# fsr

## Financial Stability Review

June 2003

**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/fsreview/themesandissues** and the *Financial stability conjuncture and outlook overview* is at: **www.bankofengland.co.uk/fsreview/overview.**

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## Financial Stability Review

June 2003

# Financial stability

# themes and issues

Despite some deterioration in economic prospects over the past six months, there are now fewer signs of financial fragility than there were last autumn. Market indicators of credit risk have tended to fall and asset prices on the whole have been less volatile. As the Bank's regular assessment of *The financial stability conjuncture and outlook* points out, in most major economies banks are in a strong position to weather any adverse developments. And in the UK, it is reassuring that the IMF/World Bank Financial Sector Assessment Programme (FSAP) team, which studied the financial system last year, concluded that UK financial institutions, markets and infrastructure are fundamentally sound. The FSAP team's assessment is summarised in *Strengthening financial infrastructure*, which also reviews efforts by policymakers and market participants around the world to improve legal and regulatory frameworks, promote sound market and crisis management practices and develop market infrastructure.

One way of assessing the robustness of a financial system is to consider how it would cope with a range of hypothetical shocks. As part of the FSAP, the Bank and the Financial Services Authority designed and carried out an exercise of this sort with the co-operation of a number of UK banks, reported in *Assessing the strength of UK banks through macroeconomic stress tests* by Glenn Hoggarth and John Whitley. Overall, the exercise suggested that the stability of UK banks is unlikely to be threatened under a wide range of significant shocks – such as substantial declines in world equity prices or UK house prices. Further work is planned in order to develop such macro stress tests – for example, in gauging the severity of the scenarios used and in linking the scenarios with banks' own approaches to risk assessment.

In the stress testing exercise, banks themselves were asked to consider the consequences of the scenarios for their corporate credit exposures. An alternative approach is to use financial market information about individual companies. In *Predicting default among UK companies: a Merton approach,* Merxe Tudela and Garry Young take this route. The study treats the probability of default as a function of a firm's debt and the level and volatility of its market value, following the framework developed by Robert Merton. The authors find that their model is relatively effective in drawing up an ordinal ranking of companies by the likelihood of going into liquidation. But it tends to overpredict the number of failures in the past couple of years; it is possible that solutions other than liquidation are being found for more companies in distress.

# Financial stability
# themes and issues

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The state of corporate balance sheets clearly affects the impact of macroeconomic and firm-specific shocks on the firms themselves but also, indirectly, the impact on the financial system. So does the state of the financial system's infrastructure, such as payment systems. In *A statistical overview of CHAPS Sterling,* Kevin James focuses on payment activity, liquidity provision and 'concentration risk' – the extent to which the failure of a single bank could disrupt the CHAPS system generally. He considers two types of risk – concentration of system liquidity and concentration of payment activity. He finds that the first is not a significant problem, as banks post significantly more eligible collateral than they use. But payment activity is relatively concentrated: hence the importance of effective systems and controls to minimise the likelihood of a participant bank's failure.

In exercising oversight of payments systems and participants, the Bank and FSA consider the incentives participants have to protect themselves against failure. The question of whether the incentive structure is appropriate or generates moral hazard also has policy implications in other contexts. In *Moral hazard: how does IMF lending affect debtor and creditor incentives?* Andrew Haldane and Ashley Taylor consider whether large-scale IMF loans might have induced excessive risk-taking by debtor countries or their creditors. They argue that past studies may have failed to detect some of the channels through which moral hazard may operate. And the authors find new evidence suggesting that in recent years the risk-taking incentives of both debtors – through insufficient effort to adjust economic policies – and creditors – through excessively risky lending – may have been affected by IMF loans.

Enhanced market discipline can in some circumstances improve the incentives facing financial market participants. In *Market discipline and financial stability: some empirical evidence,* Erlend Nier and Ursel Baumann find, in a cross-country study, that enhanced disclosure by banks seems to induce banks to limit their risk of default by keeping higher capital buffers for given asset risk. Their results also suggest that market discipline is stronger for banks that are funded by uninsured liabilities and weaker for those that benefit from wide deposit protection schemes or other safety nets. The latter may therefore be introducing a degree of moral hazard. The study provides some empirical support for the emphasis in Basel II on the importance of disclosure.

# The financial stability
# conjuncture and outlook

# The financial stability
# conjuncture and outlook

## Overview: risks to financial stability

Last autumn, financial institutions around the world were having to contend with unusually volatile markets and heightened credit risk. Since then economic growth has been weaker than expected; and there has been a moderate but widespread deterioration in the short-run economic outlook (Chart A), a period of sharply falling equity prices (up to mid-March) and temporarily heightened uncertainty related to oil prices and the situation in Iraq. Despite all this, there have been relatively few signs of stress in financial systems. In general, the level and dispersion of credit spreads have fallen. Market perceptions of default risk appear to have eased for large firms within some of the sectors under most stress, such as telecoms and merchant energy (Chart B). Gauged by option prices, at least, uncertainty about future financial asset returns seems generally to be lower than six months ago, with a particularly sharp decline since the fall of Baghdad, notwithstanding the uncertain macroeconomic outlook. Equity markets have recovered from their lows in mid-March to levels (in US dollar terms) above those at the time of the December *Review*. Moreover, a substantial adjustment in exchange rates has taken place smoothly – which may help to reduce the significant global imbalances in demand reflected in the pattern of current account deficits.

This *Review* considers why markets appear to be signalling an easing in financial pressures, despite the not-very-encouraging macroeconomic news. The first theme is that of corporate sector adjustment: firms, particularly large ones, addressing weaknesses in their balance sheets. The second is that of the growth in bank lending to households and of its relative importance in banks' overall lending. And the third is the apparent resilience of most banks and banking systems despite recent pressures. In each case, the further decline in interest rates (Chart C) has been a major influence, with both nominal and (in most cases) real interest rates now exceptionally low across the maturity spectrum. While relieving pressure on borrowers, this may also be driving some investors and intermediaries to take on greater risks in an effort to secure higher running yields, as well as heightening uncertainty about the future pattern of interest rates.
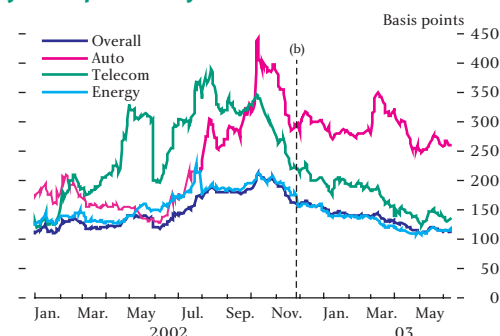
**Chart A:**
**Forecasts for real GDP growth in 2003**
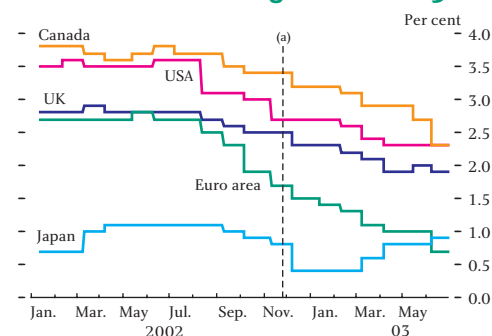
Source: Consensus Economics Inc.
(a) Dec. 2002 *Review*.

**Chart B:**
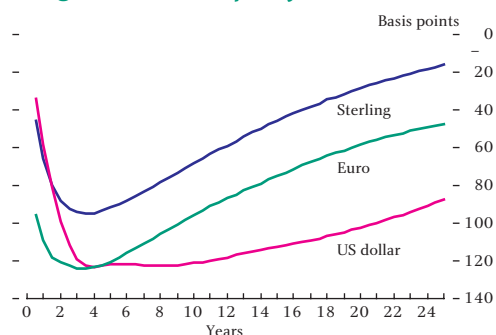**US dollar investment-grade corporate bond yield spreads by sector[a]**

Source: Merrill Lynch.
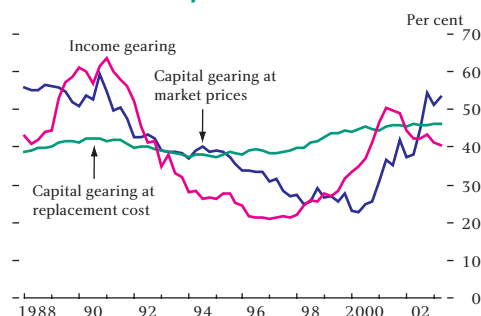(a) Spreads over swaps.
(b) Dec. 2002 *Review*.

**Chart C:**
**Changes in zero-coupon yields**[a]



Sources: Reuters and Bank calculations.

(a) Change from Dec. 2002 *Review* to 11 Jun. 2003.

**Chart D:**
**Capital and income gearing of US non-financial corporate sector**[a]



Sources: Board of Governors of the Federal Reserve System: 'Flow of Funds Accounts of the United States', 2003 Q1 and Bureau of Economic Analysis, Department of Commerce.

(a) Data are seasonally adjusted.

## Companies' balance sheet adjustment

Large companies around the world have for some while been attempting to address pressures on their liquidity and solvency. This may be one of the reasons why, up to mid-March, there were widespread falls in bond spreads (an indication of default risk), despite sharp drops in equity prices (an indication of long-run earnings potential) and increases in equity price volatility.

These adjustments have been prominent amongst the large firms that have access to global capital markets. Many took advantage of this access to increase their capital gearing in recent years. Defaults during the past 18 months or so suggest that gearing went too high in some cases, and in the USA large companies accounted for a larger proportion (by value) of bankruptcies last year. Some of the market concerns about a number of global financial institutions last autumn focused on concentrated corporate exposures – alongside litigation risk. But, since then, there has been extensive corporate refinancing – lengthening the maturity of debt – and some (although rather less) deleveraging. Bond issuance has revived across the spectrum of credit ratings and private equity has been available to help finance the disposal of unwanted operations via leveraged buy-outs. Although primary equity issuance has remained low, there have been some large secondary issues.

In the USA, corporate sector adjustment has helped to bring down income gearing (Chart D) and to stabilise capital gearing. A drop in the net retirement of equity (partly reflecting less merger and acquisition activity) has also been an important factor. As well as substituting bonds for some shorter-term liabilities, firms in aggregate have increased their liquid assets relative to their short-term debt. The fall in net current liabilities has been particularly sharp for car manufacturers and merchant energy companies. There have also been significant reductions for the heavily indebted airline industry and amongst telecom operators. But there remains concern about the size of some large companies' defined-benefit pension fund deficits, although the correlation of these deficits with firms' overall debt burdens is not particularly high. As in the UK, pension deficits may affect firms' costs of finance but by themselves are unlikely to pose an immediate threat to lenders.

The extent of corporate adjustment – and the need for it – is less easy to gauge in the euro area. But, as in the USA, corporate borrowing has recently been growing more slowly, reflecting low demand and possibly some tightening in lending standards by banks. Some large telecom operators and energy companies have issued 30-year bonds successfully, and there have also been some successful rights issues in the telecom and insurance sectors. There are, however, suggestions that pressures on corporate liquidity and solvency, which last year centred on large companies, may now be affecting small- and medium-sized

European enterprises to a greater extent. This may reflect the weaker economic prospects for European firms generally, in part due to subdued domestic demand and exacerbated by the appreciation of the euro against the US dollar over the past six months; in local currency terms, euro-area equities have tended to underperform US stocks (Chart E).

In the UK, capital gearing has stopped rising, although it is still very high by historical standards (Chart F). Firms' dividends and stocks of work-in-progress have been cut. Despite weak profitability, the rate of corporate liquidations and various other indicators of corporate distress are still relatively modest. Indeed, the increase in capital spending in 2003 Q1 and the modest pick-up in bank borrowing since the middle of last year may be tentative indications that, at least in some cases, adjustment is approaching completion. In addition, on most measures, corporate liquidity is around record levels.

One part of the UK company sector that shows a notably different pattern is commercial property; lending linked to commercial property has grown much faster (by two thirds over the past two years alone), and property investment companies may have become more highly geared. Such rapid growth may pose risk management challenges for the lenders. Much of this lending is said to be secured on fully let property. But valuation of commercial property is more uncertain than that of residential property, because it tends to be more illiquid and heterogeneous. And tenant default risk may be more highly correlated with property values.

Overall, despite significant differences across firms, the general picture appears to be one of somewhat reduced risks for lenders to large non-financial companies in the short run, although the picture for small- and medium-sized firms is less clear. Looking ahead, the position is vulnerable to weaker-than-expected economic growth.

## Financial stability risks from household borrowers

The risks to financial firms from their lending to households are still determined primarily by national economic circumstances; international credit markets are less relevant than they are for company lending. But the growing relative size of household lending has been a common factor across many countries. Household debt-income ratios have risen in developed economies over recent years (Chart G), reflecting financial liberalisation and low interest rates, and, unlike corporate debt, household debt has continued to grow rapidly in the USA and UK over recent months. This reflects the sectoral imbalances in the two countries, with consumption rising considerably faster than investment. Household income gearing does not, however, seem to have changed much (Charts H and I). In the euro area, household spending has, generally, increased more slowly than in

**Chart E:**
**Changes in world equity indices since the December 2002 _Review_[a]**
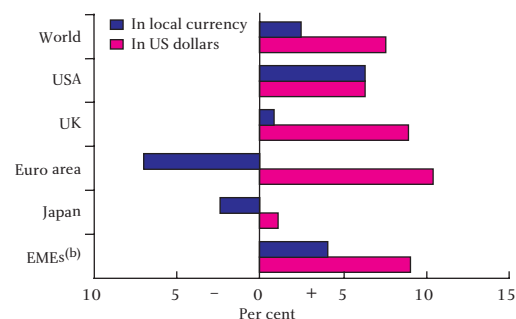
Sources: MSCI and Bank calculations.

(a) Percentage change in market capitalisation indices from 27 Nov. 2002 to 11 Jun. 2003.

(b) Emerging market economies.

**Chart F:**
**Capital and income gearing of UK non-financial corporate sector[a]**
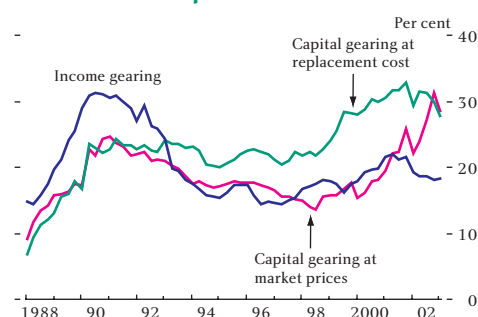
Sources: ONS and Bank of England.

(a) Data are seasonally adjusted

**Chart G:**
**Debt-income ratios of household/personal sectors[a]**
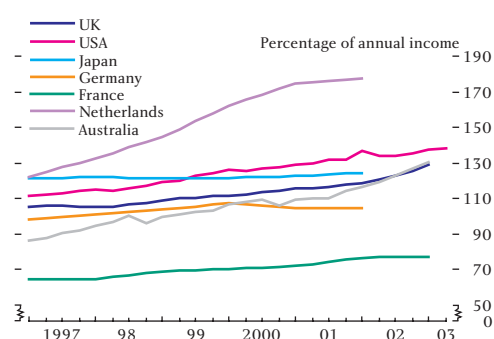
Sources: Eurostat, OECD, national central banks and statistical agencies.

(a) Ratios differ from those in Chart H and Chart 35 – because of a wider definition of liabilities, inclusion of unincorporated businesses and use of disposable income before adjustment for consumption of fixed capital – and Chart 98 – because disposable income is not adjusted for changes in net equity in pension funds.

**Chart H:**

**US household sector gearing ratios**
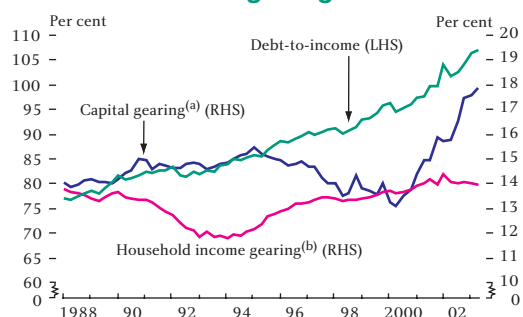


Source: Board of Governors of the Federal Reserve System: 'Flow of Funds Accounts of the United States', 2003 Q1.

(a) Total credit market instruments as a proportion of gross total assets.

(b) Interest and minimum contractual repayments of principal as a proportion of personal disposable income.

**Chart I:**

**UK household sector income gearing[a]**



Sources: ONS and Bank of England.

(a) Dashed lines indicate averages from 1987 Q1 to 2002 Q4.

(b) See page 82 of the Jun. 2002 *Review* for how this series is constructed.

