Second,

the participation rate was lower for the three most recent exchanges, which might be explained by the fact that in earlier exchanges hold-outs had secured favourable (or at least no worse) treatment than bondholders who accepted the original offer.

Recent bond restructurings have also differed significantly in terms of the process by which the countries concerned have reached agreement with their creditors. At first glance, the universal use of exchange offers implies that a 'take-it-or-leave-it' offer from the debtor is standard practice. But in several cases — notably Uruguay and the Dominican Republic — the launch of the exchange offer was preceded by a period of consultation between sovereign debtor and creditor representatives.

The role of the IMF has also differed from case to case. In Argentina, for example, the Fund adopted a relatively *laissez faire* approach. But the level of IMF involvement in the six other restructurings described in Table 1 was much greater. In each case, for example, the Fund provided market participants with at least partial information regarding its debt sustainability assessment or made some form of public statement concerning the financial terms of the restructuring.

Table 1
Key features of recent sovereign bond restructurings

	Date of exchange offer	Value of bonds (US\$ billions)	Approximate NPV reduction (per cent)	Participation rate (per cent)	Treatment of hold-outs
Post-default restructurings					
Argentina	January 2005	81.8	70	76	Unclear
Ecuador	July 2000	6.5	40	99	Paid in full
Russia	July 2000	31.8	50	99	Offer re-opened
Pre-default restructurings					
Dominican Republic	March 2005	1.1	<5	93	Likely to be paid in full
Pakistan	November 1998	0.6	35	99	Offer re-opened
Ukraine ^(a)	February 2000	2.8	40	99	Paid in full
Uruguay	April 2003	5.3	15	93	Paid in full

(a) Ukraine was technically in default for a short period during the exchange.

(1) See, for example, Drage and Hovaguimian (2004) and Bedford (2005).

this would provide a basis for including aggregation clauses in all future bond issues of that borrower, but would not cover its existing debts.

The two-way flow of information between creditors and debtors has also been improved in recent years as several emerging market countries have established investor relations programmes. Creditors have also gained more information through the IMF's voluntary Special Data Dissemination Standard (SDDS). Since its launch in 1996, 61 countries have signed up to the SDDS. The use of information covenants in bond contracts, though, has not proved popular.⁽¹⁾

By contrast, there have been very few developments on enforcement. Recent court rulings have limited the scope of sovereign immunity and rejected the champerty defence,⁽²⁾ thereby slightly strengthening the hand of potential litigants. The threat of litigation plays an important role in disciplining the behaviour of sovereign debtors, but uncoordinated litigation by a minority of hold-outs can also reduce the incentive of individual creditors to accept a restructuring offer and harm inter-creditor co-ordination.⁽³⁾

Not all the desirable elements of how a sovereign debt restructuring should proceed can be pre-specified in bond contracts. Over time, precedents are accumulated and become market conventions — the procedures followed by the London Club in rescheduling sovereign bank loans provide one example. An important recent development in 'soft law' has been the *Principles for Stable Capital Flows and Fair Debt Restructurings in Emerging Markets* (hereafter, the *Principles*) agreed between some key trade associations and a group of sovereign borrowers. The *Principles* constitute a set of voluntary guidelines designed to add further structure and predictability to the relationship between sovereign debtors and their creditors beyond that contained in contracts.⁽⁴⁾

The *Principles* primarily address information provision and inter-creditor co-ordination. They emphasise the

importance of transparency and information exchange, calling on debtors to disclose all relevant macroeconomic information (in both normal times and, importantly, during a crisis). Inter-creditor co-ordination is addressed through a requirement for fair and equal treatment across creditors.

In addition, by endorsing the *Principles* sovereign debtors informally commit to resolving any future debt crisis by entering into 'good faith' negotiations with private creditors.⁽⁵⁾ This can be interpreted as an *ex-ante* attempt to strengthen enforcement.

The voluntary nature of the *Principles* has the advantage of enabling countries to endorse behaviour which is difficult or impossible to codify in contracts. But the lack of a formal legal commitment also raises questions about the effectiveness of the *Principles* because there is typically relatively little cost in renegeing on voluntary commitments (possible reputational effects notwithstanding).

Recent changes to IMF policies

In parallel to these two complementary market-based developments, there have also been changes in IMF policies. In 2002, the IMF introduced the exceptional access framework (EAF) to specify the conditions under which the Fund will lend in excess of standard access limits. This was in response to a small number of high profile cases, starting with Mexico in February 1995, in which exceptional levels of financial assistance had been provided without a clear set of rules defining when this could be done.

An important part of the EAF is that the Fund must conduct a debt sustainability analysis. A member judged by the Fund to have unsustainable debts can only receive limited financial assistance once the process of restructuring its debts has started. By making clear the limited range of circumstances in which large scale assistance can be provided, members should be encouraged to act pre-emptively to deal with incipient crises, both by adjusting domestic policy and, if necessary, undertaking a pre-default debt restructuring.⁽⁶⁾

(1) Uruguay has included information covenants in its bonds.

(2) The law of champerty has the effect (where upheld) of prohibiting litigation in circumstances where the creditor concerned has acquired a claim with the express intent of pursuing litigation.

(3) The best known example of a successful hold-out strategy is the case of Elliott Associates against Peru. In 2000, Elliott obtained a Belgian court ruling that threatened to disrupt payments on restructured debt and encouraged Peru to agree an out-of-court settlement.

(4) Additional information on the *Principles* can be found at www.iif.com/data/public/principles-final_0305.pdf.

(5) However, the *Principles* define good faith negotiations in only the broadest of terms. For example, they set out a number of guidelines for the operation of creditor committees, but do not specify the circumstances under which such the establishment of a committee is likely to be appropriate.

(6) Countries that have undertaken pre-emptive debt restructurings in recent years include Uruguay and Ukraine (see Box 2).

In 1998, the Fund's LIA policy was revised to reflect the rising significance of bonds (relative to bank finance). It was emphasised that a sovereign debtor must be conducting 'good faith' negotiations with its creditors before the Fund will provide financial assistance. This policy was modified in 2002 in an attempt to provide clarity on the meaning of the good faith criterion.

Crisis resolution — an unfinished agenda

Improvements to the design of sovereign bond contracts, development of the *Principles*, and successive reforms to IMF policies have contributed to more efficient crisis resolution. However, these initiatives have yet collectively to deliver sufficient strengthening of the framework for resolving sovereign debt crises.

It is clear that the most significant advances have been made in inter-creditor co-ordination (albeit from a low base). As the current stock of bonds mature and those which replace them contain, for example, majority amendment clauses, the process for restructuring sovereign debts will be considerably improved.

There remains, though, significant scope for further contractual innovation to consolidate recent progress. At least two priorities can be identified. First, there is scope for wider use of trustee (or trustee-like) powers designed to minimise the risk of disruptive or uncoordinated litigation. Second, further analysis and discussion are required to identify ways of introducing aggregation clauses into sovereign bonds issued outside a debt restructuring. There may also be ways in which contractual innovation can specify more formally the role of creditor committees.⁽¹⁾

It is important that contractual innovations are tried and tested in the market place. But there is a collective interest in ensuring that progress continues to be made towards a more complete contractual framework for debt restructuring. Trade associations have played an important role in this area and will continue to do so. Public sector organisations also have an interest in maintaining momentum on the market-based approach. As a contribution towards

catalysing further progress on market-based reforms, the Bank of England hosted a workshop in January 2005 to discuss the advantages and disadvantages of a range of possible contractual innovations (including aggregation clauses and trustees).⁽²⁾

The recently agreed *Principles* are a complement to contractual provisions in shaping the practicalities of a sovereign debt restructuring and thereby clarifying the framework for crisis resolution. In particular, the *Principles* have the potential to improve arrangements for information sharing between sovereign debtors and private creditors.

But the *Principles* will need time to become fully effective. In order for the *Principles* to become a wider market standard, more countries and more private sector bodies will need to make a commitment to them. There is also scope for the content to evolve and it is welcome that the Institute for International Finance intends to keep the *Principles* under regular review. Development of a mechanism to monitor compliance with the *Principles* could be particularly useful if it raised the credibility of the commitment.

The combination of improvements in the contractual framework and the *Principles* could deliver significant gains in resolving sovereign debt crises. But it is also important to address weaknesses in the design and implementation of IMF policies. Recent reforms notwithstanding, the form of IMF engagement remains unpredictable, distorting incentives and weakening the efficiency of the debt restructuring process. For example, uncertainty over the conditions under which the IMF will lend can encourage all parties to delay reaching agreement on a restructuring deal in the hope of inducing more financial support from the Fund. Furthermore, the incentive for market participants to pursue and consistently implement market-based institutional reforms is weakened.

There are two areas in which the clarity of IMF policies could be improved. First, it is important that the Fund implements the EAF rigorously in all future cases.⁽³⁾ In addition, techniques for assessing debt sustainability in uncertain situations should be strengthened.⁽⁴⁾ A

(1) For example: the conditions under which a committee could be formed; its powers; and the arrangements for recovering the costs incurred by the committee.

(2) For a summary record of the workshop, see the accompanying article Bedford, P. 'Design of sovereign bond contracts: a workshop at the Bank of England' in this *Review*.

(3) Thus far, in all cases in which the EAF has been required, the member already had outstanding exceptional access from programmes agreed before the EAF was introduced.

(4) See, for example, Ferrucci and Penalver (2005).

more complete understanding of the dynamics of private sector capital flows during and after a debt crisis also needs to be developed, such that the accuracy of IMF projections in capital account crises can be improved. These initiatives should contribute to improved programme design and enable the Fund to make more selective and predictable decisions about the provision of financial assistance to member countries in difficulties.

Second, the LIA policy should be reviewed. As recent experience has demonstrated, the 1998 and 2002 reforms have not resolved previous uncertainties regarding IMF involvement in post-default restructuring negotiations. In particular, there are concerns regarding the role of the Fund in determining the financial parameters for a restructuring and the utility of the ‘good faith’ criterion.

The traditional approach to IMF programming, which is embedded in the current LIA policy, involves the Fund and the member country agreeing on a common projection for key macroeconomic variables such as growth, inflation, the primary surplus, the exchange rate and the balance of payments over the programme period. In cases when a debt restructuring is necessary, there is an important implicit assumption about the amount of debt relief the private sector must grant in order for debt sustainability to be restored. Sovereign debtors have limited scope to deviate from these projections when negotiating with their creditors.⁽¹⁾

While possibly efficient, it is questionable whether this approach is tenable when the private sector is the main source of payment relief and is likely to provide most of the capital flow to a country in future. Private creditors have a strong and legitimate interest in the trade-offs between IMF financial assistance, policy adjustment to increase future repayment capacity and debt restructuring. In these circumstances, there may be a case for the Fund not to specify fully the financial parameters around the restructuring in the programme. Instead, the parameters could be left partly open to allow the debtor country and private creditors to negotiate freely the amount of debt relief. This reasoning was reflected in the IMF’s decision not to specify fiscal

surplus targets fully in the programme agreed with Argentina in 2003.

If the IMF followed an approach of not fully specifying the financial parameters of programmes in which there was a forthcoming debt restructuring, it could still publish its debt sustainability analysis. The Fund would provide information to the market and its analysis could provide a ‘focal point’ for the restructuring.

The operation of the good faith criterion in the Fund’s LIA policy also needs reviewing. Given that no two sovereign debt crises are exactly alike, any criterion needs to have a degree of flexibility. It also needs to leave scope for legitimate differences in bargaining positions. The 2002 clarification of the good faith criteria was, though, so broad that it offered little operational guidance. This raises the question of whether more specific criteria can be defined and, if not, whether the good faith criterion should be dropped. There is a similar issue in relation to the *Principles*, which currently offer little specific guidance on good faith negotiation despite stressing its importance. If more detailed and objective assessment criteria (for example, concerning the timetable over which key actions should take place) could be agreed between creditors and issuers, these could, in addition to being useful in their own right, help the Fund implement its LIA policy in a transparent and predictable manner.

Analogously to the need for rigorous application of the EAF, it is important that these questions regarding the operation of the LIA policy are resolved. Both steps would enhance the predictability of IMF actions and the environment in which sovereign debtors and private creditors conduct debt restructuring negotiations.

Conclusion

Market-based mechanisms for facilitating sovereign debt restructuring are more likely to be developed if sovereigns and their creditors believe that how these mechanisms work has a material effect on the outcome. Since 2003, there has been significant progress in improving market mechanisms to deal with sovereign debt crises. The most obvious improvements have been the change in New York

(1) Room for negotiation is narrowed even further if the member agrees with the Paris Club of official creditors on a debt rescheduling and accepts the requirement to achieve comparability of treatment with its private creditors.

market practice to include majority amendment clauses in sovereign bond contracts and the development by a number of sovereign issuers and private sector trade associations of the *Principles*.

Despite this progress, significant shortcomings remain and there is scope for further market-based innovation. The design of sovereign bond contracts could be further improved in a number of areas. Market participants should encourage the wider adoption of the *Principles* and support further evolution to maximise their effectiveness.

Furthermore, the official sector should aim to address current weaknesses in the design and implementation of the IMF's exceptional access framework and its LIA policy to provide greater clarity and predictability to the Fund's role in crisis resolution.

Official and private sector participants should step back and resolve these important issues while global market conditions are calm and there are no major crises complicating the process of formulating lasting policies.

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Sovereign bond contracts: a workshop at the Bank of England

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Improving the design of sovereign bond contracts is one way in which the arrangements for resolving sovereign debt crises can be strengthened. In January 2005, the Bank of England hosted a workshop that allowed market participants to review recent developments in contract design and consider the case for further innovation. This short article summarises the main points of discussion.

ON 12 JANUARY 2005, the Bank of England hosted a workshop on sovereign bond contracts. The event aimed to facilitate discussion amongst market participants on whether and how innovation in the design of sovereign bond contracts could contribute to strengthening further the framework for sovereign debt restructuring. Those attending included: senior officials from emerging market issuers of sovereign bonds; legal experts; underwriters; providers of trustee services; and representatives of the investor community.

Suitable arrangements for restructuring sovereign bonds allow sovereign debt crises to be resolved more efficiently and reduce the risk of such crises undermining the stability of the international financial system. Furthermore, a protracted and disorderly restructuring process imposes significant costs on both the sovereign debtor and its creditors. The effective design of sovereign bond contracts can play an important role in ensuring that restructurings are concluded as efficiently as possible.

Against this background, the workshop highlighted a number of areas where different interest groups hold broadly similar views and useful progress was made in respect of identifying practical measures that could be taken to improve upon existing contractual conventions. It was also apparent, however, that there are other areas in which more fundamental differences of opinion arise and where further discussion is warranted.

Impetus for change

The workshop recognised that the recent shift in market practice to accommodate *majority amendment clauses* in sovereign bond contracts issued under New York law constitutes a significant step forward.⁽¹⁾ These clauses allow a super-majority (normally 75%) of bondholders to approve an amendment to the financial terms of a bond issue, and thus have the potential to act as particularly powerful instruments in facilitating orderly sovereign debt restructurings.

Looking beyond majority amendment clauses, several workshop participants argued that there are a number of additional areas in which further contractual innovation could deliver tangible benefits. Others noted, however, that there is a risk of attempting to move too quickly in this area. For example, majority amendment clauses in sovereign bond contracts governed by New York law remain untested in crisis situations; therefore it is not yet possible to assess with complete confidence their overall impact and effectiveness.

Furthermore, there was general consensus that contractual innovation is not the only way in which the framework for sovereign debt restructuring can be strengthened. In particular, there is scope also to pursue the non-contractual approach embodied in the recently published *Principles for Stable Capital Flows and Fair Debt Restructuring in Emerging Markets* (hereafter, the *Principles*).⁽²⁾ Most workshop participants acknowledged that there is a basic complementarity between the contractual and

(1) A comprehensive summary of recent developments in the design of sovereign bond contracts can be found in Drage, J and Hovaguimian, C (2004), 'Collective action clauses (CACs): an analysis of provisions included in recent sovereign bond issues', Bank of England, November.

(2) The *Principles* were published jointly by a number of emerging market issuers of sovereign bonds, the Institute for International Finance (IIF), and the International Primary Markets Association (IPMA) in November 2004. See www.iif.com/data/public/principles-final_0305.pdf.

non-contractual approaches to facilitating efficient debt restructuring, but opinions differed in respect of the extent to which the *Principles* would have a material impact on the behaviour of sovereign debtors and their creditors.

Types of contractual innovation

The workshop discussed three contractual innovations that could improve the effectiveness of the sovereign debt restructuring framework: engagement provisions; the appointment of bondholder trustees; and aggregation clauses.

Engagement provisions

There was broad consensus that dialogue and structured negotiation between a sovereign debtor and its creditors can facilitate efficient debt restructuring. Although some workshop participants argued that negotiations are not strictly necessary (on the theory that ‘take-it-or-leave-it’ exchange offers can be equally effective), others considered that the absence of a suitable channel for debtor-creditor communication is likely to increase the likelihood of creditors resorting to legal action and impose additional costs on all parties.⁽¹⁾

Views differed, however, on how constructive debtor-creditor communication and negotiation should be achieved. One option, advocated by a number of workshop participants, is to introduce *engagement provisions* into sovereign bond contracts. But other participants preferred to rely on a non-contractual (that is, voluntary) approach. In this respect, it is noteworthy that the *Principles* encourage both sovereign debtors and their creditors to negotiate restructuring deals in ‘good faith’.