**Chart J:**

**Nominal house prices**



Sources: BIS, European Central Bank, Halifax, OFHEO, Thomson Financial Datastream, ABS, Hong Kong Department of Ratings and Valuation.

the USA and UK, and domestic demand growth overall has been relatively weak. Even so, there have been signs of an increase in the relative share of household lending in euro-area banks' assets, starting from a lower base.
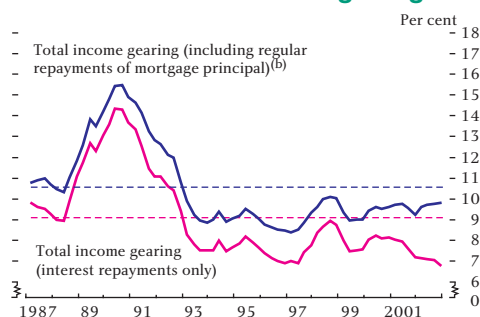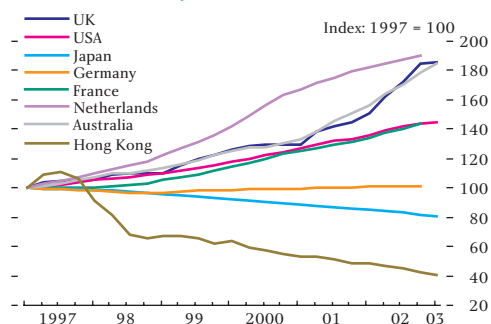
The changing balance between banks' lending to households and to companies largely reflects differences in the growth of demand for credit. But lending to households may have grown because of a change in lenders' perception of its riskiness as compared with corporate lending. Losses on banks' lending to households have generally remained low, for a variety of reasons of differing importance from country to country. First and foremost, low real and nominal interest rates have reduced the cost of borrowing, encouraging a greater accumulation of debt but also making it easier for households to service that debt. Many households have at the same time built up their bank deposits, given the lower opportunity costs (in the process providing banks with cheap liquidity), which should in turn help cushion those households against future adverse financial shocks.

Another important factor may be the progressive shift towards risk-based loan pricing. At this point, however, it is not possible to know how robust pricing techniques will prove to be in the face of any sharp changes in the economic environment, given the limited run of historical data on which the techniques are often based. In some countries, there have been increased delinquencies on credit card debt: but it is not clear how far this reflects increased financial pressures on households generally, and how far deliberate moves by lenders down the credit quality spectrum, presumably reflected in their loan pricing.

Were pressure on households' finances to increase, banks could take some comfort from the weight in total household lending of loans secured by property mortgages. Mortgage lending has been rising rapidly in the UK and the USA. It has been increasing relative to GDP in the euro area too. Even though house price rises have slowed recently in several countries, prices seem unlikely to fall far enough to bring about a substantial collateral deficit (Chart J); even in Hong Kong, where nominal prices have fallen, and as many as 25% of residential mortgage borrowers may have negative equity, potential losses so far for lenders still look small. It is true that the collateral available against loans linked to home ownership will have been reduced to some extent by mortgage equity withdrawal. But, at the same time, this has led to the collateralisation of borrowing that might otherwise have been unsecured. In the UK, mortgage equity withdrawal has continued at a rapid pace but, because of house price increases, the equity remaining in residential property has continued to rise (Chart K).
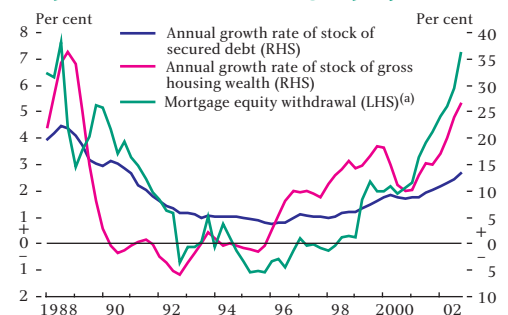
Overall, the direct risks to financial systems from household lending will probably remain relatively small unless there are sharp increases in unemployment or interest rates. Adverse supply shocks would pose a more serious challenge than adverse demand shocks, because of their potential implications for inflation and hence for interest rates. It is therefore good news that the oil price rises earlier this year have been reversed. Perhaps a bigger concern, especially for countries like the UK where the stock of bank borrowing is high relative to net financial wealth, is whether a slowdown in the growth of disposable income would lead households to revise down the level of debt they regard as sustainable. If that happened, reductions in gearing by households might amplify any weakness in aggregate demand – and credit risk might increase indirectly as a result.

## The 'search for yield'

Low interest rates have helped to moderate the risks to financial systems from weaknesses in corporate balance sheets and high household debt-income ratios. But low nominal yields may also have encouraged some investors and financial institutions to look for sources of higher investment returns. For example, at the retail level, there have been increased flows into corporate bond funds. And many international banks have increased the size of their bond portfolios. It is possible that hunting for yield has contributed to the narrowing of spreads on high-yield bonds and emerging-market sovereign debt, and that declines in spreads now exaggerate the reduction in credit risk. There have also been signs of some investors using more leverage to enhance their returns although, overall, investors in high-yielding assets do not appear to be as highly leveraged as in the late 1990s.

The 'search for yield' has been more urgent for those financial intermediaries that have offered liabilities carrying minimum nominal return guarantees – common in Europe and Japan. This has been particularly important for many life insurers internationally. Life insurers typically have a degree of mismatch between the duration of their assets and liabilities – with that of the liabilities tending to be longer – so that falls in interest rates might weaken their balance sheets. The fall in nominal interest rates has also tended to put pressure on banks' margins by reducing the 'endowment' effect from unremunerated deposits. There is specifically a danger that the riskiness of some innovative investment products designed to enhance yield might be underestimated or misunderstood, given the complexity of the pay-offs; there is often a small probability of a very large fall in value (although end-investors have on occasion looked for protection of their principal, returning such tail risk to financial intermediaries).

**Chart K:**

**UK mortgage equity withdrawal and components of net housing equity**



Sources: ONS and Bank of England.
(a) As a percentage of post-tax income.

## Chart L:
## CDS premia for LCFIs[a]

Basis points

- Maximum-minimum range
- Inter-quartile range
- Median

(b)

Jan. Apr. Jul. Oct. Jan. Apr. Jul. Oct. Jan. Apr.
2001 02 03

Sources: CreditTrade and JP Morgan Chase & Co.

(a) Annual premia for credit protection on issuers using ISDA documentation, measured as mid-point between last bid and ask quotes.

(b) Dec. 2002 *Review*.

## Chart M:
## CDS premia for European banks[a][b]

Basis points

- Maximum-minimum range
- Inter-quartile range
- Median

(c)

Jan. Apr. Jul. Oct. Jan. Apr. Jul. Oct. Jan. Apr.
2001 02 03

Sources: CreditTrade and JP Morgan Chase & Co.

(a) Includes UK banks.

(b) Annual premia for credit protection.

(c) Dec. 2002 *Review*.

# The resilience of financial markets and institutions
*International*

Accounting scandals, corporate governance problems and questions about the independence and objectivity of some investment research heightened concern last autumn about the accuracy of corporate financial reports and caused reputational damage to businesses dependent on trust. At times, there were signs of a rush for protection against credit and counterparty risk, some of which had not been perceived clearly before and was difficult to evaluate. Market participants no doubt asked themselves, would there be another Enron or WorldCom? Would any leading financial institution be implicated in illegal conduct and have its reputation and business prospects significantly undermined? Apparently in response to such worries, combined with concerns about concentrated corporate exposures, there was a spike in bank credit default swap premia and heightened market anxiety about some large banks.

Since last autumn, the concerns seem to have eased and the rush to acquire credit protection has subsided, although investors remain, no doubt, more alert to the possibility of governance and accounting failures than before Enron. Thus corporate credit spreads last autumn may have exaggerated default risk – which may help to explain their subsequent decline. In addition, credit risk transfer may have enabled financial institutions to manage their risks better. However, there remain questions about whether, net, risk is being transferred to the firms or end-investors best able to bear it, and whether the availability of risk capital from outside the banking system is growing as fast as in the recent past.

Evidence of the overall robustness of major global financial intermediaries includes their profitability over the past year, the stable or rising Tier 1 capital ratios for their banking operations and the fall in the price of credit protection (Chart L). Their income has been buoyed up by rising bond prices, greater bond trading activity and household loan growth. In the insurance sector, which has perhaps been under more pressure than banking, some large European firms have successfully raised capital. More generally, credit default swap premia have fallen back for internationally active banks, although their dispersion for continental European banks (Chart M) is somewhat higher than for US or UK institutions.

In the USA, some concentrations of exposures to large borrowers have proved troublesome, mainly affecting large banks, but not to the extent of denting their capital. For the US banking system as a whole, capital ratios have remained strong, and profits in 2002 were healthy. In the euro area, too, most banks remained profitable and maintained Tier 1 ratios, their resilience underpinned by retail banking; but profitability was somewhat below average in Germany and Switzerland.
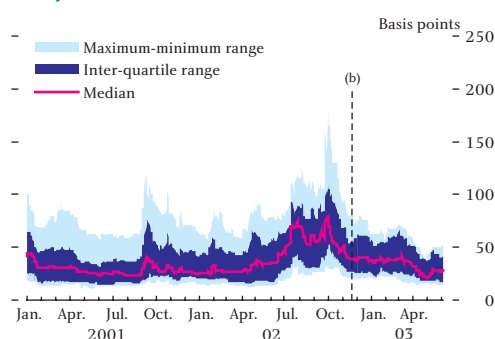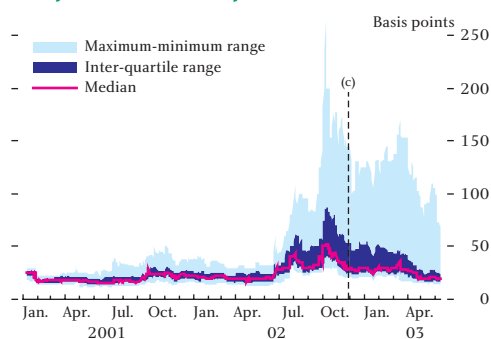
The major outlier has again been Japan, where major banks have experienced write-downs of their equity holdings and substantial loan-loss charges, and where there are growing concerns about the quality of bank capital (notably the extent to which it reflects deferred tax reserves). However, the authorities' large and smoothly executed capital injection for Resona Bank underlines their resolve to prevent spill-overs from banking sector weakness.

*United Kingdom*

Taken as a whole, UK-owned banks have maintained their financial strength. For the majority of them, pre-tax rates of return on equity rose last year, and the median Tier 1 capital ratio has been stable (Chart N). The stock of provisions relative to loans to non-bank customers has also been stable (Chart O).

Although domestic claims account for a majority of UK-owned banks' on-balance-sheet assets, much of their domestic lending is on mortgages, which have low risk (Chart P). Overall, exposures to domestic and overseas borrowers probably pose broadly similar risks of credit loss. Market risk, as measured by value-at-risk (VaR), remains relatively low for UK-owned banks. There may, however, be more uncertainties about prospects for the corporate loan book. UK-owned banks report some mild deterioration in corporate credit quality over the past six months. And, looking forward, this is the area where downward revisions in the macroeconomic outlook are most likely to be reflected in higher-than-expected credit losses.

## The outlook

If economic growth around the world picks up as projected in most forecasts, the outlook for the UK banking system is broadly reassuring, and perhaps more so than six months ago. The macroeconomic environment may be a little less supportive than borrowers and lenders expected at the time of the December *Review*, but some major risks from lending to large firms appear to have eased.

Nevertheless, there remains considerable uncertainty about future aggregate demand, and this has been an issue of growing importance to risk managers. On the one hand, were demand to grow more slowly than expected, that by itself would tend to reduce sovereign, corporate and household creditworthiness and increase banks' provisions. But further falls in interest rates would work in the opposite direction. The net effect is uncertain, particularly given the unusually low level of rates to start with. An adverse supply shock would be more likely to increase banks' credit losses, because a drop in interest rates would be less likely. Moreover, very low interest rates would be likely to increase the search for yield, and could lead to underpricing of credit risk; it might at the same time remove one of the incentives for companies to restructure their balance sheets. Some of these

**Chart N:**

**Large UK-owned banks' Tier 1 capital ratios**[a]
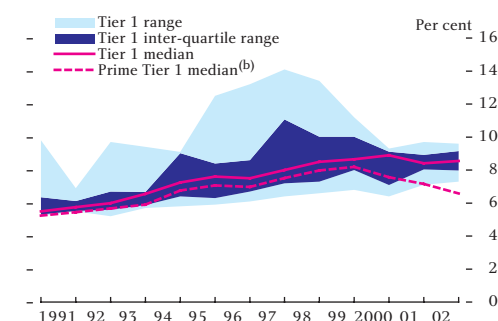


Sources: Published accounts and FSA regulatory returns.

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

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

**Chart O:**

**Large UK-owned banks' stock of provisions relative to customer loans**[a]
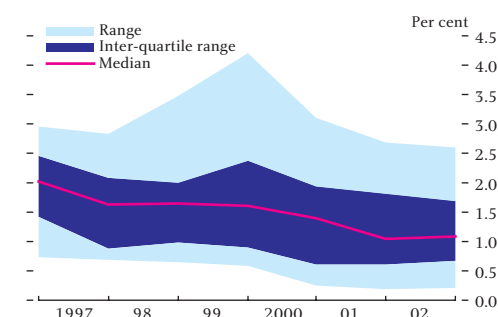


Source: Published accounts.

(a) Data are on a consolidated basis. Provisions include all provisions held against bad and doubtful debts.

**Chart P:**

**UK-resident financial institutions' arrears on UK mortgage lending**[a]
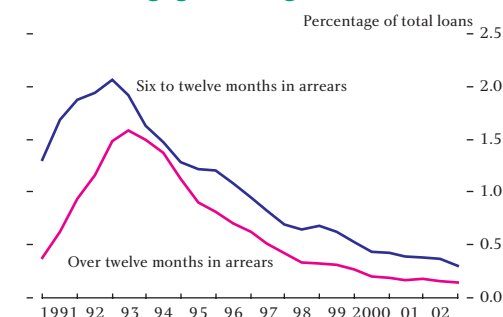


Source: Council of Mortgage Lenders.

(a) UK-resident financial institutions are those banks, building societies and other lenders who are members of the CML and who, together, undertake around 98% of all residential mortgage lending in the UK.

risks have materialised in Japan since nominal interest rates fell to very low levels.

On the other hand, demand might grow faster than expected. In that case, interest rates would be likely to rise, and, as in previous episodes, the rise could be accompanied by higher volatility (linked, for example, to the hedging of mortgages and mortgage-backed securities in the USA). Again, the net impact on the creditworthiness of sovereign, corporate and household borrowers is uncertain. Firms sharing less in the general increase in demand would find their debt financing costs increasingly onerous. But, because of the likely increase in business, the future earnings prospects of financial institutions might look brighter.

# 1 The international environment

## 1.1 International financial markets

In much of the world, economic growth over the past six months has been somewhat weaker than expected. This is likely to have entailed some unanticipated deterioration in credit quality. Consensus forecasts for GDP growth in 2003 have generally also been revised down (Chart 1); and growth in 2004 is expected to be a little less now than projected early this year. Market interest rates have fallen in most major economies[1]. As the May *Inflation Report* noted[2], there remain substantial risks to the MPC's central projection of a gradual upturn in the world economy.

Last December's *Review* described a period of highly volatile markets and perceptions of heightened credit risk. While remaining resilient, the international financial system itself had, at times, been affected by increased concerns about its possible vulnerability. Since then, there has been a clear improvement in many indicators of financial system health. Nevertheless, there are still challenges to risk management from the uncertainty about the global economic outlook and asset prices, and from imbalances across national and sectoral balance sheets. In addition, some uncertainty inevitably remains about the distribution across the financial system of past credit- and equity-related losses.

### Interest rate markets: the search for yield

The weaker macroeconomic outlook, combined with monetary policy easing, has led to further falls in dollar, sterling and euro nominal yield curves (Chart 2). Forward curves suggest that the downward shift in interest rates is expected to be sustained for some time. Real interest rates in many industrial countries are also at historically low levels. Low real and nominal interest rates make it easier for borrowers to service their debts, but give rise to other risks. For example, they put pressure on those financial intermediaries with liabilities carrying guaranteed nominal returns and, combined perhaps with reduced expectations about equity returns, may have contributed to a 'search for yield' in which riskier investments are made in an attempt to maintain nominal returns.

In many countries – in Europe, Japan and other parts of Asia – life insurance companies have guaranteed minimum nominal returns on saving policies or deferred annuities close to or above
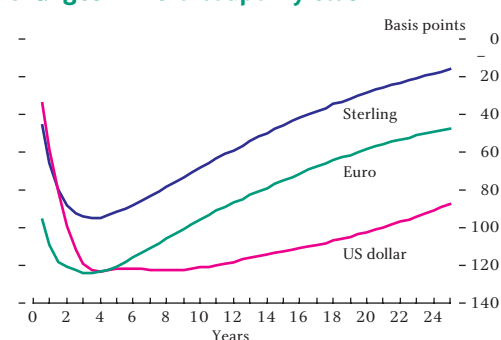
**Chart 1:**
**Forecasts for real GDP growth in 2003**
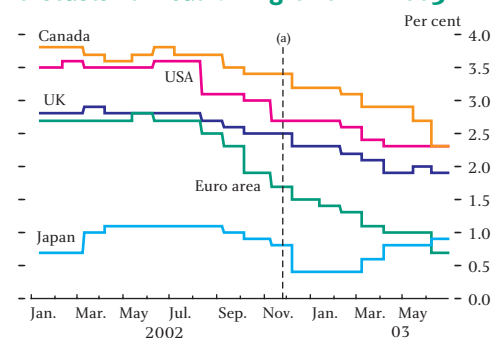


Source: Consensus Economics Inc.
(a) Dec. 2002 *Review*.