By requiring a sovereign debtor to negotiate with an elected creditor committee, engagement provisions can ensure that a single point of contact is established between the two parties. But it was also recognised that these clauses are not in themselves sufficient to deliver effective debtor-creditor engagement. A contractual requirement to negotiate with a creditor committee may have little substance if, as is typical, the committee does not have the power to commit to a restructuring deal.⁽²⁾ On the other

hand, it can be argued that a creditor committee appointed under the terms of a contractual clause is likely to have greater legitimacy than a committee established by means of a voluntary agreement between a sub-set of bondholders.

A potential advantage of the non-contractual approach relative to the contractual alternative is that it would allow greater flexibility to address sovereign debt crises on a case-by-case basis. For example, the use of engagement provisions could, at least in principle, lead to a situation where a debtor with multiple bonds outstanding is required to enter into restructuring negotiations with several creditor committees.⁽³⁾ By contrast, a voluntary framework is more likely to allow for the establishment of a single committee tasked with representing creditors holding a range of different bond issues.

Bondholder trustees

The ability to enforce creditor claims through legal action makes an important contribution to maintaining the stability of the sovereign debt market by disciplining the behaviour of debtors. But many workshop participants also noted that, from an efficiency perspective, co-ordinated litigation may be preferable to bondholders pursuing their claims individually. Furthermore, there can be benefits from protecting sovereign debtors from aggressive litigation strategies employed by a minority of ‘hold-out’ creditors intent on securing more favourable treatment in bilateral deals concluded outside the formal restructuring process.

One possible means of addressing both these concerns is to appoint a *bondholder trustee* mandated to represent the interests of the full population of bondholders. A trustee performs a role complementary to that of the fiscal agent tasked with managing (on behalf of the debtor) the process of making payments to bondholders. The appointment of a trustee is standard for sovereign bonds issued under English law, but remains the exception for bonds governed by New York law.

An English-law trustee holds an *exclusive* right to initiate litigation against a sovereign debtor in

(1) Most recent sovereign debt restructurings have involved the debtor making a non-negotiable exchange offer to its creditors. See Box 2 in the accompanying article Bedford, P, Penalver A and Salmon C, ‘Resolving sovereign debt crises: the market-based approach and the role of the IMF’ in this *Review*.

(2) A further consideration is how the costs incurred by the creditor committee are to be recovered. Among the small number of recent issues to include engagement provisions, some have addressed this point directly, whilst others have not.

(3) In practice, this concern may be more apparent than real. For example, contractual engagement provisions could be designed in a way that allows for cross-committee co-ordination.

respect of both accelerated and non-accelerated claims;⁽¹⁾ therefore bondholders (including potential hold-outs) are unable to take legal action individually. By comparison, the power of trustees under New York law is somewhat less extensive, with each creditor retaining the right to initiate litigation in order to recover missed payments (but not accelerated amounts). The appointment of a New York-law trustee does not, therefore, eliminate the possibility of a sovereign debtor being subject to numerous legal actions initiated by bondholders acting independently.

Both English and New York-law trustees are required to act on behalf of bondholders collectively. Accordingly, the proceeds of any legal action brought against a sovereign debtor must be shared *pro rata* among the full population of bondholders. In effect, the appointment of a trustee introduces a type of ‘sharing clause’ into sovereign bond contracts. Given this arrangement, a trustee can serve as convenient first point of contact for a sovereign debtor seeking to communicate (or negotiate) with its bondholders.

Trustees also perform a number of other important functions in respect of sovereign bond contracts. For example, an English-law trustee is typically able unilaterally to approve corrections to manifest error in bond documentation. But there are also limits to the role of a trustee. In particular, a trustee normally does not have the power to make commercial decisions on behalf of bondholders.

The potential benefits of bondholder trustees notwithstanding, several workshop participants argued that there are in fact a number of alternative ways in which the design of sovereign bond contracts could contribute to reducing the likelihood of disruptive litigation. For example, *acceleration thresholds* (through majority enforcement provisions) require a minimum percentage of bondholders to agree to accelerate a bond and therefore significantly constrain the ability of hold-out creditors to initiate litigation proceedings against a sovereign debtor. In this respect, acceleration thresholds have the effect of narrowing the distinction between sovereign bonds for which a trustee is appointed and those issued under a simple fiscal agency agreement (that is, without a trustee).

An acceleration threshold is not, however, a direct substitute for a trustee. Under English law at least, the appointment of a trustee ensures that a sovereign debtor cannot be subject to multiple legal actions. By contrast, acceleration thresholds leave open this possibility; in the event that a sufficiently large proportion of bondholders agree to accelerate, there is no (contractual) mechanism for ensuring co-ordinated legal action thereafter.

More generally, workshop participants noted that there is also an open question concerning whether protection against disruptive litigation would continue to be a material concern as majority amendment clauses become more prevalent in sovereign bond contracts. Under the terms of these clauses, contractual amendments approved by a super-majority of creditors holding a particular bond are legally binding on every holder of that bond. Consequently, post-restructuring legal action is unlikely to be a viable option.

However, post-restructuring litigation is not the only legal strategy available to creditors. Under the doctrine of merger (as recognised in some jurisdictions), judgement creditors’ claims fall outside the original contractual framework;⁽²⁾ therefore individual bondholders may be able to pursue *pre-restructuring litigation* as a means of avoiding the possibility of being bound by a restructuring deal concluded using, for example, a majority amendment clause. Increased use of these clauses is therefore unlikely to eliminate fully the risk of disruptive litigation.

Aggregation clauses

In practice, the vast majority of sovereign debt restructurings involve a significant number of debt instruments. An ability to aggregate creditor claims across multiple bond issues could therefore further improve inter-creditor co-ordination and allow more restructurings to be completed by means of amendments to the terms of existing bonds. There are, however, currently few examples of *aggregation clauses* in sovereign bond contracts; gauging market reaction to their use is thus difficult. Nevertheless, some workshop participants forecast that the process of introducing these clauses would mimic recent experience with majority amendment clauses —

(1) Following a missed payment, bondholders can, under certain conditions, accelerate a bond such that the full amount outstanding (principal and accrued interest) is payable immediately.

(2) The term ‘judgement creditor’ refers to a creditor that has obtained a court ruling requiring the debtor to make payment.

initial scepticism followed by general market acceptance.

It was also recognised, however, that there are many open issues regarding the most appropriate design of a contractual aggregation mechanism for sovereign bonds. One important consideration is to identify suitable creditor classes; it would not be appropriate, for example, to aggregate across secured and unsecured claims. Defining creditor classes is potentially most problematic in the context of pre-default debt restructurings (where creditors would hold claims of different maturity).⁽¹⁾

Recent debate on the design of the aggregation clauses has been heavily influenced by the approach employed by Uruguay and the use of *issue-level voting thresholds* in particular.⁽²⁾ It can be argued that a ‘true’ aggregation mechanism would dispense entirely with issue-level voting. However, the thresholds used by Uruguay play an important role in mitigating the risk of a particular bond being included in a multi-instrument restructuring deal against the wishes of a majority of the holders of that bond. In principle, this objective could be achieved using a 50% issue-level voting threshold, but Uruguay opted to pursue a more conservative approach by setting the threshold at 66²/₃%.

Uruguay first introduced aggregation clauses in a set of new bonds issued simultaneously as part of a comprehensive debt restructuring concluded in 2003. Consequently, it was relatively straightforward to define contractually the range of instruments covered by the aggregation mechanism, a task that is likely to be more difficult where new bonds are issued outside a restructuring. One possible means of overcoming this problem would be for sovereign debtors to introduce medium-term note programmes (thus establishing a means of issuing individual bonds under standardised legal terms). Moreover, there was general consensus that, in a legal sense at least, the introduction of aggregation clauses into sovereign bond contracts could be achieved in a number of different ways.

Interpretation of sovereign bond contracts

The workshop highlighted that there remain a number of unresolved questions regarding the *legal interpretation* of sovereign bond contracts, most especially in respect of the ability of creditors to recover payment due through the courts. As noted above, litigation plays an important role in imposing a degree of discipline on sovereign debtors. Yet market participants currently have only limited experience in this area — until relatively recently, legal action against sovereigns had been rare.

Over recent years, however, there has been an appreciable increase in litigation proceedings against sovereign debtors, partly as a consequence of the rapid growth in bond issuance by emerging market countries. Relative to the large banks that had previously provided the majority of emerging market finance, the population of bondholders is both larger and more diverse. The shift towards bond finance has therefore introduced a broader range of creditor interests and made effective inter-creditor co-ordination more difficult to achieve. As a result, the likelihood of individual creditors resorting to litigation has increased.

In addition, a series of legal precedents has contributed to an increased likelihood of creditors being able to secure court judgements ordering a sovereign debtor to pay — examples include rejection of the champerty defence⁽³⁾ and restrictions on the scope of sovereign immunity.

There is, however, a crucial distinction between obtaining a court judgement against a sovereign debtor and *enforcing* that judgement. Attachment of sovereign assets has traditionally been very difficult, although some judgement creditors have recently been able to find creative ways of enforcing their claims. One particular example is provided by the case of Elliott Associates versus Peru, in which the enforcement actions of the former led to Peru agreeing an out-of-court settlement.

In attempting to enforce its claim against Peru, Elliott Associates employed a legal argument based upon a broad interpretation of the *pari passu* clause routinely

(1) After a default, all creditor claims are accelerated and thus have common maturity.

(2) A description of the aggregation clauses used by Uruguay can be found in Buchheit, L and Pam, J (2004), ‘Uruguay’s innovations’, *Journal of International Banking Law and Regulation*, January. Near-identical clauses have been included in the new bonds issued by Argentina and the Dominican Republic as part of their debt restructurings completed earlier this year.

(3) The law of champerty has the effect (when upheld) of prohibiting litigation in circumstances where the creditor concerned has acquired a claim with the express intention of pursuing legal action.

included in sovereign bond contracts.⁽¹⁾ However, most workshop participants considered the likelihood of this interpretation surviving further court scrutiny to be small.⁽²⁾ Nevertheless, these participants anticipated that judgement creditors will continue proactively to seek alternative ways of enforcing their claims against sovereign debtors. At least three possible approaches were identified:

- appealing to ‘procedural’ (as opposed to contractual) *pari passu* arguments based on judgement enforcement laws;
- seeking to attach the overseas assets of state-owned enterprises; and
- requesting international arbitration under the terms of bilateral investment treaties.⁽³⁾

Although there is some precedent for the first approach to be successful,⁽⁴⁾ workshop participants acknowledged that it is currently difficult to predict whether any of these enforcement strategies will prove to be viable over the long term.

The workshop also noted the potential significance of litigation proceedings currently pending against Argentina following its default in 2001. In particular, some creditor groups have employed innovative legal strategies in their attempts to recover payment — notable examples include the use of class action procedures and the initiation of pre-restructuring litigation. Against this background, it is possible that a number of important legal precedents will be set over coming months.

Looking ahead

The workshop provided an opportunity for market participants to consider the significance of increased use of majority amendment clauses in sovereign bond contracts and discuss the advantages and disadvantages of a range of other possible innovations. In these respects, useful progress was made and a number of areas of common ground identified.

The Bank of England believes that further innovation in the design of sovereign bond contracts could contribute to the development of a more efficient framework for resolving sovereign debt crises. A companion article in this *Review* discusses the role of contractual innovation in the broader context of initiatives aimed at strengthening the framework for crisis resolution.⁽⁵⁾ The Bank also recognises, however, that changes to existing contractual conventions will require the agreement of both emerging market issuers of sovereign bonds and the investor community. Consequently, the Bank intends to build on the progress made at the workshop by continuing to encourage (and where appropriate facilitate) discussion amongst market participants.

Welcome improvements to the design of sovereign bond contracts have been made over recent years. But it would be inappropriate to conclude that, for example, the introduction of majority amendment clauses represents a complete solution addressing all potential sources of inefficiency in the sovereign debt restructuring process. Further contractual innovation, supported where necessary by other reforms to the international financial architecture, could support the gradual reduction of these inefficiencies.

(1) A standard *pari passu* clause dictates that the sovereign bond concerned ranks equally with all other unsecured and unsubordinated obligations of the debtor.

(2) Elliott Associates argued that the *pari passu* clause entitled it to a proportional share of any payments made by Peru on its (performing) external debt. These payments were settled through the Brussels-based Euroclear system; therefore Elliott Associates presented its argument to the Belgian courts. A recent change to Belgian law means that it is no longer possible for litigants successfully to enforce judgements in this way.

(3) Such arbitration could be initiated, for example, under the rules of the International Centre for Settlement of Investment Disputes (ICSID).

(4) In 2001, the Democratic Republic of Congo agreed an out-of-court settlement with Red Mountain Finance after the latter had obtained from a Californian court a ruling with similar effect to that granted to Elliott Associates in its case against Peru. The court ruled in favour of Red Mountain on the basis of its responsibility to aid the enforcement of judgements (that is, ‘procedural’ *pari passu*).

(5) Bedford, P, Penalver, A and Salmon C, ‘Resolving sovereign debt crises: the market-based approach and the role of the IMF’.

A model to analyse

financial fragility

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This article outlines the results of a programme of research, undertaken within the Bank, to try to develop a theoretically rigorous, but also an empirically tractable, model of the banking system. The Bank of England, in conjunction with HM Treasury and the Financial Services Authority, is responsible for maintaining systemic stability. The possibility of contagious failures between banks and their borrowers could be a major threat to such stability. In order to assess such dangers, a model for the analysis of financial stability needs to include amongst its characteristics heterogeneous agents, in the form of banks and their customers, and the possibility of default.

Introduction

THE BANK OF ENGLAND, HM Treasury and the Financial Services Authority are charged with responsibility for maintaining the stability of the UK financial system as a whole. A major potential cause of systemic problems within the financial system is the possibility of contagious interactions between individual participants, notably banks, in the financial system. This interaction can have many channels, for example direct counterparty effects when one of the parties fails, distress sales causing the market value of other agents' assets to decline, cut-backs in lending causing economic depression and leading to failures elsewhere, and so forth. Such interactions may occur directly amongst banks or between banks and other participants in the economy.

Central banks and international financial institutions therefore want to develop models of the system which enable assessment of the risks of interactive contagion to be undertaken. This paper reports on progress with one such model.

This objective helps to define the characteristics that such models should ideally possess. We list these below:

Default

An important element in contagion is the possibility of default, and it is essential that a model exploring contagion should include default. This is

intellectually challenging. Models cannot easily handle the discontinuous, non-linear, functions that are involved and indeed most extant macroeconomic models in effect exclude default. But that is not an option for a model of contagion. After all, if it were certain that everyone would repay all their debts in full, including accumulated interest, everyone could borrow, or lend, without credit risk. There would be no need for financial intermediaries, such as banks, whose role is predicated in some large part both on their customers' faith in their banks' creditworthiness and on banks' abilities to assess the creditworthiness of their customers.

Incomplete markets

Another important aspect of the real world is that markets are incomplete — not every eventuality can be hedged. Unforeseen, and unhedged, events are often a feature of the onset and propagation of crises. When some financial markets are missing, or otherwise imperfect, there can be a role for regulating intermediation.⁽¹⁾ Even so, it is important to be clear in what particular respects the system of financial markets is incomplete.

Roles for money, banks, liquidity and default risk

It is essential for a model exploring systemic risk to include default risk and/or the incompleteness of financial markets. After all, in the absence of these factors there would be no essential need for money,

(1) Geanakoplos and Polemarchakis (1985) show that, with incomplete asset markets, the economy may even fail to reach the second-best, ie constrained Pareto-optimality. In such a case, policy intervention may induce welfare improvements.

no need for banks, and while there would still be a real interest rate, determined by time preference and expected returns to investment, there would be no essential role for either liquidity or default premia in the determination of interest rates.

Heterogeneous agents

If all banks were assumed to be identical, then they would never have an incentive to trade with each other. Since direct interactions between banks, notably, but not only, in the interbank markets, are often viewed as a key channel of financial contagion, an assumption that all banks were identical, or equivalently that the banking system can be modelled as consisting of a single representative bank, excludes a main potential channel of contagious interaction. In any case the assumption that all banks, or bank customers, are identical is hardly realistic; while it can be a useful simplification for some purposes, it cannot be so for a study of contagion. Also, interaction amongst agents or banks should not be imposed exogenously but should ideally be an outcome of optimal behaviour.

Structural microfoundations

There are, of course, in any major field a wide range of potential models. This is the case in the study of financial stability. Some start by examining the data in order to perceive and to estimate the likelihood of defaults in individual banks, or even systemic financial crises, from other predetermined variables, such as the market value of banks' equity (Merton-type models) or subordinated debt, or the rate of growth of bank loans, or from macroeconomic data more widely. Such models have the advantage of congruence with the data, which is important from a surveillance perspective, but they can be subject to the Lucas critique (and Goodhart's Law)⁽¹⁾ that such regularities may break down as the (policy) regime changes.

At the other end of the spectrum, one can start by trying to establish models based on optimising microfoundations. The complexity of human behaviour and the wide and diverse scope of the economy imply, however, that not only do such models require simplifying assumptions that are extreme, but also that they will typically have less congruence with the data (than other, more atheoretical, data-fitting models).

Indeed one can position one's research at any point along the efficient frontier between data congruence and theoretical coherence. The programme of work reported here lies towards the more theoretical end of this frontier.

Empirically tractable

While the above characteristics will be desirable in constructing a satisfactory theoretical model of contagious interaction, such a model will have little lasting practical effect unless it can be used empirically by regulators to assess systemic financial fragility, using real data. That means that it must also be empirically tractable. But the above characteristics do also make for complexity in empirical estimation. As noted already, there is an inevitable trade-off between including desirable theoretical features and complexity. One possibility would be to construct a suite of models at different points on the trade-off. The trade-off may, however, be made less stark by designing a model structure which is flexible enough to switch focus from one practical issue to another, and so only include those elements of the wider model necessary to handle the question at hand.