**Chart 2:**
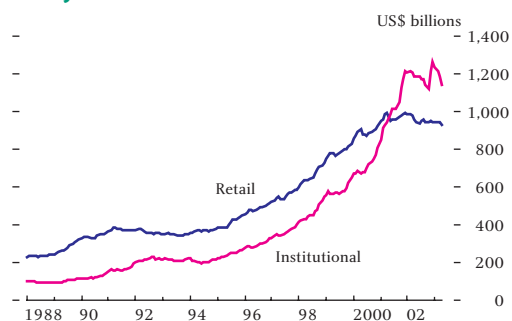**Changes in zero-coupon yields**[a]



Sources: Reuters and Bank calculations.
(a) Change from Dec. 2002 *Review* to 11 Jun. 2003.
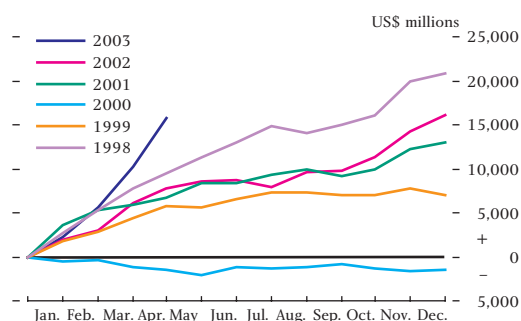
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1: For short-term rates, Canada is an exception.

2: Bank of England *Inflation Report*, May 2003, pages 56–57.
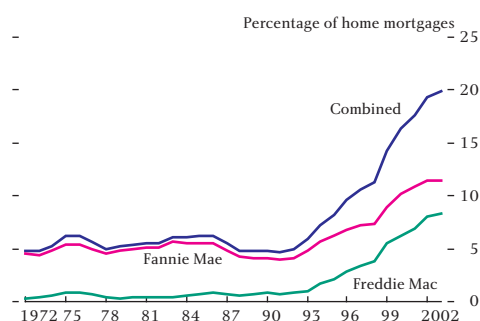
**Chart 3:**
**Money market mutual funds**



US$ billions

Source: Board of Governors of the Federal Reserve System.

**Chart 4:**
**Cumulative asset flows into US high-yield mutual bond funds**



US$ millions

2003
2002
2001
2000
1999
1998

Source: www.ici.org.

**Chart 5:**
**Federal agencies' share of US mortgage market[(a)]**



Percentage of home mortgages

Combined

Fannie Mae

Freddie Mac

Source: Office of Federal Housing Enterprise Oversight.
(a) Includes both mortgages and mortgage backed securities (MBS).

current risk-free bond yields[3]. Many such liabilities have long maturities; given the scarcity of assets with similar maturities, life insurance companies have a duration mismatch. When yields are below the guaranteed rate, the companies can attempt to renegotiate the guarantees or 'gamble' by purchasing riskier, higher-yielding assets, subject to any regulatory constraints. Although guarantees have been lowered for new policies in some countries (Section 1.3), they have typically remained unchanged on existing policies. Japanese and smaller continental European life insurers have been said for some years to be buyers of riskier structured products in search of higher yields. In Europe, these seem to have included equity tranches of collateralised debt obligations (CDOs) and very long-dated (up to 50 years) callable bonds. In Japan, where interest rates have been low for longest, some life companies, as well as other investors, buy notes that entail writing an embedded option in order to increase the initial yield (see Box 3, Section 1.4).

In the USA, falls in short-term market interest rates have increased the relative attraction of bank deposits, putting some pressure on money market mutual funds (Chart 3). Such funds are said to have been taking a little more risk (for example, more interest rate risk) or accepting lower quality collateral on reverse repos, while stock lenders are said to have been taking somewhat greater credit and interest-rate risks when investing cash collateral. Amongst retail investors, one manifestation of a 'search for yield' has been the strong flows into emerging market economy and high-yield bond mutual funds (Chart 4). Whether this rapid pick-up in demand for bonds has caused spreads to narrow beyond levels warranted by underlying fundamentals is a matter of much debate amongst market participants.

Interest rate markets have remained liquid, with high volumes. At longer maturities, volatility has at times been high in dollar markets, where it is affected by the convexity hedging related to US mortgage prepayment risk described in previous *Reviews*[4]. Hedging this prepayment option depends on continuous liquidity in swaption and other markets, apparently for increasingly large trades. This is especially important for US mortgage servicers; and for Fannie Mae and Freddie Mac, which hold a growing proportion of the mortgage-backed market (Chart 5). Some contacts speculate whether such liquidity would prove durable if yield curves were to rise abruptly in the light of positive macroeconomic news.

An unexpectedly sharp rise in short interest rates would also confront intermediaries with losses on bond portfolios. US banks' holdings of mortgage-backed securities have grown

3: The guaranteed interest rates in the products of European life insurers are discussed on page 34 of the December 2002 *Financial Stability Review*.

4: For example, Box 7 on page 72 of the June 2002 *Financial Stability Review*.

rapidly; and in Europe, too, banks' bond portfolios increased in 2002. But other business lines would very likely benefit if the rise in rates were associated with stronger-than-expected economic growth.

## Foreign exchange markets

A similar risk from sudden rises in interest rates potentially affects so-called carry trades in the foreign exchange markets. Such trades attempt to exploit differences between yield curves. Recently, hedge funds in particular have been mentioned as having taken long positions in currencies such as the Australian dollar and South African rand, financed in US dollars or yen.

But the most striking development in foreign exchange markets since the December *Review* has been the near 20% increase in the value of the euro against the US dollar (Chart 6), which has been unusually large for a major bilateral exchange rate over a six-month period. Changes in bilateral rates amongst the US dollar, yen and sterling have been smaller.

Large exchange rate changes can potentially create financial stability stresses in a variety of ways – through disorderly trading conditions, any unhedged foreign currency positions of financial intermediaries and any macroeconomic effects. Disorderly trading has not been a significant problem. With regard to unhedged positions, banks' net on-balance-sheet foreign exchange exposures seem to be small and their end-of-day value-at-risk (VaR) reports suggest that their exposure to market risk as a whole is limited, relative to capital. This reflects the fact that the measure of day-to-day foreign exchange volatility used to calculate VaR has not been high by historical standards. There have not been reports of any major banks facing significant difficulties. The position may be different for some other financial intermediaries (eg in the insurance industry) or large non-financial companies.

As far as the macroeconomic channel is concerned, the impact of a stronger euro, by reducing external demand, may have increased credit risk for euro-area companies; by the same token, it should reduce credit risks for companies elsewhere. And it should in due course help to correct the possible global imbalances discussed in previous *Reviews*. In particular, a long-standing issue has been the vulnerability of the financing of the US current account deficit – which widened further in 2003 Q1 – to any change of sentiment, such as a loss of confidence in US growth prospects. The composition of the capital inflows financing the deficit has changed since the onset of the US slowdown. Inward direct investment has declined markedly (although there was some revival in 2003 Q1) and, in recent quarters, strong buying of US assets by the foreign official sector (Table 1) has absorbed some potential pressure on the exchange rate. Box 4 in Section 1.5 describes the accumulation

**Chart 6:**

**US dollar exchange rates**
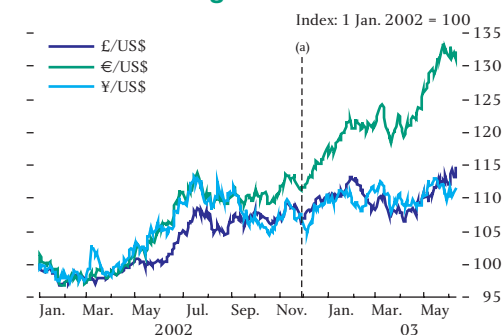


Sources: Thomson Financial Datastream and Bank calculations.

(a) Dec. 2002 *Review*.

**Table 1:**

**US capital flows**

| US$ billions | 2001 | 02 | 03 Q1[a] |
|---|---|---|---|
| **Direct investment:** | | | |
| Inward | 152 | 40 | 103 |
| Outward | -120 | -138 | -116 |
| Net | 32 | -98 | -13 |
| **Portfolio investment by private sector:** | | | |
| Inward | 399 | 388 | 258 |
| Outward | -85 | 16 | -103 |
| Net | 315 | 404 | 155 |
| **Foreign official sector's assets in the USA**[b] | 5 | 95 | 143 |
| **Net foreign liabilities of US banks**[c] | -17 | 70 | 2 |
| **All other flows, net** | 81 | 58 | 163 |
| **Total flows, net** | 416 | 528 | 451 |
| **Statistical discrepancy plus net capital transfers** | -22 | -47 | 93 |
| **Current account balance (deficit -)** | -394 | -481 | -544 |

Source: Bureau of Economic Analysis.

(a) At seasonally adjusted annualised rate.

(b) Includes lending to US-resident banks.

(c) Other than transactions with foreign official institutions.

**Chart 7:**

**Actual value of S&P 500 and range of values expected three months earlier**[a]
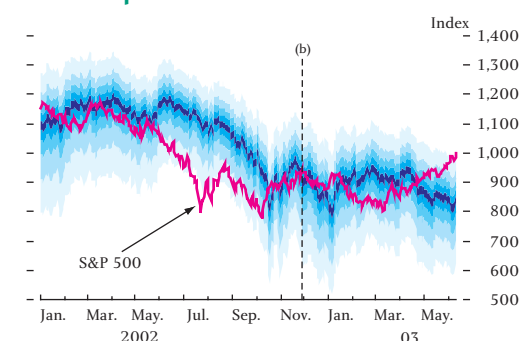


Sources: Chicago Mercantile Exchange, Thomson Financial Datastream and Bank calculations.

(a) Derived from options on futures contracts. Bands cover 10% of the probability; the darkest band is the most likely.

(b) Dec. 2002 *Review*.

## Chart 8:
## Average of bilateral equity index correlations[a]

Dynamic conditional correlations

Within G7 excluding Japan

Within G7

Between Japan and other G7

Sources: MSCI and Bank calculations.

(a) Unweighted averages of bilateral dynamic conditional correlations of weekly movements in MSCI US$-denominated equity indices.

## Chart 9:
## Changes in world equity indices since the December 2002 *Review*[a]
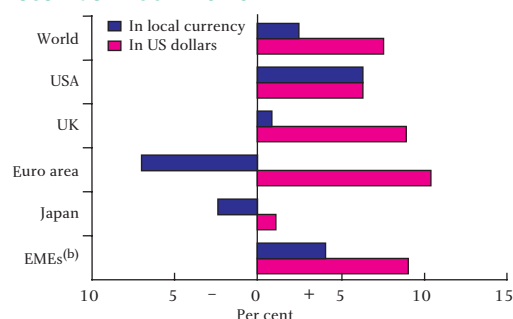
In local currency
In US dollars

World
USA
UK
Euro area
Japan
EMEs[b]

Sources: MSCI and Bank calculations.

(a) Percentage change in market capitalisation indices from 27 Nov. 2002 to 11 Jun. 2003.

(b) Emerging market economies.

## Chart 10:
## Equity indices: implied volatilities[a][b]

FTSE 100
S&P 500
Eurostoxx 50
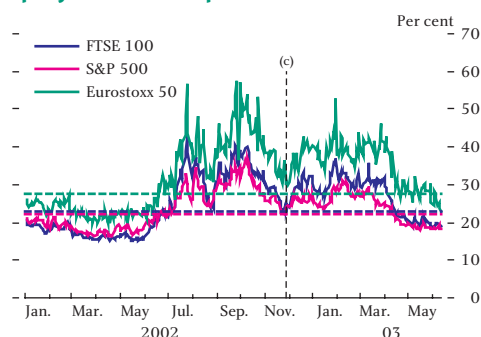
Sources: Chicago Mercantile Exchange, Eurex, LIFFE and Bank calculations.

(a) Three-month constant maturity, derived from options on futures contracts.

(b) Coloured dashed lines represent averages from 1 Jan. 1997 (1 Jan. 1999 for Eurostoxx 50) to 11 Jun. 2003.

(c) Dec. 2002 *Review*.

of US dollar reserves by Asian central banks, limiting pressure on the movement of their currencies against the dollar.

## Equity markets and corporate prospects

Equity market price indices around the world fell sharply early this year, reaching a trough around the middle of March. But, valued in US dollars, the major indices have since recovered to stand above their level at the time of the previous *Review*, although some (for example, in the euro area) are still s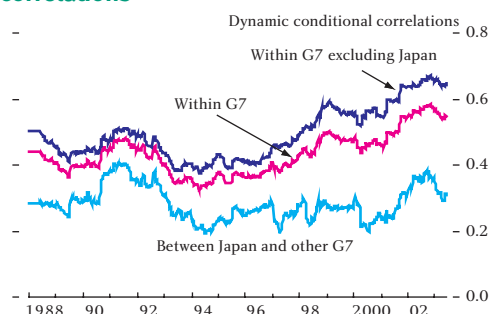omewhat lower in local currency terms. The rise from last October to the peak in late November and the subsequent fall to the March trough were not, judging by market expectations derived from option prices, as much of a surprise as were the falls in mid-2002 (Chart 7).

Despite the lack of encouraging macroeconomic data, there seems to have been a change since mid-March in views about global corporate prospects. This may have been partly due to the resolution of some of the uncertainties about the situation in Iraq and its economic consequences. Since mid-March, the perceived risk of a large and persistent adverse supply shock to the global economy from oil prices has diminished; in US dollars, oil prices have fallen back by around 15% from their peak. This will also have lessened the risk that global unemployment might rise sharply. Overall, there appears to have been a deterioration in corporate prospects and an increase in risk premia in the first part of the period, and the reverse since.

Just as macroeconomic prospects have deteriorated modestly across much of the world (exceptions include Japan), so equity index price movements have been broadly correlated. Correlations remain high by historical standards, suggesting that global factors affecting corporate prospects or risk premia have been important (Chart 8). The contrast between common and local currency measures of equity market performance (Chart 9) has been more pronounced in recent months than in the second half of 2002, because of the sharp appreciation of the euro against other major currencies.

The implied volatility of major equity indices rose between November and March, but has fallen quite sharply since (Chart 10). The average volatility of individual equity prices comprises both this index volatility (a measure of 'market risk') and share-specific idiosyncratic volatility (or 'idiosyncratic risk', which can be eliminated in a sufficiently diversified portfolio). While market risk rose at the beginning of the year – reflecting the increased relative importance of general uncertainty connected with events in Iraq – idiosyncratic risk fell (Chart 11).

Market volatility may have been exacerbated at times by selling by life companies. In addition, some European, including UK, life insurers are said to have made large purchases of index put options to protect against further falls. In many cases, the cost of buying these options seems to have been met by selling index call options, effectively giving away upside risk, or even by selling downside put options that were further out of the money. The greater negative skews in the implied probability distribution function derived from index options on the FTSE100 than on those for overseas equity indices might reflect a greater degree of such hedging by UK life insurers (Chart 12). For dealers, a short downside volatility position would, in general, expose them to potential loss in circumstances where other equity-related lines of business might also be under pressure. The post-war rally in equity markets and any closing out or expiry of insurers' positions will have given intermediaries an opportunity to move back towards a more balanced position.

Despite the rally in equity prices, equity issuance conditions have remained difficult. Initial public offerings (IPOs) have been few on both sides of the Atlantic. But there have been secondary issues. In particular, a number of European companies, including large insurers, have completed rights issues: and, taken together, European companies have issued over US$7 billion of mandatory convertible bonds since 2002 Q2 – in effect, a forward sale of equity (Chart 13). In a quiet market, competition for issuance business has been intense, with dealers sometimes having to bid very quickly, and so without a period of price discovery during which end-investor demand can be gauged.

## Credit markets

Whereas equity markets have been suggesting an improvement in corporate prospects only since mid-March, credit markets have suggested that, on the whole, corporate credit risk has been stable or improving since the December *Review*. For US dollar-denominated investment-grade corporate bonds, spreads on average fell by nearly 20 basis points up to mid-March and have fallen by around 30 basis points since; the corresponding reductions for euro-denominated bonds were around 10 and 20 basis points respectively (Chart 14). Sterling spreads have not fallen as much. The pattern was similar for sub-investment-grade bonds.

The data from both equity and credit markets since March are consistent with some combination of improving corporate sector prospects and a decline in risk premia. The puzzle for the USA and euro area is why bond spreads fell up to mid-March, while equity prices fell and equity price volatility rose (Table 2). If the apparent rise in the equity risk premium over that period reflected a more general reduction in risk appetite, that too would normally have been associated with a rise in bond spreads.