In the next section we provide a brief survey of the literature, and assess some current models against the criteria set out above. Then we briefly report the form of the model on which we have been working, indicating the main results from this work. The model is designed to simulate how financial fragility is affected by a potentially wide menu of shocks. One example of such a simulation is given. Possible extensions of this work are also reported.

A review of models to assess financial fragility

Turning first to the more empirical exercises, most of such studies of the vulnerability of banks, and indeed of banking systems, have concentrated on assessment of the conditions of individual banks or the financial system treated as a single representative entity. Hoggarth and Whitley (2003) and Tudela and Young (2003) are excellent examples of this genre. While such studies of individual institutions remain a necessary and essential part of any analysis of financial conditions, they do have certain inherent disadvantages. Amongst the problems with this approach are:

(1) See Lucas (1976) and Goodhart (1975).

1. There is an inevitable lack of focus on dynamic, secondary interactions between agents in such exercises. Since the attention is on the single institution, there is no practical possibility of modelling contagion between institutions, or between differing sectors of the economy. This means, in effect, that contagion cannot be effectively studied in the set-up, which concentrates on the individual institution or on the aggregate of banks.
2. Even if individual banks are asked how each would react to some particular stressed condition (a stress test) it is impossible to work through second and third-round effects consistently and, in practice, it is also impossible to prevent banks from adopting inconsistent auxiliary assumptions.

More recent empirical models try to take some of this critique into account by modelling the financial system on a more disaggregated basis. Bunn *et al* (2005) develop a model for the United Kingdom, which enables one to analyse how shocks to the current macroeconomic environment might feed through to the UK banking system. Bunn *et al* point out that these models are very useful from a surveillance perspective as they provide a coherent framework to discuss the possible magnitude of risks facing the financial system. However, these models still lack a coherent framework to analyse contagion between banks or feedbacks from stress in the banking system back to the macroeconomy.

Other models have been constructed to investigate financial fragility and, in particular, the role of financial intermediation in transmitting and amplifying shocks. At the empirical level, most work has been trying to model interactions between banks with the aim of overcoming the deficiencies of looking at banks on an individual basis. This line of research has explored the direct links between banks in the interbank market, and the potential spillover between banks following the initial failure of a member of this market. Examples of such work include Wells (2002), which analyses the impact of a sudden and unexpected insolvency of a single bank on the capital position of a number of other banks, and Elsinger *et al* (2002), which analyses the consequences of macroeconomic shocks for the

insolvency risk of a portfolio of banks by combining standard risk management techniques with a network model of stylised interbank exposures.

On the more theoretical front, numerous macroeconomic models analyse the impact and propagation of macroeconomic shocks in the presence of financial market imperfections. Haldane *et al* (2004) provide an excellent review of most of this work. Our framework shares many features with these models — it includes financial intermediaries, it is characterised by incomplete markets, and finally it has financial contracts that cannot be perfectly enforced. As we have mentioned, our model has two important additional features: both banks and private agents can default and they are heterogeneous. These two ingredients allow us to assess the vulnerability of the banking sector to adverse shocks and to analyse the transmission of shocks, which initially affect individual agents, to the rest of the financial and economic system.

The model

Our model is based on the work by Tsomocos (2003a, b).⁽¹⁾ In summary, it incorporates heterogeneous banks and capital requirements in a general equilibrium model with incomplete markets, money and default. It extends over two periods⁽²⁾ and all uncertainty is resolved in the second period. Trade takes place in both periods in the goods and equity markets. In the first period, agents also borrow from, or deposit money with banks, mainly to achieve a preferred time path for consumption. Banks also trade amongst themselves, to smooth out their individual portfolio positions. The central bank intervenes in the interbank market to change the money supply and thereby determines the official interest rate.⁽³⁾ Capital adequacy requirements (CARs) on banks are set by a regulator, who may, or may not, also be the central bank. Penalties on violations of CARs, and on the default of any borrower, are in force in both periods. In order to achieve formal completeness for the model, banks are liquidated at the end of the second period and their profits and assets distributed to shareholders. Box 1 makes the time line of the model explicit.

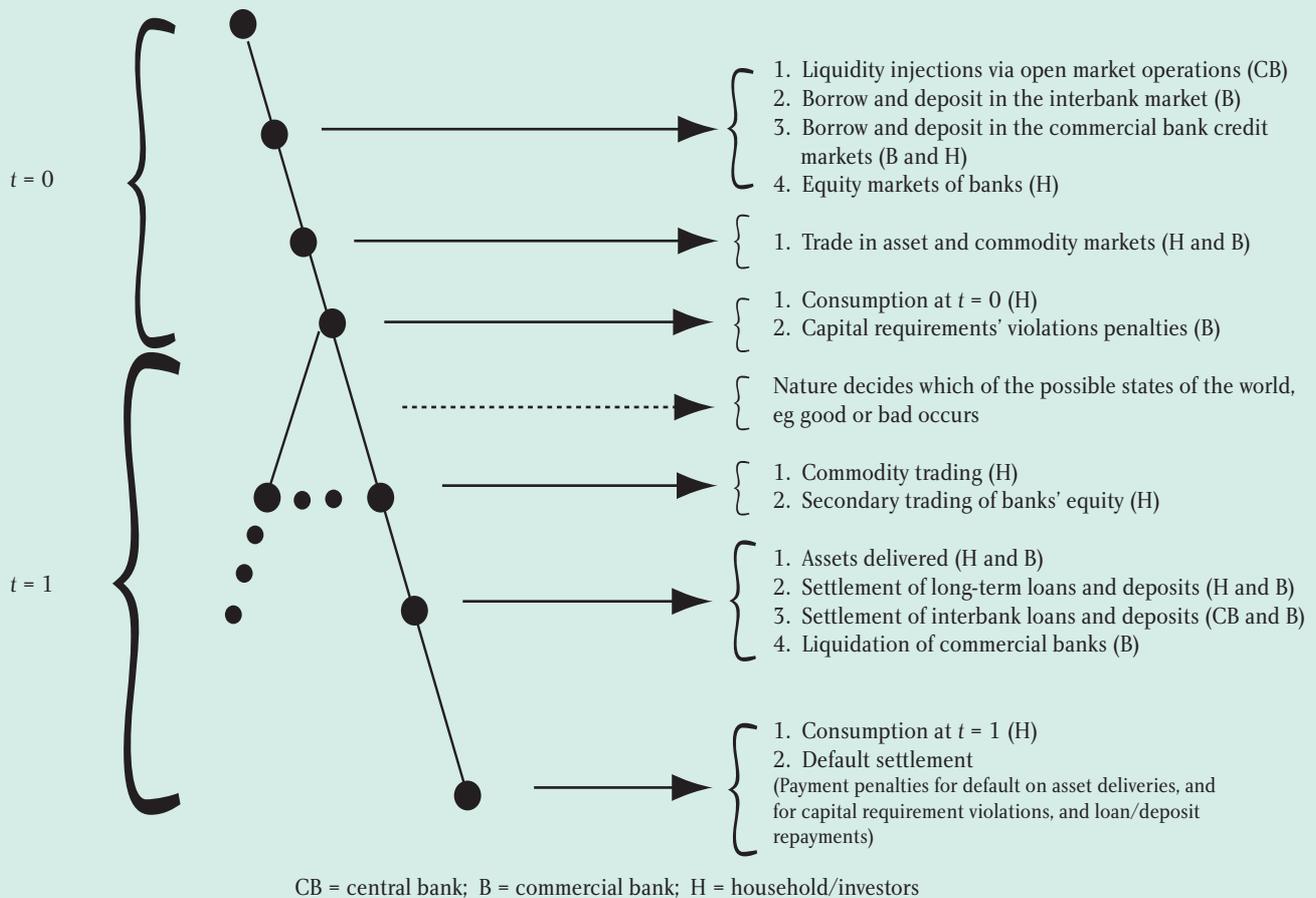
In the first period, trades by all agents take place against a background of uncertainty about the

(1) For a more detailed description of the model see Goodhart *et al* (2006).

(2) Any finite horizon extension follows *mutatis mutandis*.

(3) The official rate and the rate in the interbank market are the same, since our focus is on financial fragility.

Box 1: The time structure of the model



economic conditions (the state of nature) that will prevail in the second period. Agents are, however, assumed to have rational expectations, and to know the likelihood (the probability distribution) of good or bad states occurring when they make their choices in period one. In period two the actual economic conjuncture (the state of nature) is revealed and all uncertainty is resolved.

The model incorporates a number of distinct, ie heterogeneous, commercial banks, each characterised by a unique risk/return preference and different initial capital. Since each bank is, and is perceived as being, different, it follows that there is not a single market for either bank loans or bank deposits. In addition, we introduce limited access to consumer credit markets, with each household assigned (by history and custom) to borrow from a predetermined bank. This feature allows for different interest rates across the commercial

banking sector.⁽¹⁾ In sum, multiple credit and deposit markets lead to different loan rates amongst various banks and to endogenous credit spreads between loan and deposit rates.

Individual non-bank agents are also assumed to differ in their risk attitudes and hence in their preferences for default. We model the incentive for avoiding default by penalising agents and banks proportionately to the size of default. Banks that violate their capital adequacy constraint are also penalised in proportion to the shortfall of capital.⁽²⁾ Both banks and households are allowed to default on their financial obligations, but not on commodity deliveries.

In the model, financial fragility is taken to include any private sector defaults and reduced bank profitability and, therefore, it is not limited to episodes of bank runs, panics and other extreme disruptions of the financial system. The presence of a secondary market

(1) We assume, however, that there is a single interest rate that clears the interbank market.

(2) This way of dealing with default was first introduced by Shubik and Wilson (1977). For further discussion of approaches to modelling default, see Tsomocos and Zicchino (2004).

for bank equity also allows us to investigate how a fall in bank equity values would affect financial fragility. Our definition of financial fragility is connected to welfare losses, liquidity shortages and the banking sector's vulnerability to default. Amongst other consequences, financial fragility, so defined, may impair the efficient allocation of savings to financial investments and thus the ability of households to smooth consumption.

Results

In this model, both regulatory and monetary policies are non-neutral. This arises essentially from having incomplete financial markets and liquidity constraints. Monetary and regulatory policies influence the distribution of income and wealth amongst heterogeneous agents and hence have real effects. Some other main results are:

- the central bank controls the overall liquidity of the economy and such liquidity, as well as endogenous default risks, determines interest rates;
- nominal changes (ie changes in monetary aggregates) affect both prices and quantities; and
- the nominal interest rate is equal to the real interest rate plus the expected rate of inflation (Fisher effect).

From an analysis of a set of comparative statics exercises, using the model, a number of implications arise.

First, in an economic environment in which capital constraints are binding, more expansionary monetary policy may lead banks in some cases to adopt riskier strategies.⁽¹⁾ The liquidity injected by the central bank can be used by some banks to expand their loans to the non-bank private sector. This can lead to a rise in the size of their assets, relative to their capital base, thus worsening their capital position. It is a well-known stylised fact that financial crises are often caused by excessive, and unwise, lending in the upswing of the cycle,⁽²⁾ which then leads to non-performing loans and failures in a subsequent downturn, should an adverse shock occur. Thus

expansionary policies causing 'excessive' loan expansion can lead to financial fragility.

Second, agents who have more investment opportunities can deal with negative shocks more effectively by restructuring their investment portfolios expeditiously. Such restructuring may put even more pressure on other agents with a more restricted set of investment opportunities. For example, banks which can move into security investments when there is an adverse shock to customer borrowing may make market conditions even worse for banks which cannot so diversify. This result has various implications. Amongst them, banks with asset portfolios that are not well diversified tend to follow a countercyclical credit extension policy in the face of a tightening of regulatory standards in the loan market (eg tighter loan risk weights) during an economic downturn. In contrast, banks that can quickly restructure their portfolio tend to reallocate their investments away from the loan market, thus following a procyclical credit extension policy.

Third, an improvement such as a positive productivity shock, which is concentrated in one part of the economy, does not necessarily improve the overall welfare and profitability of the economy.

The last two insights relate to the innovative feature of the model of incorporating heterogeneous agents; banks and bank borrowers are not all alike. This has some, fairly obvious, implications. The result of a shock depends on the particular sector of the economy which is affected and it can often shift the distribution of income, and welfare, between agents in a complex way, which is hard to predict in advance.

Simulation: a negative bank capital shock to bank x in the initial period

In what follows we describe in more detail one of the simulations we conducted. There are, however, numerous other simulations and calibrations which can be run with such a model. Several examples are in Goodhart *et al* (2004a, 2004b and 2005). We simulated a 25% negative shock to the capital of a single bank — bank x, which is a net lender in the interbank market⁽³⁾ — in the initial

(1) This does not imply, in our model, that a deflationary bias is optimal. The model does not include inflation targeting. Such a regime could be approximated by maintaining the money supply fixed.

(2) See, for example, Borio and Lowe (2002).

(3) Since all the numbers in the table represent changes with respect to the initial values of the variables, similar movements in levels may result in noticeably different percentage changes. This is the case, for example, for the profits of banks y and z, since bank z has much higher initial profits than bank y.

Table A
Percentage change in key variables given a negative 25% shock to bank x's capital at $t = 1$

	Bank x	Bank y	Bank z
r_d^b	4.1	3.5	3.5
r^b	4.0	4.7	4.6
ρ	3.5		
π_i^b	0.046	0.04	0.007
π_{ii}^b	0.06	0.05	0.008
k_i^b	-21.9	0.6	0.6
k_{ii}^b	-25.1	0.7	0.6
v_i^b	-0.15	0.009	0.005
v_{ii}^b	-0.3	-0.001	-0.016
GDP_i	-0.24		
GDP_{ii}	-0.24		

Legend:

r_d^b = deposit rate offered by bank $k^b \in B = \{x, y, z\}$;^(a)

r^b = lending rate offered by bank $k^b \in B$;

ρ = interbank rate;

π_i^b = profits of bank k^b in state of the world i ;^(b)

π_{ii}^b = profits of bank k^b in state of the world ii ;

k_i^b = ratio of capital to risk – weighted assets of bank k^b in state i ;

k_{ii}^b = ratio of capital to risk – weighted assets of bank k^b in state ii ;

v_i^b = repayment rate of bank k^b to all its creditors in state i ; and

v_{ii}^b = repayment rate of bank k^b to all its creditors in state ii .

(a) For the sake of illustration, the characterisation of banks x and y is based on two big UK banks, which we cannot identify for confidentiality reasons, while bank z is constructed by consolidating data of five other big UK banks. Needless to say, the rest of the model is highly stylised, so these results should not be taken to indicate what would happen if a big UK bank lost capital.

(b) State i refers to a good/normal state of the world in period two, which occurs with probability 0.95. State ii reflects a bad state of the world with probability 0.05.

period.⁽¹⁾ This, extremely unlikely, event could be envisaged as the result of a huge fraud. Table A shows the percentage changes in the values of some key variables.

We assume first that the central bank uses the monetary base as its monetary policy instrument and fixes the supply of bank reserves by injecting, or withdrawing, funds in the interbank market. There is, of course, a dual relationship between the policy-determined short-term interest rate and the quantity of bank reserves, though this relationship can be affected by the institutional details of the precise way in which the central bank operates in the

money markets. In practice, central banks always set interest rates rather than the reserve base (Bindseil (2004)). One reason that they do so is that setting interest rates (rather than reserve quantities) strongly dampens the effects of certain shocks on the banking system. This happens, for example, in the case of a monetary policy shock, as the contagion channel operating through the interbank linkages is weakened by the central bank fixing the interbank rate. But by the same token, taking the reserve base as fixed in our simulations provides clearer and stronger responses to shocks, which is useful for illustrative purposes.

A decrease in the capital endowment of bank x causes a contraction in the funds available for loans to other banks and for loans to households. Other things being equal, the interest rate in the interbank market and on bank x 's loans to households increase, by 3.5% and 4% respectively (ie from 4% to 4.2% in the first case and from 6.9% to 7.1% in the second). The interest rate on bank x 's deposits also increases as bank x tries to make up for its shortfall in capital by an increase in deposits. The end result of bank x 's portfolio reallocation is a decrease in both interbank loans and loans to households.

Unlike bank x , banks y and z are net borrowers in the interbank market. They respond to the higher cost of interbank borrowing by decreasing their demand for interbank loans and by raising more funds through deposits. This causes the deposit and lending rates of banks y and z to rise, as shown in the second and third column of Table A, and thus loans to decrease.

The decrease in bank lending is the result of both the first-round and second-round effects of the initial shock to capital. All banks have less available funds: bank x because of the fall in its own capital, the other banks because they can borrow less in the interbank market.⁽²⁾ Also, bank x wishes to extend fewer loans, to avoid its capital to asset ratio decreasing dramatically. The second-round effect comes through the impact of a decrease in lending on future GDP. Banks anticipate that lower credit availability will cause a fall in output — as period-two GDP is a

(1) The values of banks' balance sheet items in the initial period are calibrated using the 2002 annual account data for the seven largest UK banks. The values of private agents' loan repayment rates are obtained from the same source of data. All macroeconomic variables are calibrated from UK data in the same year, 2002. The value of GDP in the bad state is set to represent a 4% fall from its value in the good state. Values for all other variables in the bad state are set in a similar fashion. The parameters of the reduced-form equations describing the loan demand, the deposit supply, households' repayment rates and the relationship between the GDP and bank credit are partly based on estimated relationships for the UK economy and partly chosen arbitrarily. See Goodhart, Sunirand and Tsomocos (2005) for more details.