**Chart 11:**

**Implied volatility of S&P 500 index compared with average implied volatility of S&P 500 stocks**
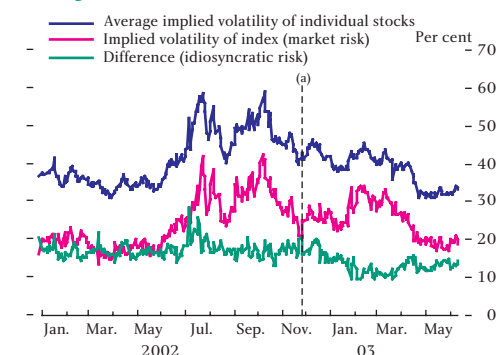


Sources: Bloomberg, Standard & Poor's, Thomson Financial Datastream and Bank calculations.

(a) Dec. 2002 *Review*.

**Chart 12:**

**Six-month implied FTSE 100 and S&P 500 skews**
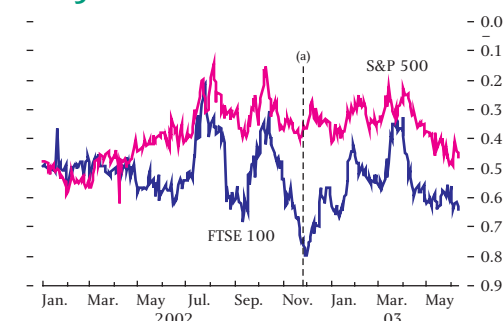


Sources: Chicago Mercantile Exchange, LIFFE and Bank calculations.

(a) Dec. 2002 *Review*.

**Chart 13:**

**Quarterly convertible issuance[(a)(b)]**
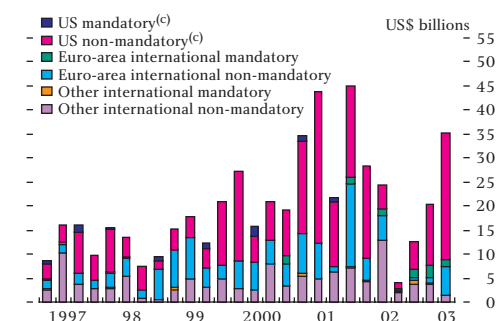


Sources: Dealogic and Thomson Financial Datastream.

(a) International series split by business nationality.

(b) International issues defined as mandatory when reference appears in report text.

(c) US series include international and domestic issues.

## Chart 14:
## Investment-grade corporate bond yield spreads[a]
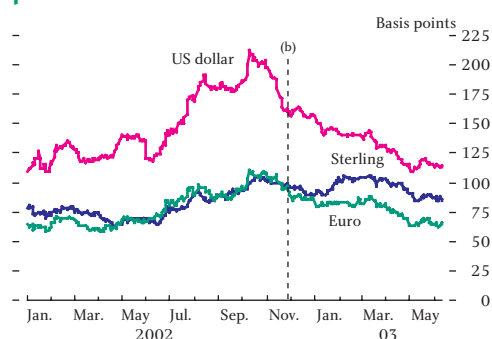


Source: Merrill Lynch.
(a) Spreads over swaps.
(b) Dec. 2002 *Review*.

## Table 2:
## Overview of US markets' performance

|  | Dec. 2002 *Review* to 12 Mar. 2003 | 12 Mar. 2003 to 11 Jun. 2003 | Dec. 2002 *Review* to 11 Jun. 2003 |
|---|---|---|---|
| Change in: |  |  |  |
| **S&P 500 (per cent)** | -14.3 | 24.0 | 6.2 |
| **S&P 500 implied volatility (percentage points)** | 8.3 | -14.8 | -6.4 |
| **US$ BBB asset swap spread (basis points)** | -14.0 | -55.0 | -69.0 |
| **Ten-year US Treasury yield (basis points)** | -67.7 | -37.1 | -104.8 |

Sources: Bloomberg, Merrill Lynch and Bank calculations.

## Chart 15:
## Rated non-government international bond issuance[a]
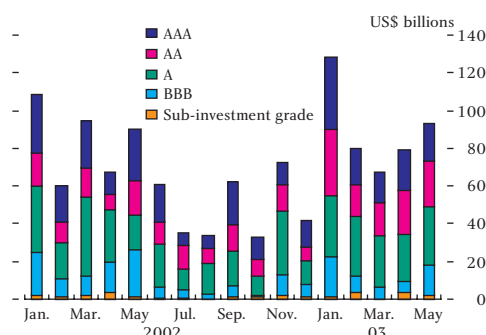


Source: Dealogic.
(a) Issues rated by Standard & Poor's.

There are various possible explanations. One is that firms with access to capital markets were judged to be reducing default risk by extending debt maturities and/or by reducing leverage. This may be a factor in the apparent decline of 'idiosyncratic' risk discussed above. Lower nominal yields will also have helped reduce default risk, by reducing debt servicing costs. And spreads last autumn may have reflected temporarily exaggerated fears about credit risk and market liquidity.

In many of the industrial countries for which evidence is available, loan losses in respect of small- and medium-sized enterprises have generally been limited, but may increase with any future crystallisation of downside risks to global economic growth. By contrast, most of the impairment in credit portfolios – whether held by banks, insurers or other asset managers – has come from exposures to larger firms, amongst which defaults have been concentrated. Using increased access to capital markets, many large firms, on both sides of the Atlantic, geared up their balance sheets during the late 1990s. More recently, however, banking and capital markets have been used to deleverage or extend debt maturities in order to reduce balance sheet vulnerabilities.

During the second half of last year, that process was impeded by significant but selective tightening in wholesale credit markets. Demand remained high for debt issues by strong companies, but weaker companies in troubled sectors or with high leverage had to pay a premium or were unable to access bond finance at all. Conditions are much improved, with issuance reviving across the ratings spectrum (Chart 15).

Repackaging of credits into CDOs has helped to attract demand from outside the banking sector, probably with greater interest in deals backed by loans than riskier high-yield bonds. Credit spreads may have been compressed by dealers dynamically hedging 'short' credit positions acquired via tranches of synthetic CDOs: so-called 'credit correlation' trading. An increased focus on correlation would be welcome to the extent that it implied that banks and others are looking at their credit exposures on a portfolio basis. It could also bring more liquidity to credit markets. But correlations may change unexpectedly, especially if the macroeconomic environment alters.

Wholesale loan market issuance terms changed little over 2002 judging by, for example, the price of drawn and undrawn committed lines in the USA. Consistent with this, the previous marked disparity between pricing in bond and loan markets has narrowed (Chart 16).

The greater availability of credit from the high-yield bond and leveraged loan markets will have facilitated leveraged buy-out deals, which have been used by both US and European conglomerates to shed subsidiaries and strengthen balance sheets. There have been further such deals this year (Chart 17), and the volume in the pipeline is said to be significant, with plenty of equity available from the large private equity firms.

Over the past six months, investment-grade spreads have tended to fall most for bonds which had the widest spreads to begin with (Chart 18). The dispersion of spreads has narrowed (Chart 19), perhaps suggesting that the companies most under pressure have generally made most progress in reducing default risk. This reduction in firm-specific risks is consistent with the reduction in idiosyncratic risk in equity markets early in the year. Chart 18 also illustrates the heterogeneity of changes in spreads. But overall, the data appear to be consistent with the idea that large, highly geared firms around the world have been working to lessen near-term default risk and to improve their liquidity.

## Leverage

Many strategies to enhance expected returns depend on greater leverage, but that in turn tends to increase risk. There are no robust measures of system leverage, but it is possible to examine a range of potential indicators, keeping in mind that they could send false signals.

### Over-the-counter (OTC) derivatives

While the measured on-balance-sheet leverage of most banks and dealers has been relatively stable, the notional value of off-balance-sheet exposures relating to OTC derivatives has been growing rapidly. Market participants caution against interpreting this expansion as a simple increase in leveraged risk-taking, pointing out that interest rate swaps are rarely cancelled but rather are closed out by entering into an equal and opposite trade, so doubling the notional principal outstanding but eliminating the market risk exposure. Given interest rate volatility, traders have adjusted their positions frequently, leading to a rapid growth in notional principal. However, there has also been a rise in the ratio of the gross market value of swaps to notional amounts outstanding: for interest rate derivatives, from 2.7% to 4.2% in the six months to end-December 2002 (the latest available data), significantly above the 3.3% level in 1998. So it seems that system leverage through off-balance-sheet derivatives may have increased.

### Hedge funds

Hedge funds are a key source of leveraged risk-taking. They are said to have taken sizeable positions via strategies that in the past have been highly leveraged: on the US dollar yield curve, in the US mortgage and credit markets and, as mentioned above, in

**Chart 16:**
**Euro-denominated bond spreads less drawn jumbo loan spreads**[a]
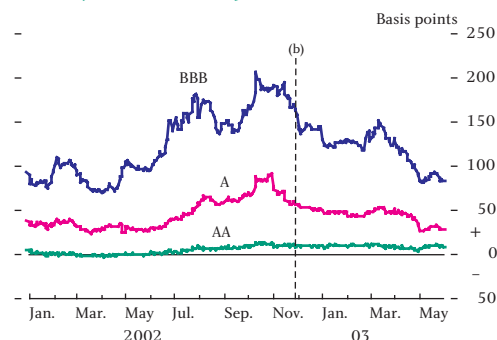


Sources: Merrill Lynch and Loan Pricing Corporation (LPC).
(a) Spreads over swaps.
(b) Dec. 2002 *Review*.

**Chart 17:**
**New worldwide syndicated lending for leveraged and management buy-outs**[a]
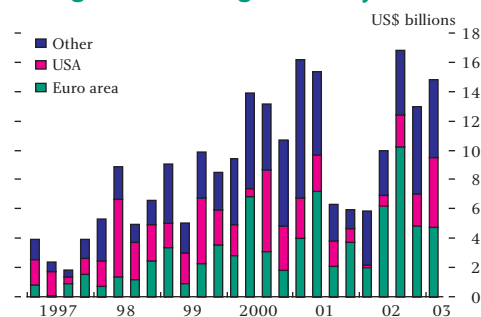


Source: Dealogic.
(a) Split by business nationality.

**Chart 18:**
**Changes in US dollar investment-grade corporate bond yield spreads**[a][b]
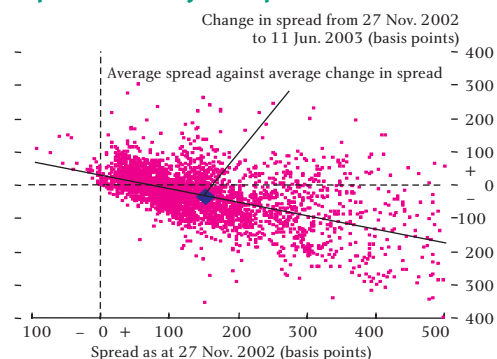


Sources: Merrill Lynch and Bank calculations.
(a) Spreads over swaps.
(b) Each point represents a bond in the Merrill Lynch US Corporate Master Index.

**Chart 19:**

**Cumulative distribution of US dollar investment-grade bond yield spreads[a]**



- Jun. 2002 *Review*
- Dec. 2002 *Review*
- Jun. 2003 *Review*

Share of index (per cent)

Spread (basis points)
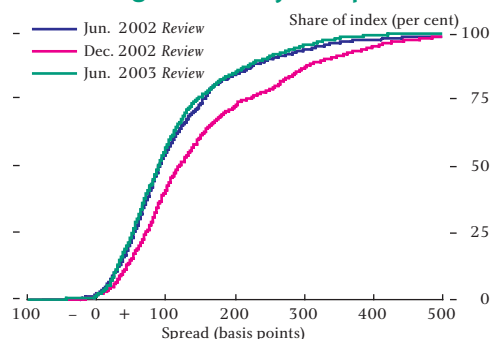
Sources: Merrill Lynch and Bank calculations.

(a) Spreads over swaps.

**Chart 20:**

**Lending to the non-bank private sector in the Cayman Islands[a] and reverse repo lending to non-residents by UK banks**



£ billions

US$ billions

Reverse repos (LHS)[b]

Lending to private sector (RHS)
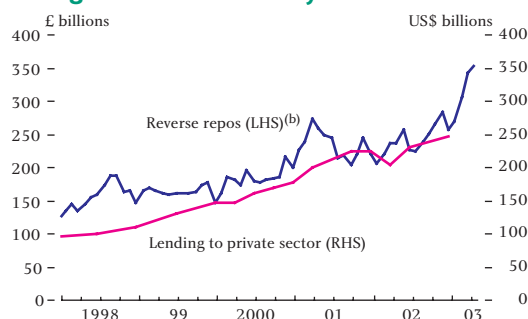
Sources: BIS and Bank of England.

(a) Cross-border lending by BIS reporting banks.

(b) Defined as amount of outstanding claims by UK banks under sale and repurchase agreements – foreign currency assets including euro.

**Chart 21:**

**Change in premiums per transaction at Lloyd's, by selected risk class**



Total[a]
Accident/health
Long-term[b]
Aviation legal liability
Ships legal liability
Non-marine property loss
Non-marine general liability
Pecuniary loss
Energy
Financial guarantee

- 2001
- 2002

Per cent

Sources: Quarterly Business Report Q4 2001 (Apr. 2002) – Corporation of Lloyd's and Quarterly Business Report Q4 2002 (Apr. 2003) – Corporation of Lloyd's.

(a) Across all risk classes.

(b) An agreement to offer the business for renewal for a number of years.

foreign exchange markets. A pick-up in activity is also suggested by two proxy indicators of leveraged risk taking by non-banks: international banking system lending to intermediaries resident in the Cayman Islands and reverse-repo lending to non-residents by UK-resident banking operations (Chart 20)[5]. According to dealers, however, hedge funds, taken as a whole, have not been taking on more leverage recently; and the proliferation of hedge funds may well mean that the exposures of prime brokers and other lenders are spread over a larger number of smaller players than, for example, in 1998.

*Structured finance*

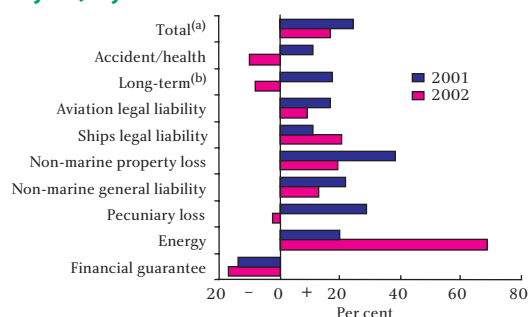Another potential source of leverage within the international financial system is repackaging of securities portfolios, into tranched CDOs, for example. Recently, repackagings of repackagings – such as 'CDOs of CDOs' – have been popular. Such structures may conceivably create greater diversification in the underlying portfolios, although they could also, at least in principle, create 'double leverage'. The rating agencies usually police this by determining the size of the 'first loss' tranches above which more senior tranches may have investment-grade ratings. Structured finance transactions are often constructed so as to achieve particular ratings – and arrangers have an incentive to achieve the greatest degree of leverage consistent with their target ratings in order to maximise their own returns.

# Internationally active financial institutions

*The global insurance industry*

For some years, parts of the global insurance industry have been significant participants in structured finance markets. Over 1999–2001, many reinsurance companies sold protection on *unfunded* CDO tranches. Some, but not all, have retreated from this activity, and monoline credit insurers are said to have become more selective[6]. These decisions may have been influenced by unexpected losses, by ratings downgrades for some insurers and reinsurers, and by the volatility of earnings where valuations are based on marking to market. For the property and casualty insurers, another factor seems to have been the improvement in prospective returns from core insurance business.

Since the 11 September 2001 attacks in the USA, premiums have risen sharply on many types of insurance (Chart 21). Although this has drawn extra capital into the market, capacity has not been sufficient to prevent this growth in premiums. Contacts speak of a sharper distinction between strong and weak insurers, reflected in shares of new business; and, with fewer highly rated

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5: See the June 2001 *Financial Stability Review*, page 71.

6: For some years, monolines have been the biggest sellers of protection on the large, super-senior tranches of CDOs. They are also 'wrappers' of US municipal authority paper, credit-card, aircraft and other asset-backed securitisations, and project finance deals (see Section 1.2).

reinsurers, of the possibility of primary insurers retaining more risk or having greater recourse to the 'excess and surplus lines' market[7].

The reduction in capital due to the World Trade Center losses has not been the only factor. Others have included increased reserves against asbestos-related liabilities, growing claims against environmental risks such as 'toxic mould', and increased risk from Directors and Officers policies. More generally, increased risk from litigation has fuelled calls for 'tort reform' in the USA, to help cap insurers' legal liabilities. To the extent that these developments cause insurance to be rationed or exclusions from coverage to widen, lenders may in the future carry greater risk in their credit portfolios than typically in the past. That is one of many potential links between the insurance and banking sectors (Box 1), reflecting a degree of convergence between some capital market and insurance products[8].

The cumulative fall in equity markets has been a major source of strain on the insurance industry, particularly in the life sector. In the USA, it appears that some companies offered or reinsured guaranteed minimum returns on otherwise apparently *off-balance-sheet* saving policies. Losses have emerged, and reinsurance terms have in consequence tightened sharply. However, the exposure to equity markets has been larger in the European industry, perhaps especially in the UK (see Sections 1.3 and 3.2).