(2) Banks are not able to offset the shortfall in funds due to the bank x 's capital shock completely by raising more deposits, because these become increasingly costly (the supply of deposits is an increasing function of the deposit rate).

positive function of the aggregate credit supply in the initial period — and a decline in the repayment rates of households. Thus, the expected rate of return on loans decreases causing a further reduction in banks' credit supply.

This mechanism is like the financial accelerator of models *à la* Bernanke, Gertler and Gilchrist (1999), where an initial shock to GDP is amplified by the effect that this shock has on the value of the borrowers' collateral and, therefore, on the cost of outside finance for firms (the so-called 'external finance premium')⁽¹⁾ and ultimately induces an additional decrease in investment and in output. In our model, the amplification mechanism works differently. A shock to a bank's capital endowment reduces the total availability of loanable funds and, since future GDP is a positive function of credit supply, it also decreases future households' income. This in turn causes a decrease in the repayment rates of households (or, in other words, an increase in default rates), who borrow money from banks. Banks then want to reduce their supply of loans even further. In effect, the working of the 'external finance premium' in BGG is akin to a 'default premium' in our model.

The effect of an exogenous shock to bank *x*'s capital on the other key variables presented in Table A can be understood by noting that in our model banks maximise their payoff by equating the marginal benefit from profits with the marginal cost from default and capital violation penalties. Penalties are imposed by the regulator on banks that violate the capital constraint and which default in the deposit market — as well as in the interbank market if they are net borrowers (as it is the case for banks *y* and *z*). Hence, in trying to achieve maximal payoff, banks face a trade-off. On the one hand, higher profits increase banks' utility both directly and by raising banks' capital to asset ratios. On the other hand, to obtain higher profits, other things equal, banks need to take more risk, ie to increase their expected default rates (equivalent to a decrease in their expected repayment rates). But lower repayment rates translate into higher costs in the form of higher expected default penalties. Following a negative shock to bank *x*'s capital, the default probabilities of

households also increase and, as a consequence, the values of banks' risk-weighted assets decrease. In this simulation exercise, banks' profits do not change much, as the increase in lending rates is offset by the higher cost of funds.⁽²⁾ Bank *x*'s capital and capital to asset ratio both decrease considerably in the second period while the capital holding and the capital to asset ratios of banks *y* and *z* are almost unaffected.

To summarise, in this simulation a shock to bank *x*'s capital affects all other banks because of their interaction in the interbank market. Specifically, in response to a negative shock to its capital, bank *x* is willing to supply less liquidity to the rest of the banking sector. This causes all interest rates to increase and aggregate credit supply to decrease.

While most of models used to analyse financial stability cannot cope, by construction, with contagious effects, the explicit modelling of links among heterogeneous banks in our framework allows us to investigate the extent of contagion to the rest of the banking system of shocks to individual institutions. This key property comes, however, at the cost of additional complexity.⁽³⁾

Box 2: Model implementation

- Step 1: Identify the relevant question;
- Step 2: Simplify the general model (ie reduce the number of markets, banks, investor sectors, assets, and time periods to the minimum required for step 1);
- Step 3: Calibrate the initial equilibrium of the simplified version of the model using data; and
- Step 4: Perform scenario analysis under different exogenous shocks (eg regulatory and monetary policy, capital, preferences, etc).

(1) In models with asymmetric information in the credit market, collateral is used by lenders as a screening or incentive device. By pledging collateral, and therefore by mitigating the potential for adverse selection or moral hazard, borrowers can reduce the cost of obtaining external funds. Therefore, when the value of collateral decreases, as may happen when the economy is affected by an adverse shock, borrowing becomes more expensive.

(2) Bank *x* also benefits from a higher rate on its interbank investments. However, it has to pay a higher rate to its depositors, who anticipate that, in order to reconstitute the capital base, the bank will try to maintain its profitability by taking more risk.

(3) The version of the model used for the simulation exercises contains 56 simultaneous equations in 135 unknown variables.

Model implementation

As in any large-scale macroeconomic model, multiple channels of interaction exist and economic sectors interact with each other so as to achieve an equilibrium. However, our framework is flexible enough that when a policy-related question is identified, its size and complexity can be reduced appropriately. Hence, streamlined versions of the model can be generated and subsequently calibrated against real data to address policy issues rigorously. In Box 2 we suggest a simple procedure for the implementation of the model.

Conclusions

In reality, the economic system is both complex and heterogeneous. In order to model it in a way that is mathematically tractable, rigorous and yet simple enough to be illuminating, economists have often tended to assume homogeneity amongst agents in the sectors involved. Unfortunately that prevents analysis of certain key features of financial fragility, especially those relating to interbank interactions.

The model here presented focuses on such interactive channels. That inevitably raises the complexity of modelling; however complexity has been limited by adopting the simplifications of an exchange economy with only endowed consumers and banks⁽¹⁾ (ie assuming no firms, no external sector, no other financial intermediaries, a black-box official sector).

In our model, banks and households (investors) are both heterogeneous and active. Second, there is a complete endogenous feedback mechanism, both amongst banks, amongst investors, between banks and investors, and between the real and nominal sectors of the economy. Liquidity plays a major role, and default is endogenous within the system; so we can seek to study the effect of regime changes on default probabilities. This model should, at least in principle, be able to provide a flexible tool for studying both shocks and policy changes. It is computable and can be calibrated against real data.

Nevertheless there are some disadvantages. First, there are no disaggregated data, identifying the customers of the individual banks.⁽²⁾ Second, the model lacks an explicit modelling of some agency problems between borrowers and lenders, and also between bank equity holders and managers, as is suggested in the literature on the theory of banking.⁽³⁾ Third, we do not incorporate production into the exercise at all.

We would like to see this work as the start of a major programme to use models such as this for the analysis of financial fragility. We have constructed the theoretical model; performed simulations based on a simplified version of the general model to assess the qualitative impact of shocks; calibrated an even simpler version of the model against UK data to examine the simulated response of the UK banking sector as a whole to a variety of assumed shocks; finally, we have extended the model to cover a longer horizon than the two periods employed in the general model and calibrated the model again with UK data to evaluate its performance against a time series of macro and banking data.

Our next objective is to provide some empirical metric for the definition of financial fragility as proposed in the model. This will involve sticking to two main principles; first, that heterogeneity is essential; second, that, for the present, we believe that our approach to modelling default and liquidity is the best available modelling strategy. Otherwise we hope to examine a wide range of alternative structures.

The main challenges ahead will be, first to represent a complex reality in a manner that is both illuminating and yet reflects that reality, and second to be able to draw general conclusions from a variety of related models that, whilst keeping to the basic principles outlined above, nevertheless have differing particular specifications, depending on the simplifications used, and reflecting the issues under consideration.

(1) In the more general set-up of the model based on an exchange economy GDP is given by the aggregate endowment.

(2) So in this respect the version of the model used for the simulation exercises cannot be based on proper optimising households' decisions.

(3) Examples of models based on the assumption of asymmetric information between borrowers and lenders are the 'credit rationing' models (like the one by Stiglitz and Weiss (1981)). The idea of potential conflicts of interest between owners and managers has been vastly applied in the banking literature. For a discussion of potential concerns regarding managerial incentives in the design of prudential regulation, see Dewatripont and Tirole (1994).

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Stress testing

as a tool for assessing systemic risks

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Stress testing exercises are widely used by financial institutions in assessing their exposures to credit and other risks. Stress tests can also help policymakers to gauge the potential implications of differing risks for the stability of the financial system as a whole. And in recent years, there has been a burgeoning interest in such systemic stress testing among central banks and international organisations. This article describes the systemic stress testing framework currently used by Bank staff.

STRESS TESTING exercises are an important tool in gauging the robustness of the financial system to large — but still plausible — shocks. In its broadest sense, a stress test is a ‘what if’ exercise: considering what might happen to the financial system, or to individual firms, were certain risks to crystallise. The use of well articulated models in this ‘what if’ analysis is important, as they provide a coherent and consistent framework for assessing which risks might pose the greatest threat to balance sheets or to financial stability, and so merit the closest attention.

Market and, to a lesser extent, credit risk stress tests are increasingly being used by financial institutions.⁽²⁾ The results can be used to inform high-level discussion of the appropriate appetite for different types of risks and the amount of capital that should be set aside to cover them. Moreover, stress testing may also reveal hidden correlations across portfolios. For example, at first glance, corporate and household arrears might seem unrelated. They may, however, both be affected by the same macroeconomic shocks and so move together. Credit risk stress testing will become a requirement under the second pillar of the new Basel capital accord and the United Kingdom’s Financial Services Authority (FSA) is working with firms to promote good practice in stress testing.⁽³⁾

Stress tests can also help policymakers in gauging the potential implications of different risks for the financial system as a whole, and hence in identifying those which may pose the greatest threat to systemic stability. In recent years, there has been a burgeoning interest in such systemic (or financial stability) stress testing amongst central banks and international organisations.⁽⁴⁾

In contrast to stress tests undertaken by individual banks, financial stability stress testing at the Bank of England has, to date, focused on the system-wide implications of macroeconomic shocks. Idiosyncratic risk factors, such as the failure of a single large firm, are rarely considered. And, while market disruptions have the potential to threaten the stability of the financial system, quantitative assessment of such systemic impact is also rare, reflecting the complexity of the modelling challenge.

Systemic stress testing now features routinely as an element of the International Monetary Fund’s Financial Sector Assessment Programmes (FSAPs). In 2002, for example, the UK authorities and IMF staff developed and carried out a stress testing exercise as part of the United Kingdom’s FSAP.⁽⁵⁾ Overall, that exercise suggested that the stability of the UK banking system was unlikely to be threatened by any of the adverse scenarios considered.

(1) The authors wish to acknowledge Andrew Logan who made a significant contribution to the analytics underpinning this article.

(2) For a survey of stress testing practices, see ‘Stress testing at major financial institutions: survey results and practice’, (2005), *Bank for International Settlements, Committee on the Global Financial System*.

(3) The FSA has recently set out a good practice model for stress testing and invited comments. The recommendations are described in ‘Stress testing’, *FSA Discussion Paper 05/2*.

(4) The various published initiatives are described in Sorge, M (2004), ‘Stress testing financial systems: an overview of current methodologies’, *BIS Working Paper no. 165*.

(5) The stress tests were described in Hoggarth, G and Whitley, J (2003), ‘Assessing the strength of UK banks through macroeconomic stress tests’, *Bank of England Financial Stability Review*, June.

But it also emphasised the importance of further development work, to gauge better the resilience of the financial system to potential shocks.

A key element of the FSAP exercise was a ‘bottom-up’ stress test. In this exercise, the UK authorities constructed four specific macroeconomic scenarios which were supplied to six large UK-owned banks and four foreign investment banks. The banks were asked for their assessments of the impact of the four scenarios on their portfolios. This type of approach has the benefit of enabling responding banks to apply the scenarios to internal data about the structure of their credit portfolios, but it has a number of disadvantages.

First, bottom-up exercises may be costly for participating institutions, as participants will need to run additional stress tests — over and above those used in their own risk assessments — if they are to capture the implications of the specific scenarios being considered. These potential costs preclude the frequent running of ‘bottom-up’ exercises which is important if stress tests are to assess risks as they evolve. Second, it is difficult to gauge how far differences between banks’ results reflect the methods and assumptions used rather than differences in their underlying portfolios.

Third, and most importantly, the ‘bottom-up’ approach is not flexible enough to test the implications of differing judgements about the way in which households, companies and banks react to the shocks. And, indeed, the *Financial stability conjuncture and outlook* articles in previous *Reviews* have highlighted many areas in which borrower and lender behaviour might have changed relative to past experience, so that historical models do not necessarily represent a ‘best guess’ of the way in which the economy might now evolve in times of stress. Any meaningful use of stress testing models should, therefore, involve exploration of the implications of differing judgements, rather than being a ‘black box’ exercise.

To overcome these limitations, subsequent research has tried to enhance the Bank of England’s ‘in-house’ modelling of the full chain from economic shock to banks’ balance sheets. So far, the focus has been on stresses which are macroeconomic in origin and, even where these economic stresses are considered, the Bank’s systemic stress testing research has concentrated on domestic credit risks rather than foreign credit,

market, liquidity or operational risks. This reflects, to some degree, data availability. For example, a full stress test of market risks requires detailed data on positions and contracts that are neither publicly disclosed nor subject to regulatory reporting. Moreover, surveys reveal that individual banks themselves are not yet able to integrate stress testing of market, credit and liquidity risks systematically.

Given these limitations, the Bank’s current stress testing framework is still work in progress but, even with further development, no single model is ever likely to capture fully the diverse channels through which shocks may affect the financial system. Stress testing models will, therefore, remain a complement to, rather than a substitute for, broader macroprudential analysis of potential threats to financial stability.

This article describes the current systemic stress testing framework used by Bank staff as part of the toolkit for financial stability assessment. Before describing the Bank’s approach to stress testing, the article outlines some general features of stress testing exercises and the challenges in running them. The final section illustrates the approach by presenting an update of the stresses analysed in the United Kingdom’s FSAP.

Features of stress testing models

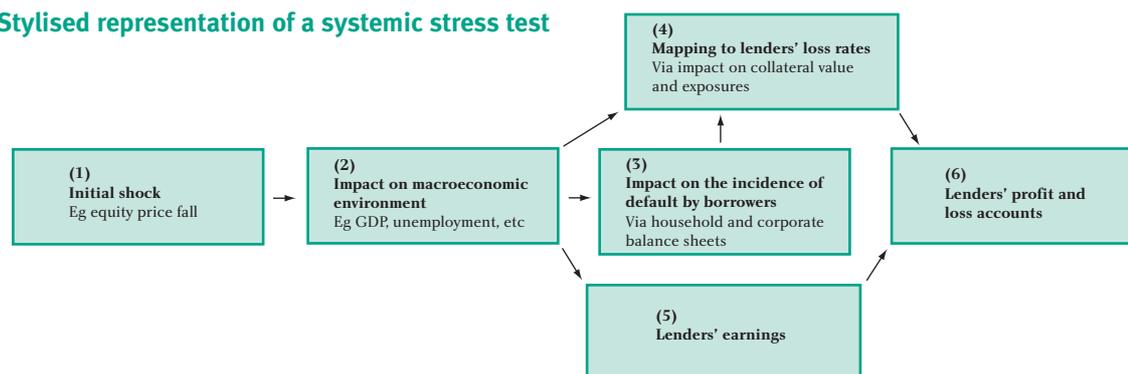
The essence of stress testing is to develop a view of the way in which a shock — crystallisation of a risk — might impact on banks’ balance sheets. Chart 1 decomposes stress tests into six steps which form a ‘chain’ from the original scenario to banks’ profit and loss accounts. These steps are not only the essence of financial stability stress tests but generic to any market or credit risk stress test.

Choice of shock

The first element of a stress test is the selection of the initial shock, or indeed combination of shocks. Each shock comprises a change in some specific risk factor such as productivity or oil prices. One key issue is how large a shock to consider. Because systemic stress tests aim to highlight vulnerabilities to stresses, the shock should be extreme. But, for any policy conclusions to be meaningful, it should not be so extreme as to be implausible. So, for example, there is no real value in considering the impact of simultaneous default by all borrowers!

Typically, shocks are calibrated using one of four methods. One is ‘historical’, in which the shock is

Chart 1
Stylised representation of a systemic stress test



calibrated to match a specific past event such as the early-1990s' recession. Another is 'probabilistic' in which the shock is calibrated against the distribution of all past outturns; for example taking the 99th percentile of past oil price changes. Stress scenarios may also be 'hypothetical', assessing the impact of risks for which past experience does not provide a ready yardstick. Another alternative sometimes used in systemic stress testing is to 'reverse engineer' shocks: assessing how large a shock would need to be to generate losses in excess of some threshold.

Mapping from shocks to systemic impact

The stress testing chain starts by considering the impact of the initial shock on the future evolution of the macroeconomic environment (step two in Chart 1). This step is important as it enforces an explicit modelling of correlations of the macroeconomic determinants of credit risk — such as unemployment and property prices — between each other and across time.

The changing macroeconomic environment will affect borrowers' balance sheets, and hence the incidence of default (step three). So, for example, an adverse supply shock might lead, at least in the short term, to an increase in interest rates. This in turn would lead to rising income gearing, making it harder for some households to service their debts. The incidence of arrears might therefore rise.

In a fourth step, changes in arrears are mapped to losses on loan portfolios. The mapping from default to losses is not one-for-one, because lenders may recover a part of the value of defaulted loans — for example, through possession of properties held as security against mortgage debts. The actual loss rate

depends on the value of collateral held, which may in turn have been affected by the impact of the shock on the macroeconomic environment. The macroeconomic environment may also affect banks' earnings — for example any slowdown in borrowing will reduce potential interest income (step five). Taken together, these steps enable a consistent mapping from the scenario to the impact on banks' balance sheets (step six).

The diagram and the discussion so far have been presented as a chain but, of course, there may be feedback at all stages. So, for example, were banks to incur material losses, they might cut back lending, with consequences for household and corporate balance sheets, and ultimately for macroeconomic variables. Were the banking sector to be so heavily affected that one institution failed, other banks might experience further losses — arising, for example, from counterparty exposures or from any falls in asset prices following the liquidation of the ailing bank's portfolio.