In summary, many insurance companies have remained under pressure, reflected in a series of ratings downgrades over the past six months (Table 3). But pressure has not on the whole entailed distress. And insurers, like other companies, have taken remedial action, with European insurers in particular strengthening capital via disposals and rights or subordinated debt issues (Section 1.3). In both the general and life industry, however, credit default swap (CDS) premia have generally narrowed significantly since the autumn, although there are still some outliers well above average (Chart 22).

*Large complex financial institutions (LCFIs)*[9]
Despite a difficult environment, most of the global banks and dealers – LCFIs – remained profitable in 2002; and the commercial banks' published Tier 1 capital ratios were generally

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7: In the USA, some risks are placed with out-of-state, 'non-admitted' companies. Policyholders do not benefit from state guaranty funds. Lloyd's and some Bermudan reinsurers participate in this market.

8: Rule, D (2001) 'Risk transfer between banks, insurance companies and capital markets: an overview', *Financial Stability Review*, December, pages 137–159.

9: The December 2001 *Financial Stability Review* (page 81) described the criteria used to determine an LCFI peer group. The group is as follows: ABN Amro, Bank of America, Barclays, BNP Paribas, Citigroup, Credit Suisse, Deutsche Bank, Goldman Sachs, HSBC, JP Morgan Chase, Lehman Brothers, Merrill Lynch, Morgan Stanley, Société Générale and UBS.

**Table 3:**

**Ratings actions: selected insurers and reinsurers since December 2002 *Review*[(a)(b)(c)]**

| Insurer | From: | To: | Notches: | Date: |
|---|---|---|---|---|
| Munich Re | AAA | AA- | -3 | 27 Mar. |
| Allianz | AA | AA- | -1 | 20 Mar. |
| Prudential PLC | AA | AA- | -1 | 29 Jan. |
| RAS | AA | AA- | -1 | 20 Mar. |
| Hannover Re | AA* | AA- | -1 | 15 Apr. |
| Aegon | AA- | A+ | -1 | 8 Apr. |
| AGF | AA- | A+ | -1 | 20 Mar. |
| Aviva | AA- | A+ | -1 | 8 Apr. |
| AXA | A+ | A | -1 | 12 Feb. |
| Chubb Corp | A+ | A | -1 | 24 Mar. |
| Loews Corp | A+ | A | -1 | 10 Jun. |
| Converium | A+* | A | -1 | 11 Dec. |
| ACE Ltd | A- | BBB+ | -1 | 21 Mar. |
| Gerling | A- | BB+ | -4 | 26 Feb. |
| Scor | A-* | A- | 0 | 27 Dec. |
| Swiss Life[(d)] | BBB | BBB-* | -1 | 8 Apr. |

Source: Bloomberg.

(a) Standard & Poor's (long-term local issuer) rating.

(b) * represents credit watch negative.

(c) Rating at holding company level where available. Date shows last rating action. Ratings sorted by initial rating.

(d) First available on 10 Dec. 2002.

**Chart 22:**

**CDS premia for selected large insurance companies[(a)(b)]**
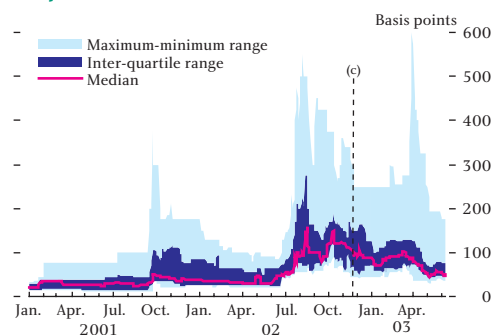
Source: JP Morgan Chase & Co.

(a) Annual premia for credit protection on issuers using ISDA documentation, measured as mid-point between last bid and ask quotes.

(b) Excludes Scor, for which CDS quote rose to 1,100 bp in Nov. 2002 and has subsequently fallen to 500 bp.

(c) Dec. 2002 *Review*.

**Chart 23:**

**CDS premia for LCFIs[(a)]**
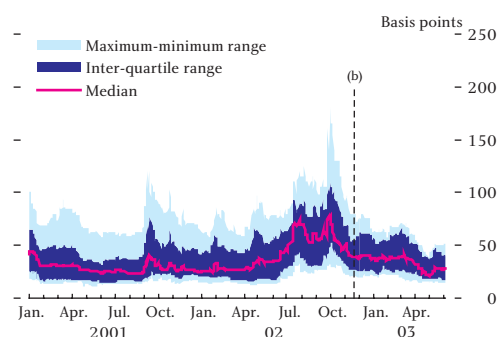
Sources: CreditTrade and JP Morgan Chase & Co.

(a) Annual premia for credit protection.

(b) Dec. 2002 *Review*.

# Box 1: Potential systemic risk from the insurance sector

The convergence of insurance with capital markets has highlighted the range of links between the banking and insurance sectors, and the question of whether difficulties within the insurance sector could ever spill over to the banking system or to wider capital markets. This Box explores some of the potential channels of contagion.

## Direct links

*Via banks' ownership of insurers*

Potential losses to the parent should be limited to the size of the investment in the subsidiary, which, in the case of life insurance subsidiaries, should include the 'embedded value' of business in force[1].

*Via ownership of the bank by an insurer, or by a parent company that also owns an insurer*

For example, a parent or holding company may be less able to support a bank if the former experiences difficulties. Counterparties may then judge the bank to be less creditworthy, affecting its access to funding or capital markets.

*Via actual or contingent credit exposures to insurers*

Drawn loans may be relatively small-scale: for example, the ten largest UK banks have loans to insurance companies and pension funds comprising only 6% of combined Tier 1 capital. But letters of credit – some collateralised, some not – are commonly provided to smaller, start-up or less creditworthy reinsurers to support their ability to pay claims. In addition, letters of credit are typically used by non-US insurers as collateral, which they are required to provide to the US authorities. In the event of credit impairment, such letters of credit may be difficult to withdraw at the roll-over date, because the insurer might react by drawing on them.

Banks and dealers also have OTC derivatives exposures to insurers, only some of which are collateralised under credit support annexes. For example, some life insurers use equity, currency and fixed income swaps and options extensively, to take or hedge investment positions; and some large,

international multi-line insurers and reinsurers have been active sellers of protection in credit risk transfer markets.

## Indirect links

*Via the impact on corporate borrowers*

Many firms rely on the availability of certain forms of insurance to conduct their business: for example, trade credit insurance and liability covers for construction or transport companies. If insurance company failures disrupted the availability of certain lines of cover market-wide, some firms could experience liquidity problems or even fail, exposing their bankers to potential credit losses[2].

*Via asset market disruption*

Most insurers do not have significant short-term liabilities and liabilities to policyholders could be run off over extended periods, avoiding 'forced sales' of their assets. But if insurers were leveraged or had puttable liabilities of whatever form, it is conceivable that asset liquidations could cause market dislocation. Regulatory requirements have also been cited as a cause of asset sales, as discussed in the article *Strengthening the financial infrastructure* in this *Review*.

*Via spill-overs to other insurers or reinsurers*

Another potential channel for spill-overs is if other insurers or reinsurers are exposed to the failed company: for example, through inability to pay out claims on reinsurance or retrocession – ie reinsurance of reinsurance – policies. This could give rise to potential effects on banks or capital markets.

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1: Embedded value is the value of business in force plus the value of any net assets. Changes in embedded value are often included in Tier 1 capital at group level. The potential impact on large UK-owned banks has been discussed in previous *Reviews*.

2: This potential risk was underlined by the knock-on effects from the failure of the Australian insurance company HIH to the national construction industry. Although the risk remained fully insurable, there was very little cover, which potentially affected the risks in banks' loan portfolios. HIH Royal Commission (2003): *The failure of HIH Insurance* can be found at http://www.hihroyalcom.gov.au.

stable or rising. Their credit spreads have both fallen and tended to converge (Chart 23).

Various issues do, nevertheless, confront these global firms. First, like all businesses, they are exposed to the economic outlook. Correlations between the share prices of LCFIs and world equity indices have remained high, even allowing for a general increase in share price correlations across all stocks, perhaps implying that the future earnings of LCFIs are expected increasingly to depend on the performance of the global economy.

Second, equity issuance and mergers and acquisitions (M&A) activity have remained subdued, with recent non-retail earnings buoyed up instead by strong fixed-income business. In some houses, during 2002 and into 2003, indicative trading book VaRs rose relative to shareholders' funds and net dealing income, consistent with anecdote of a step-up in proprietary trading and expansion of 'in-house' hedge funds. But, of course, any associated increase in risk may well be offset by lower activity and risk elsewhere in the business.

Third, a more specific issue for some LCFIs is the potential cost of civil litigation against them in the United States following the Enron and WorldCom episodes, and the settlement with US regulators in April relating to alleged conflicts of interest in research and 'spinning' of IPOs.

One change facing US LCFI commercial banks is the likely requirement to consolidate on to their balance sheets the asset-backed commercial paper (ABCP) conduits that they sponsor. This follows a new interpretation (FIN 46) by the US Financial Accounting Standards Board, due to come into effect from 1 July 2003. Up to US$700 billion of ABCP could be affected. It is unclear how, if at all, the accounting change will affect the banks themselves or the availability of short-term trade financing from this source.

*Internationally active banks*
The sharp widening of credit spreads in the autumn of 2002 affected internationally active banks (IABs) generally, not just LCFIs. CDS premia have since eased back for IABs taken as a group, although outliers remain (Chart 24).

Disaggregating CDS premia by region, they lie in a narrow range for US banks and securities houses (Chart 25). European banks' CDS premia are also now more narrowly distributed than at the end of 2002, but with a few outliers (Chart 26). The same broad picture emerges from rating agency assessments of the financial strength of various national banking systems (Chart 27).

**Chart 24:**
**CDS premia for internationally active banks**[a][b]
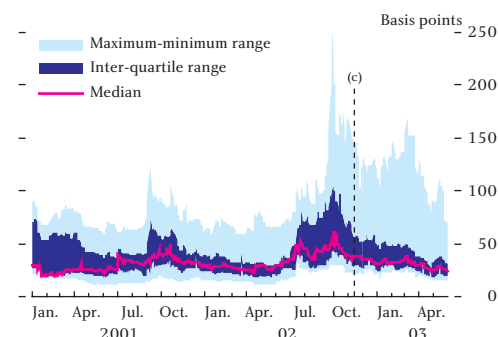


Sources: CreditTrade and JP Morgan Chase & Co.
(a) Excludes LCFIs and Japanese banks.
(b) Annual premia for credit protection.
(c) Dec. 2002 *Review*.

**Chart 25:**
**CDS premia for US banks and securities houses**[a]
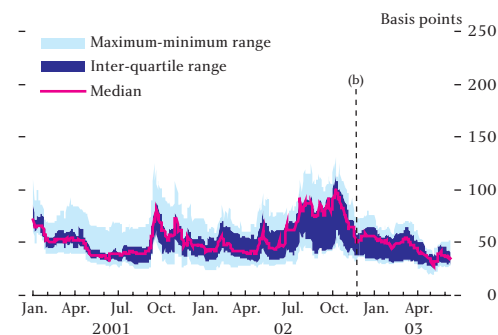


Source: CreditTrade.
(a) Annual premia for credit protection.
(b) Dec. 2002 *Review*.

**Chart 26:**
**CDS premia for European banks**[a][b]
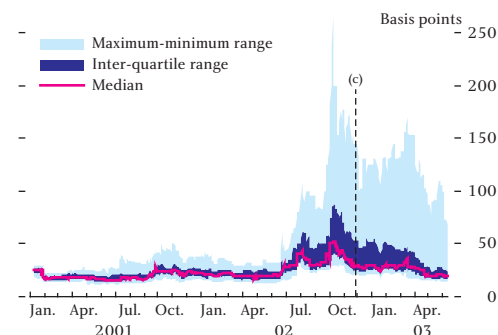


Sources: CreditTrade and JP Morgan Chase & Co.
(a) Includes UK banks.
(b) Annual premia for credit protection.
(c) Dec. 2002 *Review*.

**Chart 27:**

**Financial strength ratings of large internationally active banks[a][b]**

Sources: Moody's Investors Service and Bank calculations.

(a) Ratings exclude consideration of government support.

(b) Blue dots represent individual banks, while red dots represent country averages.

**Table 4:**

**Consolidated foreign claims against geographical areas, 2002 Q4[a][b]**
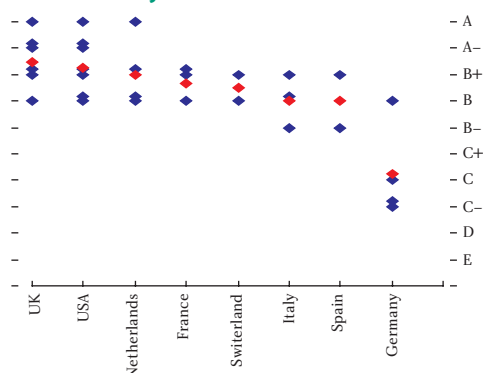
|  | Reporting country | | | |
|---|---|---|---|---|
|  | UK | USA | Europe | Japan |
| Total ($billions) | 1,357 | 742 | 7,186 | 1,142 |
| **Claims vis-à-vis** | Percentage of total | | | |
| **Europe** | 27.6 | 33.1 | 39.5 | 25.6 |
| Germany | 4.0 | 10.1 | 7.8 | 7.9 |
| France | 6.0 | 4.7 | 4.3 | 4.1 |
| Italy | 3.9 | 3.1 | 5.2 | 2.6 |
| Switzerland | 0.7 | 1.7 | 1.5 | 0.7 |
| Japan | 3.4 | 7.9 | 3.7 | |
| UK | | 14.2 | 17.0 | 8.2 |
| USA | 31.5 | | 22.6 | 42.3 |
| EMEs | 28.4 | 38.0 | 14.8 | 21.0 |
| Hong Kong | 9.5 | 2.6 | 0.5 | 2.3 |

Sources: BIS and Bank calculations.

(a) Europe excluding the UK.

(b) EMEs include offshore centres.

**Chart 28:**

**Six-month percentage changes to 2002 Q4 in consolidated foreign claims[a]**

|  | Reporting country | | | |
|---|---|---|---|---|
|  | UK | USA | Europe[d] | Japan |
| All countries | 6.3 | -7.2 | 1.4 | 7.2 |
| **Claims vis-à-vis** | | | | |
| Europe[b] | 6.4 | -3.9 | 1.7 | 14.7 |
| Germany | -7.7 | -3.9 | 6.9 | 12.2 |
| France | -2.9 | -17.5 | 1.9 | 20.7 |
| Italy | 19.4 | -1.8 | -2.2 | 21.9 |
| Switzerland | 5.7 | -2.3 | -19.3 | 4.4 |
| Japan | -9.6 | -19.8 | -9.1 | |
| UK | | -3.6 | 4.6 | -5.2 |
| USA | 8.6 | | 0.6 | 9.3 |
| EMEs[c] | 6.3 | -8.9 | 1.2 | 0.8 |
| Hong Kong | -1.6 | -8.4 | -13.1 | -19.4 |

Sources: BIS and Bank calculations.

(a) Positive changes marked orange, negative changes blue.

(b) Europe excluding the UK.

(c) EMEs include offshore centres.

(d) Excludes Ireland and the Netherlands, due to changes in data definitions.

Over recent years, European banks have been active participants in the US and international syndicated loan markets. However, more recently, some European regional banks are said to have refocused on their domestic market businesses. At the same time, an apparently increasing number of globally active banks have been re-examining the low returns on syndicated lending, and placing greater emphasis on portfolio credit management. Some may now take credit risk by selling protection via CDS, which are off balance sheet and typically earn a higher return. However, UK banks, among others, are said to have been taking a bigger share of syndicated loan facilities recently. Credit spreads for UK banks nevertheless remain low and narrowly dispersed.

UK-owned banks are the second largest group of international creditors (behind Germany), with around US$1,350 billion of consolidated foreign claims. As a result, in addition to indirect links via market risk and counterparty credit exposures, the UK financial system has strong direct financial links to the health of both foreign banking systems and foreign non-bank private sectors. Table 4 shows the percentage of UK-owned banks' consolidated foreign claims against different regions, as well as secondary links to foreign regions through the exposures of countries to which the UK lends. Just under 30% of the foreign claims of the UK banking industry are on the rest of Europe, and a little over 30% on the USA. Claims on Hong Kong (almost 10% of total) are larger than to any individual European country.

Chart 28 shows the changes in the consolidated foreign claims over the six months up to 2002 Q4[10]. In total, UK-owned banks' foreign claims increased over the period by around 6%, although exposures to Germany, France and Japan fell. US banks reduced foreign exposures across the board. Both US and European banking system on-balance-sheet exposures to Japan fell. BIS reporting banks' exposures to emerging-market economies (EMEs) reached 10.4% of overall exposures. A Box in the June 2002 *Review* discussed the compositional shift in developed country banks' exposures to EMEs from cross-border to local lending; in 2002 Q4, BIS data show that local lending reached 40.5% of the total, its highest ever. The impact of recent macroeconomic developments and changes in the balance sheets of major borrowing sectors on overseas banking systems is explored further in the rest of this section.