Many of the shocks analysed here do not appear to have a significant effect on the banking sector's profits. We might not, therefore, expect any feedback to prove material — but where stress testing does identify material impacts, feedbacks may be (much) more important and warrant further analysis. Modelling feedback and the interaction between banks, households and companies is complex: because of the many channels through which such feedback may operate; because of the critical role of expectations and information; and because past experience may not be a good indicator of behaviour in extreme circumstances. An article elsewhere in this *Review* describes one model that can help form an assessment of possible feedbacks.⁽¹⁾

(1) Goodhart, C and Zicchino, L, 'A model to analyse financial fragility' in this *Review*.

Estimation challenges

Although there are many ways to calibrate the various stages of the chain, they have two important and related challenges in common:

- *Very adverse macroeconomic conditions combined with high credit losses are rare.* Moreover many of the time-series data used in financial stability analysis have been available for only a short time. This makes it hard to form an accurate estimate of the statistical relationships in all steps of the chain. Moreover, the estimation challenge is compounded by the changes in the landscape of financial service provision over the recent past — with, for example, wide-ranging developments in the management of credit risks and a growth in the array of financial market products used by banks. These changes may affect borrowers' and lenders' responses to macroeconomic stresses, so that historical experience may not be a good guide to future behaviour.
- *Most statistical models are linear.* This approximation may well be reasonable when shocks are small. But when shocks are extreme, non-linearities may be important: doubling the size of the shock may more than double its impact. And, indeed, many credit risk models suggest a non-linear relationship between the scale of shocks to firms' balance sheets and the likelihood that they subsequently become insolvent. It is also quite possible that economic relationships will change in times of stress. So, for example, when there are few mortgage possessions, banks may be able to realise collateral without affecting house prices. But when rates of possession are high, banks may need to accept offers well below prevailing market prices, if they are to realise collateral promptly.

Given these technical challenges, no single model can hope to generate robust answers. Instead, there is a role for judgement at each step of the chain — for example, considering the potential implications were the relationship between credit card arrears and income gearing to be stronger than the average of past history. The technical challenges in modelling financial stresses mean

that there is bound to be considerable uncertainty around the precise numbers derived from any stress test.

Notwithstanding this uncertainty, however, a key benefit of stress tests is that they impose a coherent structure in which to discuss risks and the potential impact of structural changes on the stability of a financial system. It is by ensuring the consistency of the scenario that stress testing exercises can add rigour to systemic analysis.

Stress testing at the Bank of England

Bank of England staff have developed several models to facilitate systemic stress testing exercises. These models are used to calibrate the six steps of the chain described in Chart 1.

- *Step 1.* Shock selection. The example below is based on a 'probabilistic' scenario selection, as deployed in production of the stress tests used in the United Kingdom's FSAP. Hypothetical scenarios have been used to explore the robustness of the UK financial system to some of the risks identified in recent *Reviews*.
- *Step 2.* The impact of scenarios on the macroeconomic environment is calibrated using one of the Bank of England's macro-forecasting models, typically using recent *Inflation Report* forecasts as a 'base case' on which to build. In the stylised example described in the next section, the economic implications of the shocks follow mechanically from the model, with judgements applied only in assessing implications further along the chain.⁽¹⁾ One key factor driving the impact of the shocks is the assumed policy reaction. For the purpose of this stylised exercise, monetary policy is assumed to follow a Taylor rule.⁽²⁾
- *Step 3.* The profiles for macroeconomic variables are run through separate models of corporate and household sector balance sheets. The Bank's suite of satellite models for household and corporate balance sheets was first described in an article in the December 2001 *Review*. Since then, the various models have been refined,

(1) This treatment is, of course, not representative of the ways in which the Monetary Policy Committee considers the economic implications of the risks surrounding their central assessments. As has been described elsewhere, Committee members use a range of models and judgements in forming their assessments.

(2) Under a Taylor rule, interest rates are modelled as a linear combination of deviations of inflation from a target rate and output from potential output.

as described in a series of *Working Papers*.⁽¹⁾ The key equations are summarised in Annex 1.

In the statistical models used, income gearing — a measure of the ease with which households and firms can cover debt servicing obligations — is found to be an important driver of corporate liquidations, mortgage arrears and credit card arrears. GDP and unemployment have an additional impact and corporate liquidations and mortgage arrears are also found to be affected by the prices of commercial and residential property respectively.

The models used have two important limitations. First, they are estimated at an aggregate level, rather than by considering the experience of individual households or firms. One cost of this approach is that it cannot pick up the implications of any change in the composition of the borrower population. Individual banks themselves may be better able to differentiate within sectors, using the data on individuals and companies collected in deciding whether or not to approve each loan. Second, there is little explicit feedback from household arrears and corporate liquidations to the macroeconomic profiles. The Bank's macroeconomic models do, however, implicitly embody past feedbacks, as such feedbacks will be reflected in the historical macroeconomic data used to estimate them.

- **Step 4.** Banking sector losses on corporate portfolios and unsecured loans to households are modelled in aggregate.⁽²⁾ As discussed above, sectoral defaults need not map in a one-to-one fashion into bank losses. For corporate exposures, write-offs are driven by the interaction of commercial property values (a proxy for collateral) and liquidation rates. Indeed, even under scenarios in which property values fall sharply, the collateral offers some protection. Collateral values do not affect the mapping from arrears on unsecured household loans to write-offs.

Mortgage write-offs are modelled in a different way, in order to exploit the limited disaggregated information available on the distribution of collateral values across

banks' portfolios. Information on the loan-to-value ratios (LTV) of new loans and the flow of mortgage redemption payments is used to construct a rough estimate of the distribution of collateral values across all loans. In the example below, we assume that loans with the highest LTVs default first, but the model also permits an assessment of the implications for write-offs under different assumptions about the distribution of LTVs for those in arrears.

- **Step 5.** Changes in banks' income are modelled in a reduced-form fashion. Given changes in the structure of the banking sector over recent years, it is, perhaps, not surprising that statistical relationships are weak. There is a correlation between the banking sector's interest income and GDP growth. But no statistically significant link between economic activity and other types of income has been found.
- **Step 6.** The overall impact on the banking sector's profits is driven by changing write-offs and income streams. This follows mechanically from the sector's exposures to the three broad asset classes and the importance of interest income as a source of earnings.

Systemic stress testing: an example

This section sets out an example of the use of stress testing models for systemic analysis. It repeats and extends the analysis undertaken in the United Kingdom's FSAP, to highlight the flexible method that has since been developed.

Selection of shock

The FSAP exercise used four scenarios, recapped in Box 1. The shocks used in this example have not been updated to reflect any changes to the economic conjuncture since the FSAP exercise.

In the original FSAP exercise, the impact of each shock was estimated over a twelve-month period, with monetary policy assumed to react according to a Taylor rule. One consistent theme of feedback on the results of the exercise was that the stress tests might have generated a greater impact had the shocks been run over a longer horizon. In re-running the exercise,

(1) The original set of satellite models was described in Benito, A, Whitley, J and Young, G (2001) 'Analysing corporate and household sector balance sheets', Bank of England *Financial Stability Review*, December. Further developments are described in: Whitley, J and Windram, R (2003), 'A quantitative framework for commercial property and its relationship to the analysis of the financial stability of the corporate sector', *Bank of England Working Paper no. 207*; Bunn, P and Young, G (2004), 'Corporate capital structure in the UK: determinants and adjustment', *Bank of England Working Paper no. 226*; Whitley, J, Cox, P and Windram, R, (2004), 'An empirical model of household arrears', *Bank of England Working Paper no. 214*.

(2) Earlier versions of the write-off equations are described in Hoggarth, G, Logan, A and Zicchino, L (2005), 'Macro stress tests of UK banks', in *Investigating the relationship between the financial and real economy*, BIS Paper no. 22.

Box 1: Scenarios explored during the 2002 FSAP exercise

The four scenarios used were:

- A *Decline of 35% in world and UK equity prices.* Under this scenario, lower equity prices are assumed to result from a downward revision in expected corporate earnings. The macroeconomic transmission is largely through household balance sheets, with lower personal sector wealth reducing household consumption and hence aggregate GDP. The impact on demand and output is, however, partly offset by the consequent easing in monetary policy that follows from the Taylor rule.
- B *Decline of 12% in UK residential and commercial property prices.* This scenario is assumed to result from a general drop in demand for the flow of property services. Since housing accounts for one half of UK households' net worth, the personal sector's balance sheet deteriorates and UK household consumption is reduced. Output is lower than otherwise but the adverse effect is a little smaller than under the first scenario.
- C *1.5 percentage point unanticipated increase in UK average earnings growth* (reflecting a step increase in real reservation wages). This supply shock boosts personal incomes and consumption but the transmission to higher inflationary pressure induces a rise in official interest rates under the Taylor rule. Overall there is a marginal decline in GDP compared with the base case.
- D *A 15% (initial) unanticipated depreciation in the trade-weighted sterling exchange rate.* This scenario entails a fall in the demand for sterling owing to an increase in the perceived relative riskiness of sterling assets (in other words, a rise in the sterling risk premium). Sterling depreciation results in higher inflation and, in response, nominal interest rates increase under the Taylor rule. Nonetheless, since wages and prices adjust only gradually, there is a temporary depreciation in the real exchange rate which in turn boosts net export volumes.

we have therefore extended the horizon to three years — and indeed, the maximum impact on the banking sector typically occurs during the third year. The scenarios are run from 2005 Q1.

One benefit of 'in-house' modelling is the flexibility to experiment with differing shocks. So, for example, we can consider what might happen were the four shocks to coincide and explore whether their effects would reinforce or offset one another. In preparing this example, we considered all possible combinations of the four shocks described in Box 1. Combining shocks in this way begs the question: is it plausible that several extreme events might coincide? In calibrating a set of coincident shocks, one might in principle consider the historical covariance between shock factors (for example, assessing how far equity and exchange rate shocks have coincided in the past). But we have not done so in preparation of this example, so the results should be viewed as the output of a purely mechanical exercise.

Mapping shocks through the chain

The macroeconomic implications of the shocks are assumed to evolve in line with the marginal properties

of one of the Bank's macro-forecasting models. In all cases, changes in the macroeconomic environment are small relative to the recession of the early-1990s. So, for example, GDP continues growing, albeit more slowly than in the base case, under most of the scenarios considered. The relatively small macroeconomic impact reflects, in part, the assumed monetary policy response to the shocks that follows from use of a Taylor rule.

Under most of the shock scenarios, inflation rises and the Taylor rule therefore generates a tightening of monetary policy. This leads to a rise in debt servicing costs. Indeed, household and corporate debt servicing costs are currently more sensitive to movements in interest rates than previously, because indebtedness is higher relative to income than it has been in the past.

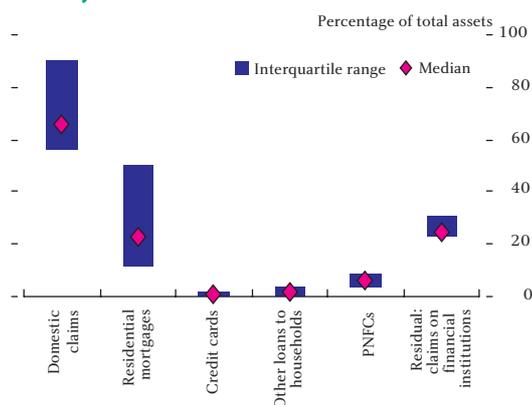
Past empirical work at the Bank has confirmed that income gearing is a key driver of liquidation rates and arrears. Hence, when all shocks coincide, mortgage arrears rise to around 3½%, or close to their historical peak, and corporate liquidations also increase as the economy slows. It is striking that

both corporate liquidations and household arrears rise, at least temporarily, under almost all of the stress tests.

The last stage of the stress testing exercise is to gauge the implications of these rising default rates for the large UK-owned banking sector's profits. The slowdown in economic activity associated with the stresses leads to a small reduction (relative to base) in banks' interest income. But the largest impact on balance sheets is through default by household and corporate borrowers.

Aggregate lending to UK households and non-financial companies accounts for around a third of the major UK banks' assets.⁽¹⁾ The remainder comprises foreign claims and exposures to UK financial institutions. The aggregate numbers do, however, mask some wide-ranging differences between the major UK banks (Chart 2).

Chart 2
The major UK banks' domestic claims as at end-2004

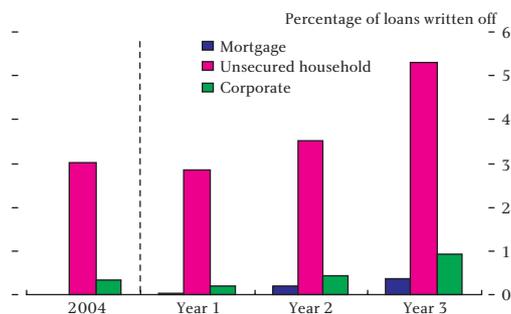


Source: Bank of England and FSA regulatory returns.

The bulk of domestic claims on non-financial institutions are residential mortgage exposures. However, while mortgage arrears rise under the stress tests, the collateral held by banks cushions the impact on balance sheets. Banks' accounting disclosures suggest that average loan-to-value ratios across their residential mortgage portfolios are typically below 50%. It is, therefore, not surprising that loss rates on mortgage portfolios remain small — even when all shocks coincide (Chart 3). Write-offs on unsecured lending to households almost double to around 5% in the third year of the stress

test; but these loans account for less than 5% of the sector's assets.

Chart 3
Write-offs on domestic portfolios under the 'worst case' combination of shocks



Source: Bank of England.

Lending to companies — around a quarter of the sector's domestic claims on non-financial institutions — is also often collateralised, so liquidations do not map one-for-one to loss rates. The extent to which this collateral covers risks is affected by the profile of commercial property prices under the stress scenarios. Corporate loss rates are around 1% in the third year when all shocks coincide — more than three times the loss rate on mortgage portfolios.

Chart 3 underlines the importance of running stress tests over a longer horizon. It takes time for the shock to work through to a rise in arrears and liquidations, so that write-off rates are little changed in the first year of the stress test, but then increase markedly.

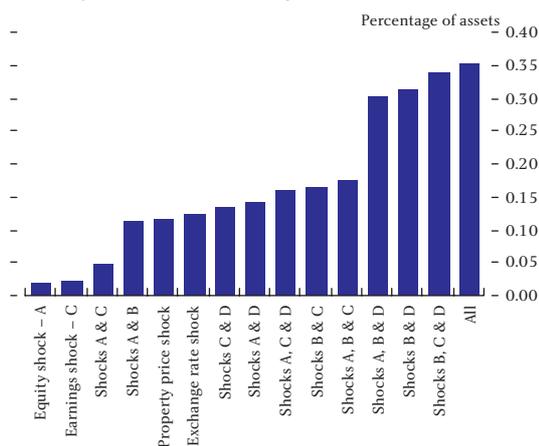
The text above has focused on the 'worst case' combination of shocks, to give an impression of the way in which a shock works its way down the chain from the initial change in an exogenous factor to banking sector balance sheets. Chart 4 summarises the results of all the various shock combinations.

The equity price fall is the most benign scenario. Some of the other individual shocks have a much greater impact — the largest being the exchange rate shock. The ranking of the individual shocks differs from that in the FSAP exercise, in which the equity price shock had the greatest effect. This reflects, in part, the

(1) The peer group used is described in Box 1 on page 18 in this Review.

exclusive focus on domestic credit risk in the example presented here, whereas banks' participating in the FSAP could have considered the impact of the shocks across all activities. But it also reflects the longer horizon used in the stress tests, as the macroeconomic effects of some shocks unwind more quickly than others.

Chart 4
Cumulative impact of stress scenarios on major UK bank's profits over three years



Source: Bank of England calculations.

When several shocks coincide, the impact is typically greater than for any of the shocks taken in isolation. Indeed, interactions between the shocks often magnify their impact so that the overall effect on banks' profits is more than the sum of the individual shocks. So, for example, a shock to property prices reduces the value of collateral available and hence increases the impact of a rise in arrears, from any source, on banks' profits. Nevertheless, even the worst case considered costs the banking sector just 0.35% of total assets.

That said, however, some individual banks within the system might be affected more than others and, as mentioned above, a failure of an individual bank might have systemic implications. As a rough check, we gauged the overall impact on individual banks by applying changes in write-off rates mechanically to each institution's balance sheet exposures. No bank loses more than 0.6% of assets under any combination of these four shocks.

The stress tests shown take estimated models at each stage of the chain as a 'best guess'. There are risks around these central cases, which on the downside would imply that the sanguine results understate the threat to financial stability were these scenarios to

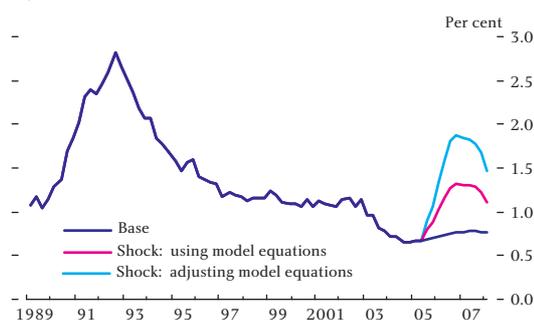
occur. There are also risks that the model might not fit the data well. The models do, however, provide a framework for exploring which of the myriad uncertainties might have the greatest impact on our conclusions. Such discussion — or 'what if' analysis — may be helpful in focusing future assessment work and indeed in gauging the degree of uncertainty surrounding the results.

Extreme responses under stress

As argued above, theoretical models suggest that the relationship between default and balance sheet shocks is likely to be particularly pronounced during episodes of stress. And, while the estimation period of both the macroeconomic model and the satellite models determining arrears and liquidations rates do cover the experience of the recession in the early-1990s, the dataset is dominated by the sustained and stable growth through the remainder of the 1990s. It is, therefore, possible that any model based on normal linear statistical techniques will be unrepresentative of stress periods. Indeed, in the case of the corporate liquidations equation, the fit is relatively poor during the recession period.