10: Consolidated claims denominated in US dollars. Movements in major currencies from 2002 Q2 to 2002 Q4 were not large enough to explain the changes in claims.

# 1.2 The USA

Several developments have made borrowers in the USA[11] more resilient to any demand or supply shocks that might delay the expected recovery. These include corporate balance sheet adjustment, an easing of concerns over company earnings and governance which had been prompted by corporate scandals, and the refinancing of household mortgage debt at significantly lower, fixed interest rates. US banks' earnings and capital have remained robust, with loan losses largely concentrated amongst exposures to some large corporate borrowers in relatively few sectors. These losses have tended to fall on institutions that had earlier permitted exposures to sectors such as telecoms to build up excessively.

## Domestic financial balances

Over recent quarters, the financial deficits of the US household and corporate non-financial sectors have adjusted quite rapidly back to approximate balance, as the public sector deficit has widened to become the main counterpart to the continuing current account deficit discussed in Section 1.1 (Chart 29)[12].

*Balance sheet adjustment by the non-financial corporate sector*
While cutbacks in fixed investment and a run-off of inventories during much of the recent downturn have contributed to the narrowing of the sector's financial deficit, financial adjustments have also made companies more robust to a further downturn or sluggish recovery. The growth of debt has slowed and been accompanied by a sharp fall in the net retirement of equity that had been a characteristic of the late 1990s. This had largely been a by-product of heavy cash or debt financed M&A activity. These developments have helped to slow the rise in capital gearing (Chart 30).

Companies have also improved their liquidity by lengthening the maturity of their debt and holding more liquid assets relative to their short-term debt (Chart 31). Dependence on commercial paper (CP) and bank loans has been progressively reduced via bond finance which, as discussed in Section 1.1, picked up in 2003 Q1. Falling demand for bank loans has reflected weak investment, moves to lengthen the maturity of debt and the absence of widespread distress borrowing. Although the financing costs of longer-term debt are higher, companies have still benefited from the general downward movement in interest rates since early 2000. Income gearing has declined, although the fall is mainly accounted for by a recovery in profits from the low levels in 2001 H1. The April 2003 *Senior Loan Officer Opinion*

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11: The US market accounts for around 31.5% of consolidated foreign exposures of UK-owned banks, as well as being an important market for other banks. Within North America more broadly, Canada accounts for around 2.7% of UK-owned banks' consolidated foreign exposures.

12: All flow of funds quarterly flow data are seasonally adjusted.

## Chart 29:
## Financial balances of domestic sectors[a]
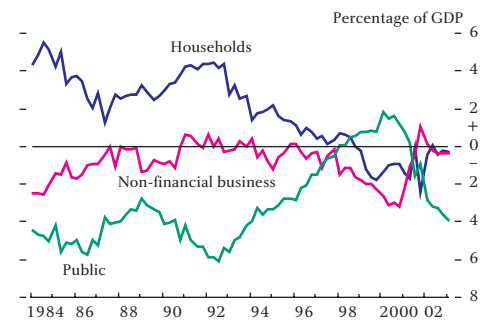
Source: Board of Governors of the Federal Reserve System: 'Flow of Funds Accounts of the United States', 2003 Q1.
(a) Data are on a national income and products accounts basis.

## Chart 30:
## Capital and income gearing of non-financial corporate sector
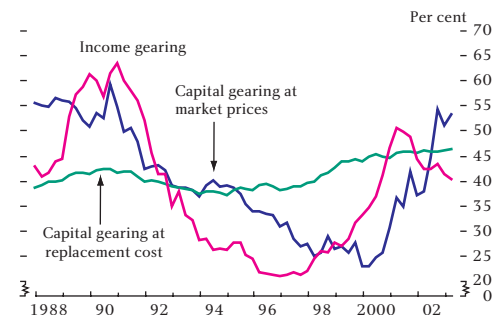
Sources: Board of Governors of the Federal Reserve System: 'Flow of Funds Accounts of the United States' 2003 Q1 and Bureau of Economic Analysis, Department of Commerce.

## Chart 31:
## Non-financial corporate sector debt and liquid assets[a]
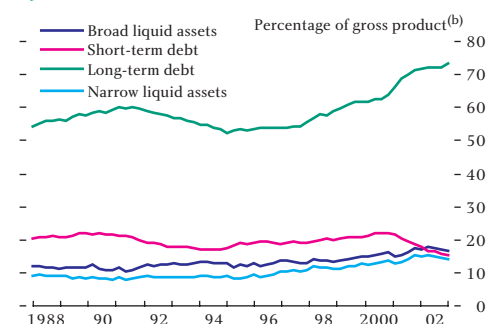
Sources: Board of Governors of the Federal Reserve System: 'Flow of Funds Accounts of the United States', 2003 Q1 and Bureau of Economic Analysis, Department of Commerce.
(a) Narrow liquid assets comprise currency, deposits and money market mutual fund shares. Broad liquid assets comprise narrow liquid assets and holdings of securities.
(b) Gross product of non-financial corporate business.

**Chart 32:**
**Net current liabilities of US companies(a)**



Source: Standard & Poor's Compustat.

(a) Liabilities and assets maturing within one year, as a percentage of total assets.

(b) Excludes Enron.

**Chart 33:**
**Business bankruptcy filings**



Sources: Thomson SDC, IMF, Board of Governors of the Federal Reserve System 'Flow of Funds Accounts of the United States', 2003 Q1 and Administrative Offices of US Courts.
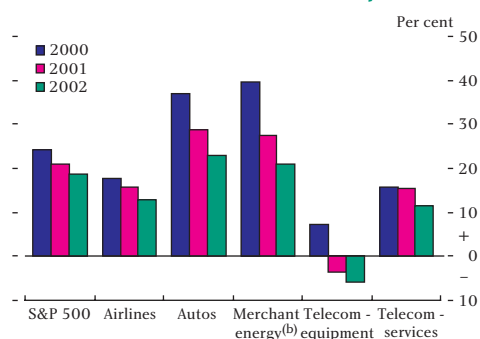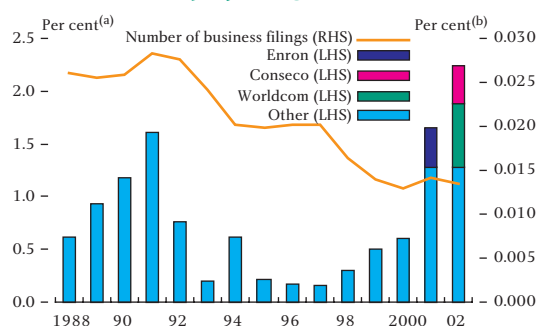
(a) Chapter 11 filings as a percentage of total assets of non-financial companies at historical cost.

(b) Total business filings as a percentage of total population.

*Survey*[13] reported, however, that the net percentage of domestic banks tightening lending standards had fallen to its lowest level since 1999, mainly because of increased competition from bank and other lenders. With corporate bond spreads and default rates also falling over the past six months (Section 1.1), these trends suggest that credit supply to companies has eased.

Liquidity pressures that were earlier evident in some of the more highly indebted sectors have moderated. A fall in net current liabilities has been most marked (but from a high level) in the car manufacturing and merchant energy sectors, but they have also fallen in the airline and telecom industries (Chart 32).

Bankruptcy figures also suggest that problems have been concentrated amongst a relatively small number of large firms. The small- and medium-sized enterprise (SME) sector, whose external financing needs are largely met by bank loans, has been comparatively resilient so far. While the total value of assets of firms seeking Chapter 11 protection has risen sharply – reflecting some large company failures – the relative number of filings has been broadly stable (Chart 33).

The funded positions of US companies' defined-benefit pension schemes[14] have deteriorated due to a combination of falling interest rates and, until recently, equity prices. Between end-2000 and end-2002, the market value of the pension fund assets of 100 companies[15] with the largest pension plans fell by 21%, while the present value of their pension obligations rose 19%, leaving 87 with pension fund deficits (Chart 34). In over a third of those companies the deficit exceeded 25% of their pension obligations. Although companies with chronically large deficits are required to increase contributions and insurance premiums payable to the Pensions Benefit Guaranty Corporation (PBGC)[16], companies under acute financial pressure can apply to reschedule their mandatory contribution payments. Even so, however, the burden of higher employer contributions could impair future business expansion. Higher contributions to pension funds along with health insurance were behind a sharp rise in employer costs for benefits in 2003 Q1. In any event, in the short term, higher net pension liabilities raise capital gearing, conceivably affecting firms' costs of, or access to, external funding (Box 2).

13: http://www.federalreserve.gov/boarddocs/SnLoanSurvey/200305/fullreport.pdf.

14: The liabilities of a pension fund can be considered as a portfolio of zero coupon bonds issued by the fund that mature on dates coinciding with pension payments. Pension fund assets will typically include not only bonds but also a variety of other financial and real assets. If the fund is short duration (ie it holds assets with a combined average duration less than that of its liabilities), a given fall in interest rates will tend to raise the fund's deficit (or reduce its surplus).

15: These represented about 46% of total defined-benefit pension fund assets as identified in the US flow of funds accounts.

16: The role of the PBGC and the position of insured pension funds were described on pages 31–32 of the June 2002 *Financial Stability Review*.

## The household sector

The resilience of US household spending that has supported the economy during the current slowdown has partly been financed by a strong rise in debt. Capital gearing ratios have accordingly continued to rise, but over the past year income gearing has been relatively stable (Chart 35). While delinquency rates on non-mortgage consumer debt have also remained stable (Chart 36), there is a risk that any future adverse shock to income growth might trigger higher defaults among households, while the wider macroeconomic impact of a slowdown in spending might then adversely affect credit conditions more generally.

The recent rises in indebtedness have been mainly accounted for by mortgages (Chart 37). Mortgage equity withdrawal[17] reached record levels in 2002 Q4, encouraged by a further fall in interest rates, and remained strong in 2003 Q1. However, some proceeds of mortgage refinancing have been used to pay down more expensive unsecured debt (Chart 37). Outstanding non-mortgage consumer debt fell in 2002 Q4 but growth resumed in 2003 Q1.

One potential threat to the robustness of banks' and other lenders' consumer loan portfolios is the impact of the fall in equity prices since early 2000 on households' net worth. However, the triennial *Survey of Consumer Finances* (SCF)[18] showed that households whose wealth had been most impaired by falling equity prices were also those best placed to service their debts. The top 10% of households by income, which have much higher holdings of equities than other income groups, have an income gearing of only around half that of other households. The ratio of household net worth to disposable income, while reduced by the fall in equity prices, remains at about the same level as in the early 1990s, partly because of the persistent strength of house prices.

Average house price inflation (and its regional dispersion) has, however, been falling since 2002 Q3 (Chart 38). As a proportion of total mortgage loans, non-current mortgage loans made by banks and thrifts have risen somewhat since early 2000 but remain below the level of the mid-1990s. Moreover, in the event of default, mortgage insurers and lenders would incur losses only if house prices were to fall significantly. In general, lenders allow a down-payment of less than 20% of the value of a property only if the borrower has mortgage insurance.

17: Mortgage equity withdrawal is defined as the difference between the net acquisition of mortgage debt and residential investment.

18: http://www.federalreserve.gov/pubs/oss/oss2/2001/bull0103.pdf.

### Chart 34:
### Distribution of funded positions of large companies' pension plans[a]
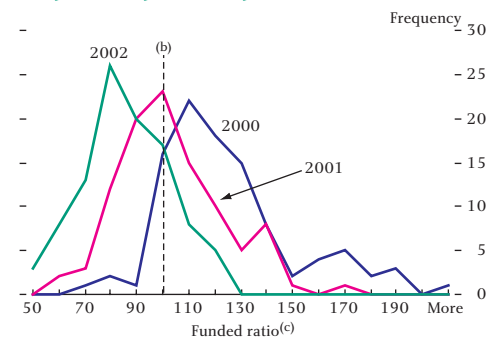


Source: Milliman USA: '2003 Defined Benefit Pension Plan Study', Apr. 2003.

(a) The study covers 100 of the largest companies with defined benefit plans. The results are based on 2002 annual reports and include non-qualified and foreign plans. both of which are often unfunded, as well as US qualified pension plans.

(b) Fully funded position.

(c) Ratio of market value of assets to projected benefit obligation.

### Chart 35:
### Household sector gearing ratios
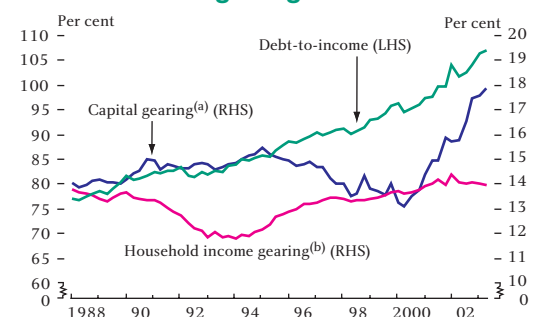


Source: Board of Governors of the Federal Reserve System: 'Flow of Funds Accounts of the United States', 2003 Q1.

(a) Total credit market instruments as a proportion of gross total assets.

(b) Interest and minimum contractual repayments of principal as a proportion of personal disposable income.

### Chart 36:
### Delinquency rates on US bank loans
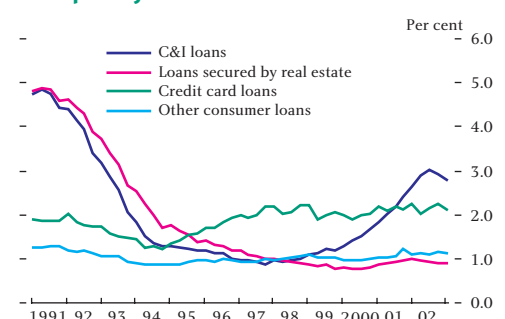


Source: Federal Deposit Insurance Corporation.

# Box 2: Financial stability implications of pension fund deficits of US companies

The deterioration in the financial position of company defined-benefit (DB) pension plans could in principle pose a number of threats to financial stability.

First, banks and other financial institutions may themselves have large pension liabilities, eroding their capital. In fact, while many banks have large pension fund plans[1], deficits, where they exist, are typically smaller than those of non-financial companies and the under-funded position represents only a small addition to their long-term debt. Nevertheless, several of them made significantly higher contributions to their pension funds last year.

Second, large deficits could affect the credit standing of companies and the elimination of deficits could impede an individual company's expansion plans or pose a drain on company cash flow and liquidity.

Third, there are complex long-term macroeconomic effects. These arise from the impact of large deficits on other companies through pension plans' cross-holdings in shares, and the effects on broader saving behaviour and asset preferences of changes in pension arrangements. The latter include the impact of the closure of DB schemes and their replacement with other forms of contractual saving where plan members absorb the market risk. These are, however, beyond the scope of this Box.

For non-financial companies, especially in sectors such as steel, airlines, and autos, the burden of containing the impact of burgeoning pension fund deficits at a time when earnings prospects are uncertain has become significant. However, despite certain sectoral concentrations, there is, in general, only a weak relationship between the size of pension liabilities and other long-term debt (Chart A).

A firm's unfunded or pension liabilities are valued as the balance of the present value of its fund's liabilities (which depend on the accumulated service of past and present employees, and complex actuarial calculations and choice of discount rates) less the market value of its fund's assets. While this net liability shares some of the characteristics of long-term fixed-interest-rate debt (for example, a high sensitivity to changes in interest rates), the value of net pension fund obligations is also influenced by equity and other asset prices. But perhaps more important, the cash flow implications of having to meet pension fund liabilities – which are not a well-specified contractual stream of interest and principal payments – can be hard for creditors and investors to pin down.

**Chart A:**

**Long-term liabilities of 80 non–financial companies**[a]
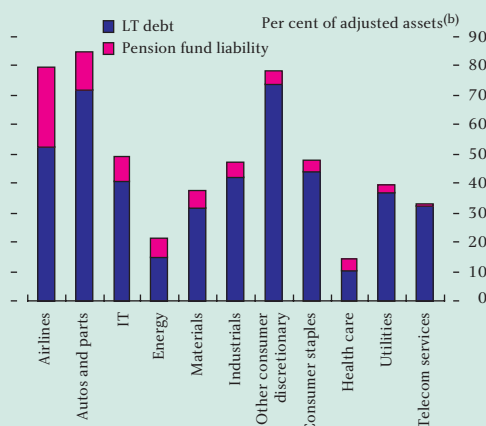


Sources: Milliman USA, Standard & Poor's Compustat and Bank calculations.

(a) Pension liabilities are measured by the greater of the projected benefit obligation less the market value of plan assets, or zero, and not by the liability (or for plans in surplus, the pre-paid accrued asset) shown in a company's accounts.

(b) Adjusted assets are total assets less intangibles less receivables. The last adjustment is significant for companies such as the main auto manufacturers that have large consumer credit or other finance company operations. The large receivables associated with this activity inflate their balance sheets relative to those of other non-financial companies.