One way of assessing the potential implications of these non-linearities is to ask: what if the experience of the early-1990s is representative? In other words, re-running the shock analysis with the corporate liquidations equation adjusted to fit the experience in the 1990s' recession rather than the average over the entire decade. Under the 'worst case' combination of shocks, this 'what if' exercise sees corporate liquidations rising considerably further (Chart 5). The reduction in major UK banks' profits is approximately 40% larger.

Chart 5
Corporate liquidations with and without residual adjustments – when all shocks coincide



Sources: DTI and Bank of England calculations.

As discussed above, another reason why large shocks may have a disproportionate impact is the potential for banks' responses to affect asset prices if all banks want to realise large amounts of housing collateral. One way of assessing the potential implications of any asset firesale is to ask: what if banks incurred (say) a 10%, or even a 20%, haircut on any mortgage collateral realised during the stress test? Under the full combination of shocks, cumulative mortgage losses would be 40% higher with a 10% haircut and 75% higher with a 20% haircut.

Structural breaks

As argued above, the financial landscape has changed over the past 15 years, so that borrowers' and lenders' responses to shocks may differ from historical experience. In a modelling sense, these changes mean that some estimated parameters no longer represent a 'best guess' of the true response of borrowers and lenders to shocks. Further research, analysis and market intelligence might enable us to understand better the behavioural implications of any structural changes identified in the *Review*. But there are many candidate changes, so how can the work best be focused? Stress testing models provide one tool for prioritisation, by providing a rigorous framework within which to ask how far the impact of shocks might be increased (or indeed decreased) were equation parameters to differ from historical estimates.

As an example, consider the implications of the recent rapid growth of the buy-to-let mortgage market, as discussed in previous *Reviews*. Bank contacts have differing views on the vulnerability of these exposures. On the one hand, buy-to-let borrowers may be better able to finance their mortgages than are first-time buyers. On the other hand, buy-to-let borrowers may be less inclined to tolerate negative equity than are owner occupiers — so their arrears may be more sensitive to movements in house prices. Because the market is new, the behaviour of buy-to-let borrowers through a business cycle is untested.

'What if' analysis can help in gauging how much of a risk this new market might pose for financial stability.

For example, we have re-run the 'worst case combination' assuming that buy-to-let borrowers are twice, three times and even four times as sensitive to house price movements as average households. There is no science to this calibration, though quadrupling the sensitivity seems extreme. But even under this extreme assumption, the major UK banks would lose no more than a further 0.01% of assets over the three years — a low number, reflecting the small scale of buy-to-let lending. While some banks may be more affected than the sectoral average, it seems quite likely that other candidate structural breaks will have more material implications for the stability of the financial system.

Concluding comments

This article has outlined how stress testing exercises can be used to assess the potential impact on the financial system of the risks identified through surveillance analysis and market intelligence. In doing so, it draws out some features of stress testing analysis that are pertinent for stress testing by individual banks as well as by financial authorities concerned primarily with systemic risk. The estimation challenges faced in modelling financial stresses are sufficiently significant that no single model can hope to generate robust analysis in isolation. Meaningful stress testing exercises will, therefore, involve discussion and judgement. The value of the models is in providing a coherent framework within which to consider the implications of differing judgements.

The Bank's suite of models has been broadened in recent years, permitting 'in house' stress testing of the entire chain from economic shock through to banking sector balance sheets but many limitations remain. In particular, the focus on domestic lending omits any potential for the shocks considered to generate losses on either foreign credit exposures or through any impact on the functioning of financial markets. The integration of market and international risks is an area in which we hope to develop the framework in the future.

Annex: Main equations and data sources

This annex lists the main equations for the stress tests. Most right-hand variables are taken from the Medium Term Macroeconometric Model as defined in 'Economic Models at the Bank of England', Bank of England, (2000) as well as Benito, A, Whitley, J and Young, G, (2001) 'Analysing corporate and household sector balance sheets', Bank of England *Financial Stability Review*, December.

Default rates

D1 Annualised corporate liquidations rate (LQR)

$$LQR_t = 4 * (-0.024 + 0.22LQR_{t-1} - 0.089 \Delta LQR_{t-1} - 1.57(\Delta \ln(GDP_t) - 0.0059) + 0.003IGEAR_{t-2} - 0.003 \Delta CAPITAL_{t-1} + 0.012 \Delta RRL_{t-1} + 0.017 \Delta (NDEBT_{t-1}/GDPL_{t-1}))$$

GDP = real GDP at factor cost

IGEAR = PNFC income gearing

CAPITAL = commercial property capital values

RRL = real interest rate

NDEBT = net debt of PNFCs

GDPL = nominal GDP at factor cost

Data source: DTI, annualised number of as a percentage of the stock of registered companies.

D2 Mortgage arrears of more than six months (ARREARS)

$$\ln(\text{ARREARS}_t) = 1.23 + 0.30 \ln(\text{MIGM}_{t-1}) + 0.086 \ln(\text{UR}_{t-1}) - 1.06 \ln(\text{UNDRAWN}_{t-1}) + 1.41 \ln(\text{ARREARS}_{t-1}) - 0.51 \ln(\text{ARREARS}_{t-2}) - 0.52 \ln(\text{LVRFTB}_t)$$

MIGM = mortgage income gearing

UR = unemployment

UNDRAWN = undrawn housing equity

LVRFTB = loan-to-valuation ratio of first-time buyers

Data source: Council of Mortgage Lenders.

D3 Credit card arrears of three payments (CREDARR)

$$\text{CREDARR}_t = -2.59 - 0.062Q2_t - 0.064Q3_t - 0.053Q4_t + 0.024IHGEAR_{t-1} + 0.156 \ln(\text{CREDBAL}_{t-1}) + 0.677 \text{CREDARR}_{t-1}$$

Q2 = seasonal dummy, Q2

Q3 = seasonal dummy, Q3

Q4 = seasonal dummy, Q4

IHGEAR = income gearing of households

CREDBAL = number of active credit card balances

Data source: Association of Payment Clearing Services.

Banking sector model equations

B1 Corporate write-off rate (BWRCORP)

$$\ln(BWRCORP_t) = 12.81 - 3.48\ln(CAPITAL_t/0.01RPIX_t) + 2.09\ln(LQR_{t-4})$$

CAPITAL = commercial property capital values

RPIX = retail price index

LQR = annualised corporate liquidations rate

Data source: Bank of England.

B2 Credit card write-off rate (BWRCC)

$$\ln(BWRCC_t) = 0.13 + 0.47\ln(BWRCC_{t-1}) + 0.84\ln(CREDARR_{t-4})$$

CREDARR = credit card arrears of three payments

Data source: Bank of England.

B3 Real net interest income (BNIKP)

$$BNIKP_t = 0.996 + 2.02*((GDPM_t/GDPM_{t-4}) - 1)$$

GDPM = GDP at constant market prices

Data source: Annual accounts of UK banks.

Inter-industry linkages between UK life insurers and UK banks:

an event study

Allan Monks and Marco Stringa, Financial Industry and Regulation Division, Bank of England

Interlinkages between financial sectors are an important consideration in the assessment of the overall financial system. Whilst previous *Reviews* have focused primarily on the banking system, an article in the December 2004 *Review* provided a comprehensive qualitative assessment of the risks to financial stability arising from other UK-resident financial sectors. This article builds on that work by exploring the degree of co-movement in market prices as an indicator of linkages between sectors. The event study approach used in this article measures the extent of any spillover to UK banks' equity prices from specific events affecting the UK life insurance sector.

ASSESSING THE IMPORTANCE of interlinkages between financial sectors is a key ingredient in financial stability analysis, given the Bank's responsibility for the stability of the financial system as a whole. Matthew Corder's article in the December 2004 *Review* provided a comprehensive qualitative assessment of the potential risks to financial stability arising from non-bank UK-resident financial sectors. It concluded that, even when disruption to a non-bank financial sector does not pose a direct threat to the financial system, such disruption could still have financial stability consequences through its effects on the banking sector, whose systemic importance is clear. The article described three potential channels of contagion through which stresses from one financial sector could be transmitted to the rest of the financial system: counterparty exposures; links through capital markets; and effects on confidence.

Although banks' monetary returns and accounting disclosures are sufficiently detailed to obtain a first estimate of counterparty exposures, they are less useful in measuring the two remaining channels: links through capital markets and confidence. Market prices, however, provide a natural way of gauging the materiality of linkages between sectors via all three transmission channels. This article thus adopts a quantitative approach based on market prices.

Among the various non-bank UK financial sectors, previous *Reviews* have concentrated on UK-resident

life insurers, as falls in global equity prices from 2001 to early 2003 reduced solvency margins across the sector. Furthermore, the emergence of the bancassurance model over the past decade has led to an increasing involvement of UK banks in the life insurance market. The potential for contagion from the insurance sector to the UK banking sector has therefore become a more important issue. This article focuses on periods of stress in the UK life insurance sector during 2001–03, and analyses movements in equity prices to corroborate the information contained in balance sheet data.

Measuring interlinkages using balance sheet data

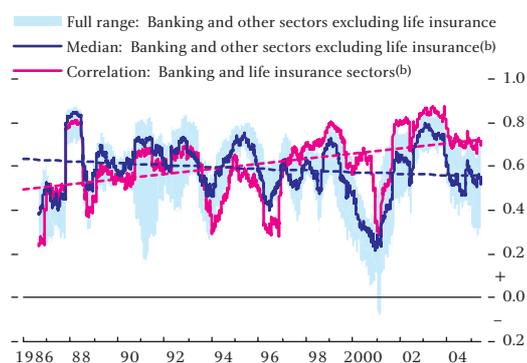
The direct credit exposure of UK banks to the UK life insurance sector is limited. Loans to UK-resident insurers and pension funds account for just 6.3% of the major UK banks' Tier 1 capital. But ownership interests are potentially more significant. At the end of 2003, six of the ten largest UK-owned banks owned life insurance subsidiaries, although their scale varied markedly. In adverse circumstances, life subsidiaries might affect their parents via: reductions in banks' operating incomes; the effect on banks' capital from changes in subsidiaries' 'embedded value'; and the cost of re-capitalising a life insurance subsidiary. Life insurers are also heavily involved in capital markets and provide important financial services to households and corporates. Market prices have the ability to reflect this additional relevant information and, therefore, provide a convenient way of gauging the significance of spillovers via capital market and confidence channels,

as well as through the counterparty exposures measured by accounting data.⁽¹⁾

Measuring interlinkages using correlations

Correlations between equity prices are often used as a simple metric to assess the potential for contagion between sectors. In Chart 1, the bilateral correlation between the UK banking and life insurance sectors is compared to those of the banking sector with all other sectors of the UK equity market.⁽²⁾

Chart 1
Correlation between UK banks and other UK sectors' equity prices^(a)



Source: Thomson Financial Datastream.

(a) Correlation is calculated using a 182-day rolling window.

(b) Broken lines show the trend in correlations.

Over the period 1986–2004, the median correlation between the equity prices of UK banks and those of the non-financial UK sectors fell slightly (blue line). However, over the same period, the correlation between UK banks and the UK life insurance sector increased (pink line). The rise in correlation *might* partly be attributed to the increased involvement of banks such as Abbey, HBOS and Lloyds TSB, in the life insurance market in the second half of the 1990s and early 2000s.

The main shortcoming of correlation analysis is that the equity returns of any two sectors may arise as a result of market-wide developments, which do not reflect any interlinkages or spillovers from one sector to another. Equity returns can be affected by developments on three levels: the overall market, a specific sector, or an individual institution. While the last two are relevant for identifying specific interlinkages between two sectors, the first is not.

Hence, systematic market-wide movements must be filtered out first when assessing the degree of spillover from the life insurance to the banking sector.

Moreover, as Chart 1 shows, correlations vary over time, so that *average* relationships might not accurately reflect the potential for contagion in times of stress.

An event study approach

In order to uncover spillovers between the two sectors, an event study technique can be used to remove the systematic part of equity returns. The intuition behind the event study technique lies in the separation of equity returns into two components: the first due to general market movements and the second due to the impact of a chosen event, thereby revealing the specific systemic impact of life insurance events. Such an approach also enables the *ex-post* measurement of interlinkages during stress periods, resolving the problem of correlations varying over time.

The remainder of this article explains the event study approach in more detail and then presents a set of results and concluding comments.

Event selection

In any event study the choice of events is paramount. First, the events need to meet some general criteria:

- The event should be unexpected, as equity prices should not react to expected events if markets are efficient.
- The event should not coincide with the release of other significant but unrelated news, due to the difficulties of disentangling the impacts of the two events.

Second, for the purpose of this article, some additional criteria are required:

- The event should have occurred in a relatively recent period. Structural changes in either the economy or banks' business models could result in misleading conclusions if earlier events are used.
- The event should have originated from the life insurance sector.

(1) Furthermore, while accounting data could take several months to be published, market indicators can be obtained quickly.

(2) According to Datastream's classification, the UK equity market can be divided into eight representative sectors: resources, basic industries, general industrials, non-cyclical consumer goods, cyclical services, non-cyclical services, utilities, and financials. The life insurance and banking sectors are used in place of the financial sector.

Furthermore, spillovers through the financial system might operate asymmetrically depending on whether news is good or bad. So, in this article, only negative events are considered.

During the 2001–03 period, UK life insurers were adversely affected by a prolonged fall in global equity prices. As equity prices fell, speculation grew about the regulatory solvency of some UK life insurers. At the beginning of 2003, the FSA revised its policy, waiving some regulatory rules governing the calculation of solvency, provided the life insurers both remained strong on ‘realistic’ solvency measures and continued to meet EU minimum requirements. The 2001–03 period thus provides a suitable window to assess the degree of interlinkages between UK life insurers and UK banks as revealed by market price movements.

A list of candidate events was made after examining daily news events during the chosen period. Both *idiosyncratic events* — news originating from a single life insurance firm — and *sector-wide events* — news originating from more than one life insurance firm, or from an external source with relevance to the life sector — were considered. From the list of candidates, six events were judged to have met the selection criteria (Table 1).

Table 1
Selected events

<p>Event 1</p> <p>Date: 27 Feb. 2002</p> <p>Type: Sector-wide</p>	<p>Event description</p> <ul style="list-style-type: none"> • Aviva announced fall in its 2002 dividend. • Goldman Sachs cut its Earnings Per Share forecasts for Prudential. • AMP, 5th largest UK-resident life insurer by with-profits assets, announced earnings fell 54%. • HBOS issued new shares for £1.1 billion to fund mortgages and insurance policies. 	<p>Event 2</p> <p>Date: 11 July 2002</p> <p>Type: Sector-wide</p>	<p>Event description</p> <ul style="list-style-type: none"> • The FSA announced that some UK insurers were almost forced to sell stocks of equities at the FTSE 100 level of 4540, to protect their assets before the FSA adjusted one of its rules. The FTSE 100 fell to 4230 after the adjustment. • Bloomberg Europe Insurance Index posted its biggest decline since 21 Sep. 2001.
<p>Event 3</p> <p>Date: 23 July 2002</p> <p>Type: Sector-wide</p>	<p>Event description</p> <ul style="list-style-type: none"> • Aviva cut bonus rates on its with-profits policies, due to falling equity prices. • According to a Bloomberg survey, Prudential's operating profits are expected to fall by 10%. • Fortis, one of the largest European life insurers, announced profit might not meet estimates due to falling equities. • Skandia AB, the largest Nordic insurer, announced sales dropped 28% due to falling equity markets. 	<p>Event 4</p> <p>Date: 8 Aug. 2002</p> <p>Type: Sector-wide</p>	<p>Event description</p> <ul style="list-style-type: none"> • Citigroup stated that a fall in the FTSE 100 to 3600 may force insurers to inject money into their life funds. • Prudential announced sales dropped 49% in Singapore due to falling equity prices. • Royal and Sun Alliance stated the need to raise £800m, close its UK life insurance business and cut 1,200 jobs. • Aegon, the second largest Dutch insurer, announced a 77% fall in profits due to falling equity prices.
<p>Event 5</p> <p>Date: 5 Mar. 2003</p> <p>Type: Idiosyncratic</p>	<p>Event description</p> <ul style="list-style-type: none"> • Friends Provident reduced its 2002 dividends and announced future payments might not keep in line with inflation. 	<p>Event 6</p> <p>Date: 4 Sep. 2003</p> <p>Type: Idiosyncratic</p>	<p>Event description</p> <ul style="list-style-type: none"> • Fitch Ratings, downgraded Royal & Sun Alliance to BBB from BBB+ and long-term rating to BB+ from BBB-.

Source: Bloomberg.

Event study method

The event study approach employed in this article uses a market model to estimate the relationship between an institution's equity returns and overall stock market returns (see Annex). Daily equity returns can then be decomposed into two parts for the statistical model adopted: general market movements forecast by the model, and the remaining residual — the abnormal return (AR). The AR is then divided by its standard deviation to obtain the standardised abnormal return (SAR). If the calculated SAR on the event day is significantly different from zero, the firm's equity price is deemed to have been significantly affected by the event.

The ten largest UK-owned banks, which accounted for more than 90% of UK-owned banks' assets over the period studied, are used to represent the UK banking sector. The five UK-owned life insurers in the FTSE 100 Index at the time of the study were used as a proxy for the life insurance sector.

Event study results

The results are presented in three steps: first, institutions are analysed individually, then they are grouped into a life insurance index and a bank index, and finally the bank index is split into three sub-indices according to the proportion of life

insurance assets held. In each case, Chi-square (χ^2) and SCAR statistics are used to provide a summary of the six events (see Annex).