This uncertainty arises partly from quite complex accounting rules which require careful interpretation. The rules are intended to prevent temporary fluctuations in the value of the net pension liability from unduly distorting a company's earnings while still recognising a measure of the net liability on the company's balance sheet. However, the information provided often gives only a broad indication of the prospective burden of future contributions.

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1: Of the 100 companies covered in the Milliman USA survey, 20 are in the financial sector. At end-2002, they accounted for 8% and 9% respectively of the total pension liabilities and assets of the sample. For those financial institutions with pension fund deficits, the funding ratio was 87% as against 76% for non-financial companies with deficits. The larger deficits amongst financial institutions tended to be in insurance companies rather than in banks.

Table A illustrates some of the perhaps surprising implications of current accounting standards[2]. It highlights, in particular, a small *positive* contribution from pension schemes to aggregate profits for a sample of large company earnings in 2001-2002[3], despite significant net losses on pension fund assets and a rise in liabilities (largely as a result of lower discount rates). Nevertheless, US accounting rules require that much of the deficit of an under-funded pension scheme be recognised as a liability on the company's balance sheet. In 2002, the part of the change in this minimum liability that was charged against equity was US$81 billion. The mounting cash flow cost of the recent deterioration in funding positions is shown by a significant increase in contributions last year (US$34 billion as against only US$9 billion in 2001).

### Table A:
### Pension fund deficits and company accounts

| US$ billions | | 2002 | 01 |
|---|---|---|---|
| **Accounts of pension funds** | | | |
| **Position (underfunding is shown as negative amount)(a)** | | | |
| | Level | -157 | 15 |
| | Change | -172 | -168 |
| *of which:* | *actual earnings on pension fund assets* | -72 | -68 |
| **Accounts of companies** | | | |
| **Profit and loss (P&L) recognition (gross of tax)** | | | |
| | Net periodic pension cost (cost equals negative amount) | 3 | 12 |
| *of which:* | *expected earnings on pension fund assets* | 81 | 82 |
| Memo. | Actual less expected earnings on pension fund assets | -153 | -150 |
| **Balance sheet** | | | |
| Charge to equity(b) | | -81 | -17 |
| **Cash flow(c)** | | | |
| Employer contributions | | 34 | 9 |

Source: Derived from Milliman USA: '2003 Defined Benefit Pension Plan Study', Apr. 2003. Sample of 100 companies.

(a) As measured by the market value of assets less the pension benefit obligation (PBO).

(b) Representing most of the counterpart to the change in the required minimum liability (the accumulated benefit obligation (ABO), net of tax relief) that must be recognised by firms with pension schemes in deficit. The ABO differs from the PBO in excluding the allowance for future increases in pay rates included in the PBO.

(c) Employer contributions are not a component of annual pension cost. Their payment reduces the pension liability.

Regulation requires pension funds to make good pension fund shortfalls, and companies with large persistent deficits are also required to pay additional insurance premiums to the PBGC. However, the rules that determine minimum pension contributions and

PBGC premiums are themselves complex and based on, for example, different discount rate assumptions in calculating pension liabilities. In cases of acute difficulty companies may also be able temporarily to defer contribution payments. While rating agencies and others with good access to the necessary information may be able roughly to estimate the burden on future cash flows, a lack of transparency may still contribute to investor uncertainty, so raising the cost of capital of the firms concerned.

Concerns have been expressed that current regulations place insufficient pressure on firms to close deficits promptly and not to concede costly improvements in plan benefits[4]. Rules restricting the tax-deductibility of contributions when pension funds are in surplus may have discouraged companies from continuing to make contributions over a period in the 1990s when asset prices and investment earnings were – as it proved with hindsight – unusually strong.

Recently, several companies, especially in the steel sector, have failed with very large pension liabilities outstanding. These liabilities have in large measure been assumed by the PBGC, and in consequence the PBGC's single-employer programme has itself gone sharply into deficit. The PBGC is required by law to be self-funded. Eliminating the deficit through higher premiums levied on all companies could mean that sound companies will effectively have to subsidise those with chronically under-funded schemes. This could be a further inducement to strong companies to terminate their pension plans. This might both undermine the PBGC premium base and further accelerate the long-term decline of DB schemes, whose share of US private pension fund assets has fallen from just under two thirds at end-1985 to 43% at end 2002.

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2: Both the US standard SFAS 87 and the UK standard FRS17 include a measure of long-term expected (rather than actual) returns on pension plan assets as an offset to the other components of periodic pension cost included in company annual earnings.

3: Within the sample, companies with pension *deficits* had net periodic pension costs of $2 billion in both 2001 and 2002.

4: Such concerns were summarised in recent testimony to the US Congress by the PBGC. http://www.pbgc.gov/news/speeches/testimony_043003.pdf.

**Chart 37:**
**Households: net borrowing and residential investment**
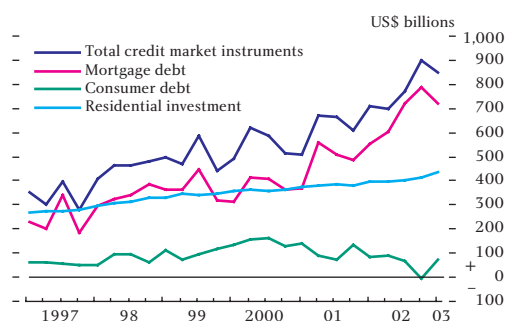


Source: Board of Governors of the Federal Reserve System: 'Flow of Funds Accounts of the United States', 2003 Q1.

**Chart 38:**
**US nominal residential property price inflation**
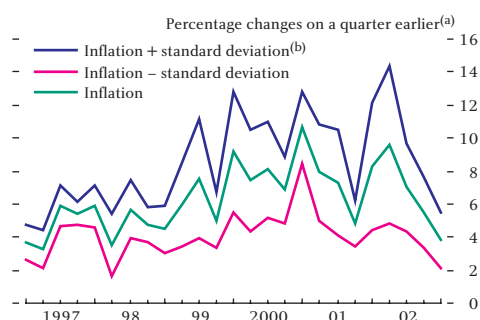


Source: Office of Federal Housing Enterprise Oversight.

(a) Annualised data.

(b) Standard deviation of inflation rates across the nine census divisions.

**Chart 39:**
**Bankruptcy filings and credit card charge-off rates[a]**
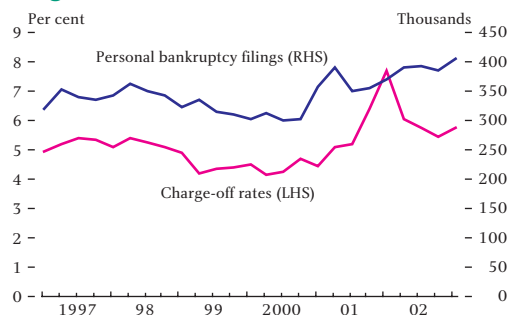


Source: Federal Deposit Insurance Corporation.

(a) Charge-off rates in 2002 Q1 includes one-time charges related to restructurings and loan sales.

Further rises in unemployment probably represent the biggest risk to providers of credit card and other unsecured lending. Non-farm employment peaked in early 2001 and unemployment has risen somewhat this year. Personal bankruptcies levelled off during last year but rose again in Q1, accompanied by an increase in charge-off rates on credit card lending (Chart 39).

## The financial system

*The non-bank financial sector*

Banks have exposures – such as CP back-up lines and other liquidity facilities – to other financial institutions, some of which have seen more deterioration in credit quality, and have had more direct or indirect exposure to the fall in equity markets and to other market risks. While a number of finance companies have been absorbed by larger groups in recent years, others have successfully issued bonds in place of CP. But evidence of potential pressure still occasionally surfaces. In mid-December the financial conglomerate Conseco went into Chapter 11 after longstanding difficulties at its main sub-prime finance company. These had hampered efforts to restructure its highly geared balance sheet, leading to ratings downgrades which in turn threatened the viability of its insurance operations – the last were not, however, included in the bankruptcy.

Other US life insurers have also been downgraded and their capital partly eroded by credit losses. Insurers have also suffered losses on products with embedded options that have gone heavily into-the-money (see Section 1.1). Risk-based regulatory capital requirements have also been raised by shifts in customer preferences towards insurance products that attract higher capital charges. In general, however, insurers are not under liquidity strains and while some banks had exposures to Conseco that have been restructured, strains in the sector have yet to affect the banks significantly.

*Resilience of the banking system*

Despite improvements in risk management in recent years, some concentrations of exposure to large corporate borrowers have emerged over the past 18 months or so, mainly in a few large banks. Contacts suggest that banks have further refined risk management practices in light of these experiences. But the impact of stresses among large companies on the banking system overall has been on earnings rather than capital.

A combination of reduced loan demand and tighter lending standards has led to a reduction of commercial and industrial (C&I) loans on banks' balance sheets (Chart 40). Also, banks built up large reserves against non-performing assets during the 1990s. While these reserves have been drawn down, coverage of non-performing assets remains above 100% and has been stable recently (Chart 41). Capital ratios have also remained high. The April 2003 *Senior Loan Officer Opinion Survey* reported that in the

view of the banks themselves, a tightening of lending standards over recent years has been a factor in reducing the incidence of new problem C&I loans.

The robustness of the SME sector, relative to large companies, has tended to insulate small commercial banks[19] from corporate losses. At end-2003 Q1 they reported a lower proportion of non-performing assets, lower charge-off rates and higher reserve coverage for non-performing assets (Chart 41). Their lending to companies has held up more than that of larger banks, which will have had higher exposures to larger, problem credits but may have chosen to expand balance sheets less rapidly (Chart 42).
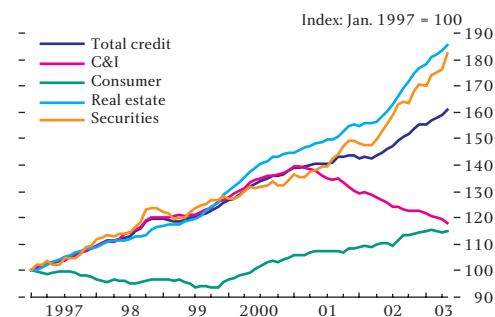
Although the proportion of delinquent C&I loans remains high, it has fallen since 2002 Q3 (Chart 36). One factor limiting the rise in delinquency rates has been an increasing tendency of banks to sell poorly performing loans (and so crystallise losses), assisted by a continuing deepening of the secondary loan market. In aggregate, C&I charge-offs have also fallen (from a high level) since 2002 Q3.

Strong bank profits from credit card lending reflect high interest margins and income from fees and securitisations. Recent movements in charge-off rates on credit card loans have been somewhat erratic, with falls in 2002 H2, but, as reported above, an increase in 2003 Q1 (Chart 39). Overall, levels of delinquent debt remain somewhat higher than in the early 1990s (Chart 36). That may reflect a rise in loans to groups whose access to credit is relatively recent – a so-called 'democratisation of credit'.

In contrast, delinquency rates on real estate loans have been much lower than in the early 1990s recession. As well as a relatively mild economic slowdown, better risk management practices amongst lenders may well have contributed to a generally more stable market than a decade or so ago (Chart 36), although there are pockets of weakness, linked, in particular, to difficulties and over-capacity in the technology, media, and telecommunications (TMT) sector. Losses on commercial real estate have risen over recent years, but from a very low base, while those on residential mortgages, 2001 Q3 apart, have edged up slightly[20] (Chart 43).

Despite higher credit losses for C&I and credit card lending, US banks continued to report robust results in 2002, with net income up 22% on a year earlier. Net interest income was boosted by increases in interest earning assets although net interest margins, while higher overall in 2002 than a year earlier,

19: Less than US$10 billion in assets.

20: A sharp rise in 2001 Q3 reflected sales of a large portfolio of sub-prime mortgages by Bank of America.

**Chart 40:**
**US bank credit[(a)]**



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

**Chart 41:**
**Commercial banks' non-current loans coverage ratio[(a)]**
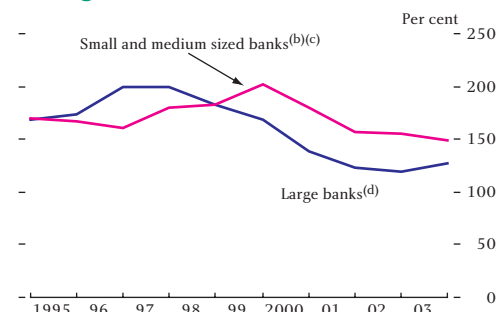


Source: Federal Deposit Insurance Corporation.
(a) Data are annual except for 2003 data which are as of 2003 Q1.
(b) Banks with assets less then US$10 billion.
(c) Weighted by total assets.
(d) Banks with assets greater than US$10 billion.

**Chart 42:**
**C&I lending by bank category**
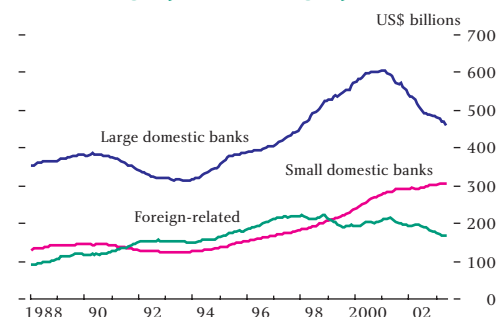


Source: Board of Governors of the Federal Reserve System.
(a) Large domestic banks are banks that report balance sheet data weekly to the Federal Reserve. Domestic banks include US-incorporated subsidiaries of foreign banks. Foreign-related banks include the branches and agencies of foreign banks, along with Edge Act and Agreement corporations.

**Chart 43:**
**Charge-off rates on real estate loans**
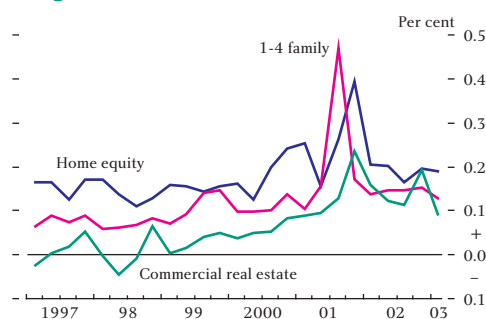


Source: Federal Deposit Insurance Corporation.

**Chart 44:**
**Large US banks' securities holdings[a]**
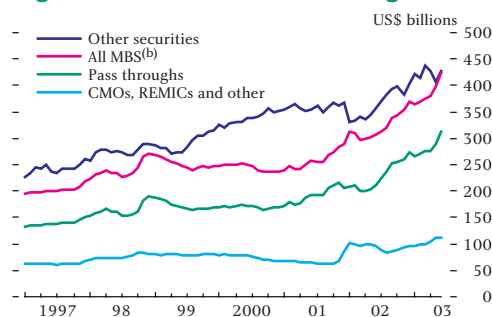


Source: Board of Governors of the Federal Reserve System.

(a) Data are not seasonally adjusted.

(b) Mortgage-backed securities comprise pass-through securities plus structured securities such as collateralised mortgage obligations (CMOs) and real estate mortgage investment conduits (REMICs).

**Chart 45:**
**Largest fifty US BHCs: ratio of market capitalisation/book value of equity**
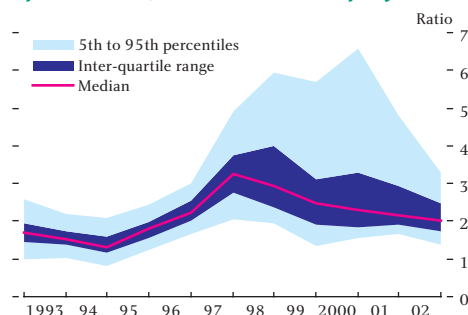


Source: Board of Governors of the Federal Reserve System.

fell during the year, as nominal interest rates declined further towards the effective floor of zero, eroding the 'endowment effect'. Net income continued to grow in 2003 Q1, up 15% on a year earlier despite a further fall in net interest margins.

Earnings were augmented by gains on sales of securities. In the face of weak corporate loan demand, banks have been building up their holdings of securities strongly since early 2001 (Chart 44). Net purchases of mortgage-backed securities have accompanied a strong rise in mortgage lending. As a result, banks have potentially become more exposed to pre-payment risk although contacts suggest that such risks are recognised and generally well-managed by sophisticated firms.

Non-interest income was 9.5% higher in 2002 than a year earlier[21]. Large banks – which typically derive a higher proportion of their total revenue from non-interest income than do small banks – earned more from service charges on domestic deposit accounts and securitisations. These revenues, coupled with lower venture capital losses, offset declines in both servicing fees and trading income. In 2003 Q1, non-interest income continued to grow, up 7.4% on a year earlier.

Overall, the banking sector appears to remain well positioned to absorb losses. Major banks' market capitalisation is over double book value despite the fall in equity markets (Chart 45)[22]. Looking forward, activities such as commercial real estate, credit card and sub-prime lending remain potentially vulnerable to a sluggish economic recovery, while net interest margins could be depressed further in an environment of very low interest rates.

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21: The components of banks' non-interest income were described in a box on page 35 of the June 2002 *Financial Stability Review*.

22: The peer group used in Chart 45 was described on page 28 of the December 2002 *Financial Stability Review*.