Both summary statistics are necessary complements for a correct interpretation of the results. The SCAR — by summing returns over the events to capture the average reaction — may cause two oppositely signed but significant reactions to cancel each other out.⁽¹⁾ The Chi-square statistic avoids this problem by summing squared returns, but has the disadvantage of not distinguishing between positive and negative responses. The Chi-square also differs from the SCAR, by testing whether *at least* one of the events is significant, rather than the average response across events. The results for individual institutions are shown in Table 2.

The first column lists all the institutions in the sample. Columns two to seven report the SARs for each event. The last two columns show the Chi-square and SCAR summary statistics. Red shaded cells indicate a significant reaction to an event at the 99% confidence level, with orange shaded cells indicating significance at the 95% level.

Both summary statistics show that each of the five life insurance companies experienced a significant negative reaction to the six events *as a whole*. This confirms that the selected events had a significant impact on the life insurance sector, a pre-requisite for assessing spillover effects to the banking sector.

Observing the events *individually*, idiosyncratic events only have a significant impact on the life insurer that the news originated from. Thus there appears to be no spillover effects to the rest of the life insurance sector from firm specific idiosyncratic events. For sector-wide events, perhaps unsurprisingly, significant reactions appear for several insurers.

The banking sector had a more mixed reaction. Lloyds TSB shows the strongest response to the events, as evidenced by its Chi-square and negative SCAR. Although HSBC has a marginally significant Chi-square, its SCAR is not significant, implying a moderate and varied response to the events. According to the Chi-square statistic, none of the remaining banks have been affected significantly. The SCAR statistic reinforces this point, with the exception of Abbey National. Abbey has a negative

Table 2
First step: results by individual institutions

	Event 1	Event 2	Event 3	Event 4	Event 5	Event 6	Summary statistics	
	Standardised Abnormal Returns (SAR) ^(a)						χ^2_6	SCAR
Banks	Sector-wide				Idiosyncratic		All events	All events
Abbey National	-1.50	-0.93	-2.01	-0.91	-0.73	0.07	8.53	-6.02
Alliance & Leicester	-1.51	-0.15	-0.76	-1.66	1.51	-0.44	8.12	-3.01
Barclays	-1.53	0.62	-1.75	-1.90	0.05	1.02	10.44	-3.51
Bradford & Bingley	-1.81	-1.21	-0.87	1.02	1.22	1.36	9.86	-0.29
HBOS	-2.2 ^(b)	-0.54	0.43	0.49	0.47	-0.13	5.58	-1.42
HSBC	0.87	2.88	2.07	-0.66	0.17	-0.58	14.13	4.75
Lloyds TSB	-5.26	0.93	-1.6	-3.65	0.15	-0.17	44.52	-11.47
Northern Rock	-0.57	-1.6	-1.18	2.38	0.12	-0.37	10.10	-1.22
RBS	-1.48	-0.25	-0.05	1.39	-0.05	-1.22	5.69	-1.65
Standard Chartered	-1.97	1.46	-0.98	-0.17	0.78	-1.02	8.57	-1.88
Life insurers								
Aviva	-6.72	-2.87	-3.02	-1.25	-0.02	-0.28	64.12	-14.16
Friends Provident	-0.51	-0.22	-0.78	-1.14	-5.49	0.17	32.33	-7.96
Legal & General	-3.17	-1.34	-0.59	-0.62	-0.92	-1.09	14.62	-7.72
Prudential	-2.34	-0.01	-3.56	-2.59	-1.10	-0.39	26.23	-9.98
Royal & Sun Alliance	-2.32	-0.77	-3.77	-10.93	-1.01	-3.62	153.84	-22.42

Significant at the 99% level

Significant at the 95% level

(a) SARs are reported for the day of the event.

(b) Reaction calculated net of the dilution effect of the right issue described in Table 1.

(1) At first glance, positive reactions to negative news might seem surprising, but these reactions might be plausible were some institutions to gain competitive advantages from the news.

and marginally significant SCAR, indicating that responses to the events were collectively significant.

Focusing on individual events (SARs in Table 2), those defined as idiosyncratic showed no spillover to the banking sector. The sector-wide events did, however, prompt significant reactions from some banks. In a few cases — including the significant effects at HSBC — SARs are positive. This adds further uncertainty when trying to identify the impact of events on the banking sector by using individual institutions' results.

In order to assess the overall impact on the banking sector, individual institutions are aggregated into two portfolios representing the banking sector and the life insurance sector (Table 3). The summary statistics are broken down to capture sector-wide (S–W) and idiosyncratic (Idio) events separately.

Table 3
Second step: results by sectors^(a)

	χ^2			SCAR		
	All	S–W	Idio	All	S–W	Idio
Banks	6.4	4.9	1.5	-2.1	-1.2	-1.0
Insurance	55.2	55.0	0.2	-13.5	-13.0	-0.6

(a) The red shaded cells are significant at the 99% level.

For the banking sector, both summary statistics show that when the sector is viewed as a whole, there is no significant reaction to either the sector-wide or idiosyncratic events. As an initial conclusion, these results suggest that there is no clear evidence of spillover from the life insurance sector to the banking sector as a whole. However, Table 2 reveals that some individual banks did have significant responses to the events.

In order to investigate the above findings further, a third step is taken which aggregates banks according to the proportion of life insurance assets they held. This classification is best characterised as follows: 'bancassurers', which held the highest proportion of life assets; 'mortgage banks' with the lowest proportion; and 'internationally active banks' which fell in between these two extremes (Table 4).

The bancassurers group reacted significantly to sector-wide events according to both summary statistics (Table 5). There is thus evidence of a reaction from bancassurers' equity prices to life insurance events, which lends support to the notion

that there is a potential channel for spillovers to the banking sector via ownership. There is no significant evidence that either the international or the mortgage banks' equity prices reacted to the events.

Table 4
Percentage of assets attributable to life insurance business

(Per cent)	End-2001	End-2002	End-2003
Bancassurance			
Lloyds TSB	19.7	17.9	19.9
Abbey National	14.2	14.3	16.0
HBOS	12.0	10.5	10.7
Internationally active			
Barclays	2.3	1.8	1.8
HSBC	1.4	1.4	1.5
RBS	2.8	2.2	0.8
Standard Chartered	0.0	0.0	0.0
Mortgage			
Alliance & Leicester	0.6	0.0	0.0
Bradford & Bingley	0.0	0.0	0.0
Northern Rock	0.0	0.0	0.0

Source: Published accounts.

Table 5
Third step: results according to the proportion of life insurance assets^(a)

	χ^2			SCAR		
	All	S–W	Idio	All	S–W	Idio
Mortgage	6.3	4.3	2.0	-3.1	-3.8	0.7
International	4.9	3.4	1.5	-0.6	0.6	1.1
Bancassurance	20.8	20.5	0.3	-7.3	-7.6	0.3
Insurance	55.2	55.0	0.2	-13.5	-13.0	-0.6

(a) The red shaded cells are significant at the 99% level.

Concluding comments

This article employs a quantitative approach to assess the significance of spillovers from the UK life insurance sector to the UK banking system in times of stress. During the 2001–03 period of global equity market decline, several life insurers were exposed to adverse conditions. This provides a period of materially important events for the life insurance sector, which are used in the event study to reveal interlinkages between institutions using equity prices.

The event study method has the benefit of being able to detect spillovers arising from the full range of interlinkages. The same cannot, however, be said about balance sheet data, which tend to reveal only counterparty exposures. The event study provides a powerful tool that can be applied to any event, and used to extract the corresponding systemic part of an equity price reaction, helping uncover evidence of interlinkages. The event study is, however, only useful

when applied to events that have the potential to reveal evidence of interlinkages. The relatively small sample of events during 2001–03, and the rigorous selection criteria used in the event study, limit the number of events available for analysis.

The results of this relatively small sample show that, when the events are considered collectively, each insurer experienced a significant reaction. Of these events, neither of the idiosyncratic disturbances spilled over to the UK banking sector as a whole.

However, there is evidence that elements within the banking sector responded to the sector-wide events, but these reactions are not uniformly pervasive. On closer inspection of the banking sector, the results show that the bancassurers were the only group where equity prices were affected by disruptions in the UK life insurance sector. These results might suggest that spillover to the banking sector came through ownership, while the links through capital markets and effects on confidence were not materially significant during the events considered.

Annex

A market model is used to remove the impact of market wide movements on equity returns:

$$R_{i;t} = \alpha_i + \beta_i R_{m;t} + u_{i;t} \quad [1]$$

where $E(u_{i;t}) = 0$, $Var(u_{i;t}) = \sigma_{u_{i;t}}^2$

$R_{i;t}$ and $R_{m;t}$ are the period- t returns for institution i and the market portfolio respectively, and $u_{i;t}$ is the disturbance term. The FTSE All-Share index is used as a proxy for the market return.

The parameters of the market model are estimated by using a 250-trading day (one year) window, T_i , beginning 270 days before the event. Abnormal returns (ARs) are defined as the difference between the actual return and the predicted return:

$$AR_{i;t} = R_{i;t} - \hat{\alpha}_i - \hat{\beta}_i R_{m;t} \quad [2]$$

where $E(AR_{i;0}) = 0$ and $Var(AR_{i;0})$:

$$\sigma_{AR_{i;0}}^2 = Var(\hat{\alpha}_i) + R_{m;0}^2 Var(\hat{\beta}_i) + 2R_{m;0} cov(\hat{\alpha}_i; \hat{\beta}_i) + Var(u_{i;0}) \quad [3]$$

where $t = 0$ is the event day. The presence of autocorrelation and heteroskedasticity in the market model means that the estimates $Var(\hat{\alpha}_i)$, $Var(\hat{\beta}_i)$ and $cov(\hat{\alpha}_i; \hat{\beta}_i)$ are inefficient. Therefore, the Newey-West HAC adjustment is used to calculate $\sigma_{AR_{i;0}}^2$. The variance of the ARs is then used to form a standardised abnormal return (SAR):

$$SAR_{i;t} = \frac{AR_{i;t}}{\sigma_{AR_{i;t}}} \sim t(T_i - 2) \quad [4]$$

where T_i is the number of days in the estimation window, and $t(\cdot)$ denotes the student t distribution. By Using equation [4] with the appropriate critical values, the significance of the ARs can be estimated. A summary measure of ARs across events can be obtained as follows:

$$SCAR_i^{\tau=0} = \frac{\left[\sum_{e=1}^E SAR_{i;e}^{\tau=0} \right]}{\sqrt{E}} \sim t(T_i - 2) \quad [5]$$

where E is the number of events. The SCAR statistic, by capturing the average reaction, may cause two oppositely signed but otherwise significant reactions to cancel each other out. A Chi-square statistic is an alternative summary statistic that avoids this issue:

$$\sum_{e=1}^E (SAR_{i;e}^{\tau=0})^2 \sim \chi_E^2 \quad [6]$$

However, the Chi-square, by squaring the ARs, does not distinguish between positive and negative responses. Finally, an F -statistic is used to assess whether there is a significant difference in the impact of sector-wide and idiosyncratic events:

$$\frac{\sum_{b=1}^S (SAR_b^{\tau=0})^2 / S}{\sum_{b=1}^Y (SAR_b^{\tau=0})^2 / Y} \sim F_{S,Y} \quad [7]$$

where S is the number of sector-wide events, and Y the number of idiosyncratic events.

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A framework for financial stability

Sir Andrew Large, Deputy Governor, Bank of England

This is the text of a speech delivered by Sir Andrew Large, the Bank of England's Deputy Governor for Financial Stability, at the International Conference on Financial System Stability and Implications of Basel II on 18 May 2005 in Istanbul.

Introduction⁽¹⁾

Vulnerabilities in financial stability

It is clear that rapid growth in size, complexity, and diversity of global financial markets has added new dimensions and challenges to the process of maintaining financial stability.

Traditional concerns remain that unwise credit exposure can result in insolvency, and systemic instability. But today there is a new series of hazards. Credit risk transfer has introduced new holders of credit risk, such as hedge funds and insurance companies, at a time when market depth is untested. Systemically significant issues could increasingly arise from market-related risks, or from single point of failure risks in the market infrastructure as ever greater volumes of transactions pass through. Equally the growth of derivative instruments and advent of a range of new asset classes, despite added dispersion and better risk management, have added to the risk of instability arising through leverage, volatility and opacity. No wonder that those involved in financial stability work have much to think about.

Introducing a framework for financial stability

The purpose of my remarks today is not to analyse these threats. Instead I want to discuss how to approach some of the challenging issues faced by many central banks as we seek to decide how best to organise our work and to allocate resources in order to promote financial stability.

Given that, we need to be clear, accountable and transparent as to how we devote our resources in this area. And just as the financial system becomes more complex, so the judgements as to what we do and what we do not do are increasingly difficult. That is why we need a framework — a set of organising

principles — that enables us to provide context and understanding to our endeavours, to provide a source of focus and rigour to our approach, and to motivate our people.

The issues are, I believe, of general application. Though you will forgive me I am sure if I start by looking at the framework within which the Bank of England, as a non-regulatory central bank with a remit for system-wide stability, addresses the vulnerabilities.

Challenges in creating a framework

Monetary policy

I want to start by considering the governance of the Bank's accompanying mandate, the conduct of monetary policy. This highlights the clarity of our accountability in the monetary policy arena. In line with many central banks, we have a mandate in statute — the Bank of England Act — to conduct monetary policy. The Government sets a target inflation level which we are required to meet.

Importantly we — and you — can see how we are performing month by month in relation to our mandate. We also have a tested analytical framework. We model possible future outcomes and we look at the balance of risks around a central view. We can rely on experience and judgement to make regular policy decisions. And we can alter our policy decision on interest rates each month as the data and circumstances evolve.

Financial stability and why it is different

If financial instability occurs, costs to society may be high. Damage to our reputation could be potentially high too. Yet judging the optimal amount of resources to devote to prevent crises is problematic.

(1) The author is grateful to his colleagues Alastair Clark, Nigel Jenkinson, Andy Haldane and Victoria Cleland for their help in preparing this speech.

What degree of resilience do we want? And what should we be prepared to pay for insurance? This is a familiar problem in public policy — what is the optimal size of the fire brigade or army?

The challenges we face in seeking to maintain financial stability are very different to those in the monetary policy arena.

- First, there is neither a clear over-arching analytical framework nor a commonly agreed set of indicators of incipient financial instabilities.
- Second, the task is made harder because we are dealing with tail events — low probability scenarios — rather than central projections. It is about aberrant rather than normal behaviour and situations: less predictable and harder to model.
- Third, there are a number of different potential policy instruments that can affect the financial environment in various, sometimes conflicting, ways. And by no means are all in the hands of central banks.
- Fourth, national financial stability responsibilities are often shared. In the United Kingdom we work with Her Majesty's Treasury (HMT) and the Financial Services Authority (FSA). For cross-border activities we operate alongside overseas central banks and supervisors.
- Fifth, although the roles of the United Kingdom authorities are outlined and published in a Memorandum of Understanding (MoU), this gives little guidance as to what financial stability is or a clearly identifiable target.
- And, last, it is harder to get motivational feedback — unless in unwelcome form should a crisis occur.

Defining our role in financial stability oversight

These factors pose a number of challenges in defining our role in financial stability oversight — what activities should we as a central bank undertake? To make these decisions, firstly we should identify the main functions that need to be performed in each jurisdiction to promote financial stability. Then we can look at the Bank's own institutional mandate. And finally we can determine the most appropriate way to fulfil it.

Three essential functions for public authorities

There seem to me to be three essential functions to be carried out in securing financial stability: I think this is the case in most jurisdictions. First, there are the roles relating to supervision of firms and markets where financial instability could arise.

Second, there is the oversight of the financial system as a whole — the systemic issues which could impinge on society. And, third, there is the fiscal underpinning which may exceptionally be required to restore confidence in the event of failure.

The fiscal underpinning is a role for Ministries of Finance. The other roles can either be combined institutionally or separated. I am sure each model is represented here today. In the United Kingdom, HMT has responsibility for the fiscal underpinning, FSA for the supervision of firms and market regulation, and the Bank of England for the stability of the system as a whole.

The 'must dos' for the Bank of England

The roles as such are set out with slightly more precision in the MoU, and it is from there that we start on our quest to decide what initiatives we — the Bank of England — should undertake, and how far we go with each. The MoU highlights three 'must dos' for the Bank. I expect that these are similar in many central banks. They really define our mandate.

(a) Assessment of threats to financial stability

First, we need to assess the threats to the financial system. We need to be in a position to inform ourselves and to advise HMT at all times on the implications for UK financial stability of developments in both the domestic and international market places. We do this by continually assessing threats to the system as a whole — 'oversight of the systemic conjuncture' if you like.

So we look beyond the risks in relation to individual institutions, to the aggregate problems that can arise: through networks and single points of failure; through dependencies and interdependencies of firms and markets. In other words to areas where, if market forces and market participants are left to their own devices, problems could threaten the stability of the system. This means that we need to have our finger on the pulse and to maintain regular contact with key firms and infrastructure providers. Market intelligence is vital in this area: it is not enough to

read about issues, we need to be learning about them first hand from key players and analysing our findings from a financial stability perspective.

The FSA also shares responsibilities in this area. They too will be asked for advice by HMT. Their starting point is the assessment of the strengths and weaknesses in the individual institutions and markets they supervise, and the potential consequences of problems or failures at individual institutions.

An important factor for the Bank relates to London's position as a major financial centre. Although our specific focus and interest is the systemic conjuncture as it affects the United Kingdom, possibilities of contagion in an increasingly global market mean that we have to be alert equally to developments in global capital and financial markets. And it means we have to understand the dynamics and interrelationships of markets; how new products work; and the possible behaviour patterns of intermediaries, investors, and borrowers. Above all we need to be focused on where major risks are most likely to emerge and the market dynamics if those risks start to crystallise. And we need to distinguish those which are systemic from a myriad of fascinating developments, many of which are just 'noise' but which could otherwise distract us.

(b) Risk reduction: oversight of payment systems

The second area where we, and typically other central banks, are required to perform is oversight of payment systems. Payment systems facilitate economic transactions of goods, services and financial assets and are an essential component of a well functioning financial system. So reduction of risks in these systems, for example through the introduction of our Real Time Gross Settlement system, is clearly a priority from a systemic perspective.

(c) Provision of liquidity and preparation for a financial crisis

And, third, the MoU stipulates that we need to be in a position to inject liquidity at all times. This means that we must be able to provide liquidity in normal times, as well as in times of stress or crisis. This puts an increased onus on well developed and tested crisis management plans, and a particular focus on ensuring that we are able to undertake a range of official financial operations in exceptional circumstances.

Financial stability: parallel processes

Recognition of these three 'must do' areas is a starting point in deciding the scope of our financial stability work and in enabling us to fulfil our MoU mandate. But it does not provide a clear steer on what we actually have to do to carry out our functions efficiently and effectively. Regarding long-term thinking, which might one day lead to an analogue to monetary policy, we are undertaking a research project. This is separate from our day-to-day activities where a set of organising principles can be used operationally to handle today's issues.

Research and Development (R&D): creation of an analytical framework

The research project is an attempt to devise an analytical framework as an analogue to that in monetary policy: to help clarify some of the differences I outlined earlier and to provide greater certainty and focus. As with the development of monetary frameworks, this will be a medium to long-term endeavour. This may sound overambitious. But even modest achievements towards it would enhance understanding of what financial stability oversight is about, and what our priorities should be in seeking to ensure it. And so it could assist our quest for clearer accountability and more transparent governance arrangements.

This quest gets to issues such as how to define our financial stability objective, how to articulate indicators of financial stability, and how they relate to each other. It provides the possibility of calibrating systemic risk and developing tools that could potentially be deployed to reduce such risk, and will include scenario analysis and macro-stress testing.

In reality, it is unlikely we will converge on a single model which captures systemic risk in its entirety. But by developing and calibrating a suite of models we hope to make some progress towards gauging fragilities and frictions in the financial system better — how likely they are to arise; on what they depend; and, ultimately, what pre-emptive mitigating action might be feasible. This could put financial stability analysis on a more similar analytical footing to monetary policy — albeit with a greater amount of uncertainty regarding eventual outcomes.

With time we can review the outputs of this research work. We can then operationalise those that are relevant and robust to help decide our ongoing

activities. In other words, the outputs of this R&D activity could become inputs to prioritising our day-to-day risk reduction activities.

Ongoing activities: organising principles

In the meantime we have to address the real risks of today. How are priorities to be set? Financial stability is an area where there are so many things we could do. So we need to have a set of organising principles to help us prioritise and focus. I'd like to describe the process we go through in addressing the difficult decisions — how much to do, and how far to go.

One could make a case for a huge empire of threat assessment on the basis that seemingly remote events or threats could crystallise into a financial crisis. For example, what resources would it have taken to foresee that default of the Russian government on its debt in 1998 would, through a complex chain of events, eventually result in the failure of the hedge-fund Long Term Capital Management in New York? A failure which importantly was judged as having wider significance for financial stability. Equally what resources could it be wise to devote to assess what implications, if any, the downgrades of General Motor's and Ford's debt this month might mean for the financial sector and ultimately for financial stability.

Alternatively one might take a hardline view that unless an activity falls fairly and squarely, in the short run, into one of the 'must do' categories, it should be discontinued. For example, we could in theory simply ignore risk emanating from overseas — even in an international financial centre like the United Kingdom — on the expectation (or hope) that others would take care of these risks on our behalf.

Common sense suggests that the answer lies somewhere between the two. But difficult judgements are involved. So we have to devise a rigorous process to scrutinise our actions. A valuable approach is to set out the practical actions we intend to achieve — the 'outcomes' or 'deliverables' — and then to challenge them. We do this from two points of view.

First, we need to be clear why we are pursuing a particular deliverable. Is it a market failure justifying any intervention at all? What real impact will the work have on fulfilling our mandate? How closely does it relate to the 'must dos'?

Second, we need to think through the costs, benefits and risks associated with the action from the points of view of both likelihood and impact. What will be the risks to society, the economy and even the Bank if we do not do it? How might these risks be reduced if we do do it? How well placed are we to do it as opposed to others? How confident are we of achieving the intended deliverables — particularly when we need to rely on others? Do we have influence to ensure action is taken?

The answers — difficult as they may be to define — help us in prioritising and resource allocation; and provide sunset provisioning in deciding whether to continue with particular strands of work.

Ongoing activities: the matrix

Uses for the matrix

There are many types of activity, and many sources of threat where we could be active. So we need organising principles to make sense of where particular actions fit into the landscape of our financial stability work. It is only then that we can evaluate competing priorities, by subjecting each 'bid' to a common set of challenges. To do this we find it helps to use a simple matrix. This adds objectivity to what is in many senses a subjective process. Here is an example:

Matrix: organising principles for financial stability

Activities	Sources of threat			
	Credit risk	Market and liquidity	Infrastructure (including payment systems)	International architecture
Assessment of threats to financial stability				
Risk reduction				
Preparing for and managing a financial crisis				

The matrix is a common sense map, which enables us to visualise why something is being done, and where it fits into the overall financial stability effort. The specific activities and deliverables that are located in each of the boxes can be scrutinised to see if they meet our objectives or if they should be discontinued.

This helps us decide on the level of resource and the nature and qualities of people we need. It also helps with budgeting, and provides a basis for motivating good performance.

To explain the relevance of the boxes let us look first at the columns: sources of threat. Our desired end objective is to promote financial stability by seeking to prevent threats from crystallising, or at least to reduce their impact. Then we will look at the rows — the different types of activity we undertake: the means if you will to achieve our ends.

Sources of threat

First, the columns: the sources of threat.

(a) Credit risk

Financial crises have traditionally arisen where the solvency of one or more institutions either crumbles, or is perceived to be in danger of doing so, in a way that threatens the financial system. So we need to focus on credit concentrations, credit aspects of prudential standards, credit pricing and terms etc. We need data and intelligence to do that. Understanding credit conditions and vulnerabilities is quite well developed territory. But new threats have arisen, particularly from sophisticated credit transfer instruments. This is a tricky and opaque arena. It is hard to know where concentrations of credit risk actually reside and even where credit risk ends and market risk begins. In addition there is the increasing range of participants who are also taking on credit risk. Of course in addition to this we can — and do — think about credit risk standards like Basel II. We focus on the systemic aspects of prudential design since in the UK the supervisory issues are focused on by the FSA.

(b) Market and liquidity risk

As the global capital market has expanded on the back of securitisation and derivatives increasing vulnerabilities arise. Change has been so rapid and development so fast that it has been hard for any of us to keep up. Given the multitude of new instruments and new markets that have appeared and the resulting increase in risk, this is a significant area of work for us.

There is of course much to be done in understanding the complex interdependencies and concentrations, and how these might impact on financial stability.

So we need data and market intelligence in this area. And we need to improve our ability to make *ex ante* judgements about the possible behaviour of both investors and intermediaries, as well as the potential depth of markets. Equally we need to be sure we would have relevant information and understanding of markets and agents should problems arise.

(c) Infrastructure (including payment systems)

Focus is also important in the field of payment, clearing and settlement systems. Historically payment systems were primarily domestic entities, but as markets have become more globalised so too has the underlying infrastructure. This has helped to enhance efficiency, but leads also to added network or 'single point of failure' risks. As 9/11 showed, when problems arise in this area liquidity injection may be needed to prevent market or institutional failure, and risks of instability to the financial system could mount swiftly.

This brings us to one of our 'must dos' — oversight of payment systems. Based on adequate data and understanding we work here on enhancing interoperability, strengthening risk management, strengthening business continuity resilience, and improving governance.

(d) International architecture

International architecture and emerging markets exposures are a broad arena where there are particular risks and complexities which lead us to look at it separately. In response to the wider environment, constant adaptation is needed both of the architecture itself and the institutions within it, such as the IMF. In terms of our quest for financial stability, this focuses specifically on sovereign debt, crisis prevention and resolution. Progress has been made since the Asian Crisis, but significantly more is needed to build on the emerging elements of the exceptional access framework, and the Fund's lending-into-arrears policy, but also Collective Action Clauses, and the recently devised Principles for Stable Capital Flows and Fair Debt Restructuring in Emerging Markets.

In using the matrix to categorise sources of threat there are of course a number of ways one could cut the cake. Credit exposure to emerging sovereign debtors for example can appear both in the 'credit' and 'international architecture' boxes.

Activities

Now we can move to the rows. To use the matrix as a location device to focus our efforts, decide on deliverables and enhance our resource allocation, we need to create the 'boxes' by considering the types of activity we could undertake to address each main source of threat — the rows.

(a) Assessment of threats

First, we need to evaluate threats to the system. We need a process of data collection and assessment to analyse information and market intelligence from multiple sources. This 'horizon scanning' enables us to get early warning of how and where threats could appear.

We cannot do all this without knowing how markets work. Typically we obtain intelligence about what is going on from a number of sources, including a group of experienced staff who are operationally active in financial markets. We then evaluate and assess the threats from this intelligence. This needs people who are motivated to think through and identify new aspects of risk and threats, who can move with intellectual agility and flexibility between risks as they arise. This enables us in turn to judge the risk and allocate resources accordingly for risk reduction — as well as stopping work if threats no longer seem relevant.

A key challenge here is distinguishing between slow burn issues (such as a gradual shift towards more exotic financial instruments) and the more immediate issues relating to, say, the prospect of a major market default. In each case it is important to understand the potential threats to financial stability: but the timescales and tools are different. The matrix helps to start the process.

Above all we have to clarify the types of threats we are looking for. An issue here is the risk of 'missing something'. Not acting on something seemingly minor may have significant consequences for financial stability and costs compared to the resource saved by ignoring it. So the stakes are high in getting this right — though we need here to be realistic as particularly in the early stages the significance of developments can be hard to read.

(b) Risk reduction

Second, risk reduction or mitigation. Here we seek to make the financial system more resilient. This is the

world of risk management, prudential standards, liquidity standards, resilience of payment systems etc. It can involve the promotion of codes and standards over a wide field ranging from accounting to improving legal certainty, and management of countries' external balance sheets.

Decision making about priorities is particularly challenging because we cannot be clear *ex ante* how well the mitigation techniques will work, and we often need to rely on others to implement them. In addition we need to ask whether we are the right party to act.

We also need to think about the relevance of our activities to our mandate — or 'must dos'. In some areas, for example payment systems — one of our 'must dos' — it is clear that we have a responsibility to reduce risks. In this case the questions we need to answer relate to the degree, methods and resource implications.

But in other areas whether we should act is less clear cut. What particular contributions can we make and are there any areas where we can sensibly act alone? We need to ascertain areas where we can achieve results both domestically with HMT and FSA, and internationally with organisations such as the Basel Committee, the Committee on Payment and Settlement Systems and the Financial Stability Forum.

Perhaps I can mention one area to which the challenge process suggests we should devote considerable resources — global institutional liquidity. As I have said before this is an area of potential vulnerability that has developed alongside the rapid globalisation of markets and of firms operating within them. I personally feel that it has been somewhat overshadowed in recent times by work in other areas such as capital adequacy. We feel that we can make a particular contribution here — both owing to our position in such a major global financial centre and because, in sterling at least, we are a potential provider of liquidity. So we justify devoting significant resources to the analysis of liquidity issues, and the development of potential risk reduction strategies for liquidity problems — nationally and in particular internationally.

At the other extreme, whilst we feel strongly about the desirability of robust and widely applied accounting standards — and are prepared to express

our views on the big picture aspects of this from time to time — we do not devote significant resource to analysis, or lobbying in this area.

(c) Preparation for a financial crisis

And finally, tail event territory though it may be, we need to undertake preparation for financial crises. We need to think forward to being ‘in-event’ where instability has actually been triggered, whether by a business failure of a firm or firms or by a terrorist or other disruptive event. We need to prepare now, in advance, to enhance predictability at what would be a time of great uncertainty. We need to know how we will work and communicate with public authorities and with the private sector.

There is a different set of factors which impact our decisions in this area. First, our ‘must do’ roles are dependent on crisis preparation and an adequate general understanding of how the financial system operates, with all the complexities entailed.

Second, while each national authority has its specific responsibilities to fulfil, the speed with which decisions would then need to be made and actions implemented make it also essential to act effectively as a single operational unit. In the United Kingdom the FSA, HMT and the Bank have developed

mechanisms designed to turn this into reality and to provide necessary confidence to the market.

And, third, through testing programmes, we can obtain feedback as to whether our efforts are likely to prove successful and to refine preparation as we go along.

The costs to the economy of failure would be high and the expectation is that we would be well prepared. This puts a strong onus on collecting in advance up to date information on firms and markets, or being confident of its availability and source. And also of regular and exacting testing programmes — working with other authorities and with the private sector.

Conclusion

So in conclusion, the field of financial stability oversight presents us with plenty of challenges. Not only is the world more complex, but we need to devote real thought as to how best to operate and organise ourselves so as to contain risks.

Defining the resources you need, and how to deploy them is challenging in itself. My prediction is that as the system’s complexity increases all of us involved in the oversight of financial stability will find ourselves asking the same questions: Just what should we do? Why? And what effect will it have?

Other Bank of England publications

The Bank of England publishes information on all aspects of its work in many formats. Listed below are some of the main Bank of England publications. For a full list, please refer to our website www.bankofengland.co.uk/publications/index.htm.

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The MPC Unit discussion paper series reports on research carried out by, or under supervision of, the external members of the Monetary Policy Committee. Papers are available from the Bank's website at www.bankofengland.co.uk/publications/other/externalmpcpapers/externalmpcpaper0000n.pdf (where n refers to the paper number).

Monetary and Financial Statistics

Monetary and Financial Statistics (Bankstats) contains detailed information on money and lending, monetary and financial institutions' balance sheets, banks' income and expenditure, analyses of bank deposits and lending, external business of banks, public sector debt, money markets, issues of securities, financial derivatives, interest and exchange rates, explanatory notes to tables and occasional related articles.

Bankstats will continue to be published monthly on the Internet but paper copies will be available on a twice-yearly basis. Paper copies will be published for the January and July editions published on hard copy on Wednesday 2 February 2005 and Monday 1 August 2005 respectively, the price per annum in the United Kingdom will be £40, or £20 per copy. It is available on a monthly basis free of charge from the Bank website at: www.bankofengland.co.uk/statistics/statistics.htm.

All these data and more are available on the Bank's Statistical Interactive Database at

www.bankofengland.co.uk/mfsd/iadb/NewIntermed.asp. The Statistical Interactive Database provides the latest and long runs of statistical data. The site has comprehensive search options and the ability to download the data in a variety of formats, and covers the series found in this publication and some additional data eg daily exchange rates.

Practical issues arising from the euro

This is a series of booklets providing a London perspective on the development of euro-denominated financial markets and the supporting financial infrastructure, and describing the planning and preparation for possible future UK entry. Copies are available from Public Enquiries Group, Bank of England, Threadneedle Street, London, EC2R 8AH and at the Bank's website at: www.bankofengland.co.uk/publications/practicalissues/index.htm.

Economic models at the Bank of England

The *Economic models at the Bank of England* book, published in April 1999, contains details of the economic modelling tools that help the Monetary Policy Committee in its work. The price of the book is £10. An update was published in September 2000 and is available free of charge.

The Bank of England Quarterly Model

The Bank of England Quarterly Model, published in January 2005, contains details of the new macroeconomic model developed for use in preparing the Monetary Policy Committee's quarterly economic projections, together with a commentary on the motivation for the new model and the economic modelling approaches underlying it. The price of the book is £10.

Quarterly Bulletin

The *Quarterly Bulletin* provides regular commentary on market developments and UK monetary policy operations. It also contains research and analysis and reports on a wide range of topical economic and financial issues, both domestic and international.

Summary pages of the *Bulletin* from February 1994, giving a brief description of each of the articles, are available on the Bank's website at www.bankofengland.co.uk/publications/quarterlybulletin/index.htm.

Inflation Report

The Bank's quarterly *Inflation Report* sets out the detailed economic analysis and inflation projections on which the Bank's Monetary Policy Committee bases its interest rate decisions, and presents an assessment of the prospects for UK inflation over the following two years.

The *Report* starts with an overview of economic developments; this is followed by six sections:

- analysis of money and asset prices;
- analysis of demand;
- analysis of output and supply;
- analysis of costs and prices;
- summary of monetary policy during the quarter; and
- assessment of the medium-term inflation prospects and risks.

The *Minutes* of the meetings of the Bank's Monetary Policy Committee (previously published as part of the *Inflation Report*) now appear as a separate publication on the same day as the *Report*.

Publication dates

Copies of the *Quarterly Bulletin* and *Inflation Report* can be bought separately, or as a combined package for a discounted rate. Publication dates for 2005 are:

Quarterly Bulletin

Spring	14 March
Summer	20 June
Autumn	26 September
Winter	12 December

Inflation Report

February	16 February
May	11 May
August	10 August
November	16 November

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