# 1.3 Europe

The extent of the economic slowdown and downward revisions to Consensus forecasts varies significantly amongst European countries[23] (Chart 46), as do growth rates of bank lending (Chart 47) and house prices[24]. Such differences have affected the relative performance of financial sectors: several banks in Germany reported losses for 2002 and 2003 Q1, while most Spanish and Nordic banks maintained strong profitability, based primarily on domestic retail banking.

## Corporate sector adjustment

Credit exposures for banks in major European countries, unlike for UK-owned banks in aggregate, tend to be dominated by lending to the domestic corporate sector (Chart 48). But in 2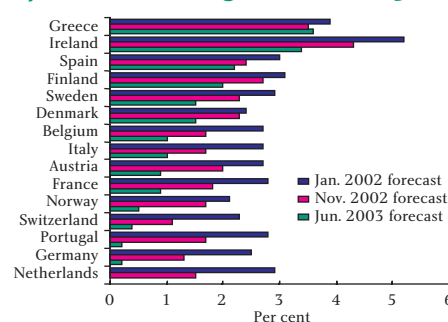002, according to euro-area flow-of-funds data, lending to companies increased less than household loans. Consistent with this, national data available since the December *Review* show that the stock[25] of bank loans to companies contracted in Germany and was stable in France, but expanded further in Italy, while loans to households expanded in all three countries (Chart 49). The European Central Bank's (ECB) new euro-area bank lending survey for April 2003 suggested that the overall weakness in corporate lending has reflected a combination of reduced demand and a tightening of lending standards by some euro-area banks.

For many European countries, the number of corporate bankruptcies rose sharply in 2002, and had already in late 2002 been projected to increase further in 2003. But the pattern of bankruptcies may be shifting towards fewer large company and more SME failures. In Germany, for instance, several large high-profile companies failed in 2002, whereas so far in 2003 bankruptcies appear to be mainly concentrated amongst SMEs. And although credit rating downgrades continue to outnumber upgrades (Chart 50), financial market concerns about credit risk appear to be abating, at least as judged by the recovery in equity markets since March and the continuing narrowing of credit spreads on corporate bonds (even for highly leveraged sectors) since the December *Review* (Chart 51).

For large companies, this may reflect some success in balance sheet repair, as in the United States. In 2003 Q1, euro-area fixed investment fell, while corporate bond issuance reached

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23: Europe is defined here as the European Economic Area plus Switzerland, but excluding the UK. The close links with the UK banking sector were documented in the June 2002 *Financial Stability Review* (Box 5, page 41). At end-2002, Europe accounted for 46% of UK-owned banks' international net risk exposures (excluding portfolio investments and using net local currency claims); and at end-April 2003, European-owned banks accounted for 40% of UK-resident banking sector assets.

24: European Central Bank (ECB): *Monthly Bulletin*, 'Recent Trends in Residential Property Prices in the Euro Area', May 2003, page 49.

25: Not adjusted for securitisations and write-offs, so not a true measure of lending.

## Chart 46:
## Expected real GDP growth for 2003



Source: Consensus Economics Inc.

## Chart 47:
## Euro-area banking sector loans[a]
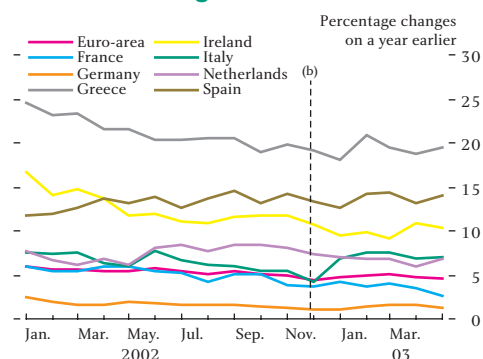


Source: European Central Bank.

(a) Loans to euro-area non-financial private sector by all locally resident banks.

(b) Dec. 2002 *Review*.

## Chart 48:
## Distribution of banking sector assets[a]
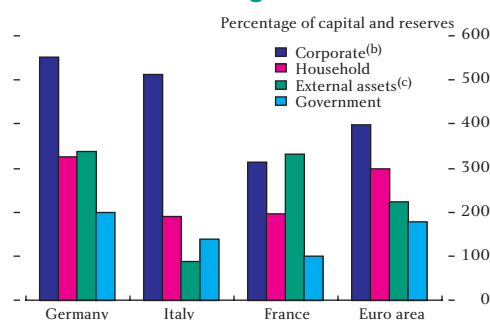


Sources: National central banks, European Central Bank and Bank calculations.

(a) Assets of Monetary and Financial Institutions as at end-2002.

(b) Includes all claims (loans, debt and equity).

(c) For Italy and Germany, this includes international claims on banks.

**Chart 49:**
**Domestic bank loans**[a]

Percentage changes on a year earlier

France
Germany
Italy

Jan. Mar. May Jul. Sep. Nov. Jan. Mar.
2002 03

Sources: National central banks and Bank calculations.

(a) Solid lines: loans to non-financial companies; broken lines: loans to households.

**Chart 50:**
**European non-financial sector ratings changes and value of debt affected**[a]
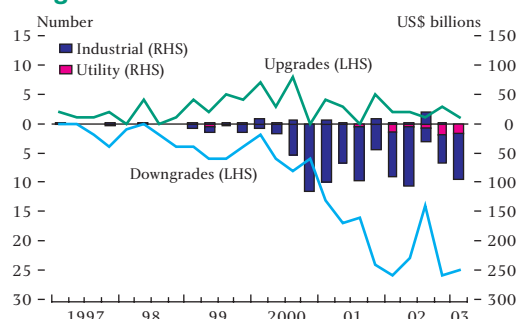
Number                                    US$ billions

Industrial (RHS)
Utility (RHS)
Upgrades (LHS)

Downgrades (LHS)

1997 98 99 2000 01 02 03

Source: Moody's Investors Service.

(a) Entities that have had their debt downgraded more than once in a quarter are counted only once for that quarter.

**Chart 51:**
**Euro-denominated**[a] **investment-grade credit spreads**[b]

Basis points

Energy (c)
Telecoms
Media
All companies

Jan. Mar. May Jul. Sep. Nov. Jan. Mar. May
2002 03

Source: Merrill Lynch.

(a) Euro-denominated issuance is mainly by European companies.

(b) Weighted average option-adjusted spread of corporate bonds over government bonds.

(c) Dec. 2002 *Review*.

near-record levels. A few telecommunications operators and energy companies issued 30-year bonds, on which credit spreads narrowed in the months after issue. Several telecommunications operators have also restructured their operations to improve cash flow, although pressures to increase revenues are still continuing for some equipment suppliers. Although most energy sector credit ratings remain investment grade, they have declined further, and syndicated loans to this sector (which may have been sold on or hedged) exceed half of the shareholder equity of some banks.

Data are not yet available to update the aggregate income and capital gearing measures discussed in the December 2002 *Review*. Since much of the gross bond issuance has replaced maturing debt, net issuance has increased only to an 18-month rather than a historical high (Chart 52). Given the slowdown in bank lending to companies, measures of indebtedness and leverage appear unlikely to have increased materially. And lower nominal interest rates will have tended to reduce income gearing.
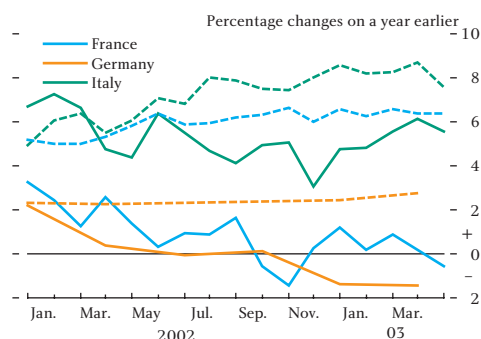
Accounting irregularities concealing potential financial problems (as in Enron or Worldcom) are also a potential source of idiosyncratic corporate credit risk. So far, only a few such cases have come to light in Europe – most recently at Dutch retailer Royal Ahold. But the treatment of corporate pension funds is under increasing scrutiny, given the prolonged weakness in equity markets and current low nominal interest rates. After reviewing the unfunded pension liabilities of more than 500 European companies, Standard and Poor's (S&P) placed eight European companies on 'CreditWatch with negative implications' in February, but has since downgraded just two companies. Both S&P and Fitch Ratings have clarified their treatment of corporate pension funds, which they do not expect to result in any further downgrades of European companies. In the Netherlands, the authorities have required prompt corrective action by pension funds to close any funding shortfalls, and many have now increased contribution rates.

## The household sector

The ECB's April euro-area bank lending survey suggested that demand for loans for house purchase had increased somewhat, but that banks expected it to level off. Two thirds of banks' loans to households are f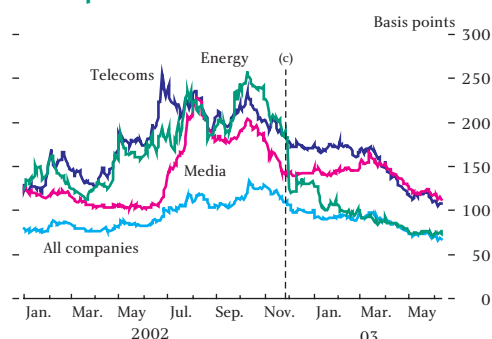or house purchase, and are regarded as low risk, given the low historical loss experience and the comfort of real estate collateral. Banks also view higher margin unsecured consumer credit and other household loans as *relatively* low risk, given the social safety net buffers and the ability to diversify borrower-specific credit risk in a portfolio of numerous small retail loans. An increasing number of banks have collated and analysed historical loan-loss data, which has supported this view and facilitated securitisation of mortgages in some countries.

Several factors have affected the risks attached to household lending recently. In some countries, lending to households has expanded rapidly from a low base, thus widening the range of borrowers well beyond that on which historical loss experience has been computed – this could be an important source of uncertainty about credit risk. Unemployment has risen in most countries, and could rise further.

Potential strains in household sector finances vary from country to country. At end-2001 (latest available data), the Netherlands had the highest household indebtedness and mortgage debt relative to GDP, followed by Portugal and Germany. House price increases in recent years have been strongest in Spain, the Netherlands, Greece and Ireland, and have been accompanied by sharp increases in bank lending. Adverse effects from financial markets have been most obvious in the Netherlands, where share ownership has been relatively wide, and where contribution rates to many private pension funds have been raised significantly.

## The financial system

Market concerns about internationally active European banks, taken as a whole, have continued to ease since the previous *Review* (Section 1.1). Bank share prices have generally moved in line with the broader stock market, while CDS prices have continued to narrow (Chart 53). However, the CDS prices of some European financial institutions, notably several major German firms, remain to some extent decoupled from the rest. The German banking and insurance sectors have also been amongst those most affected by poor results for 2002 and by ratings downgrades or negative outlooks (Chart 54).

*The insurance sector*

The decline in nominal interest rates has exacerbated pressures on those life insurers whose liabilities include long-term contracts with guaranteed rates of return (GRRs). To mitigate such pressures, in May the German authorities cut the minimum GRR by 50 basis points to 2.75% (although many insurers still pay out higher returns), and in January the Swiss authorities cut the minimum GRR for group pension plans from 4% to 3.25%, and are expected to cut it further to 2%. Insofar as such reductions reduce any negative yield gap between the risk-free rate and the GRRs, this should reduce the incentive for insurers to take additional risk in a search for yield (Section 1.1). Nonetheless, many European insurers have reportedly been significant net sellers of protection[26], and anecdotally, for example, the sector retains an appetite for bonds with embedded written options to enhance coupon income.

*The banking sector*

Despite adverse economic and financial conditions, large European banks generally reported profits both in 2002

26: Fitch Ratings, Global Credit Derivatives Survey, March 2003.

**Chart 52:**
**Euro-area companies' net bond[(a)] issuance**
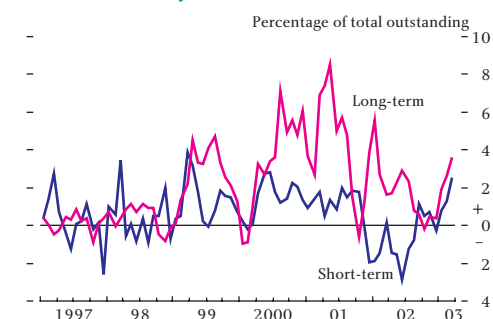


Source: European Central Bank.
(a) Three-month net issuance of securities other than shares.

**Chart 53:**
**European banking sector credit default swaps[(a)(b)]**
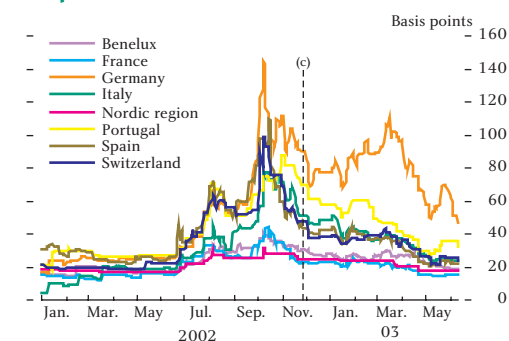


Sources: CreditTrade, JP Morgan Securities Ltd and Bureau van Dijk Bankscope.
(a) Annual premia for credit protection. See Chart 23, footnote (a) for further details.
(b) Average for each country of available bank and bancassurer credit default swap premia, weighted by 2002 total assets.
(c) Dec. 2002 *Review*.

**Chart 54:**
**European financial sector ratings changes and value of debt affected[(a)]**



Source: Moody's Investors Service.
(a) Entities that have had their debt downgraded more than once in a quarter are counted only once for that quarter.

## Chart 55:
## European banks' pre-tax return on equity[(a)(b)]
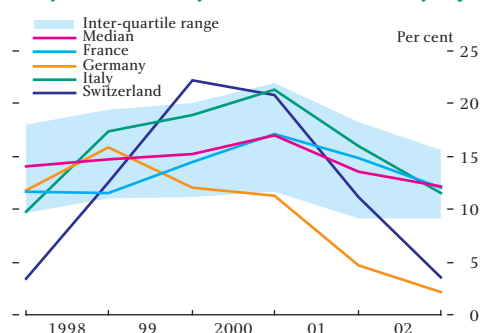


Source: Bureau van Dijk Bankscope.

(a) Top 100 European banks by assets in given year. 2002 sample consists of 67 reporting banks from 2001 sample.

(b) Individual country series calculated as aggregate ratios.

## Chart 56:
## European banks' Tier 1 ratios[(a)(b)]
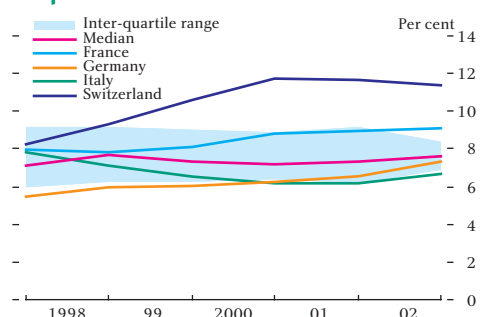


Source: Bureau van Dijk Bankscope.

(a) Top 100 European banks by assets in given year. 2002 sample consists of 67 reporting banks from 2001 sample.

(b) Individual country series are weighted averages by total assets.

## Chart 57:
## European banks' share of new worldwide syndicated lending[(a)]
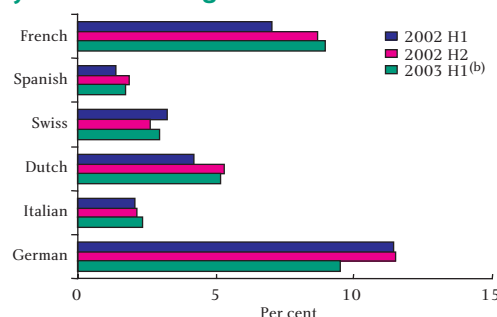


Source: Dealogic.

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

(b) 2003 H1 data up to and including 6 Jun. 2003.

(Chart 55) and in 2003 Q1, with a few notable exceptions discussed below. This resilience was mostly attributed to retail banking, with interest income increasing as a proportion of banks' total income. European banks, even those whose profitability was subdued, generally maintained their reported Tier 1 capital ratios (Chart 56).

The main exception to this benign overall picture is in Germany[27], where banking sector profitability and Tier 1 capital ratios have been below the European average for some time. This has been attributed to various structural factors, such as the large number of banking institutions, including public sector landesbanks and savings banks, and to the recent economic slowdown and consequent rise in credit costs. Several of Germany's large private-sector banks made significant losses in 2002 and in 2003 Q1. But they also took steps to maintain their capital ratios by reducing risk-weighted assets, and some banks have made progress on restructuring, including cost-cutting and asset disposals. Taken as a whole, German banks have also been reducing participation in the international syndicated loans market (Chart 57). Moves towards more risk-based loan pricing have been given added impetus by the proposed new Basel II capital adequacy accord, and the true-sale securitisation initiative announced in late April may facilitate more active balance sheet management. One structural change will be the removal, beginning in 2005, of state guarantees for landesbanks, which may increase their funding costs. Some landesbanks have sought to defend their profitability and credit ratings[28] by consolidating or reorganising their activities. Landesbanks have also reportedly[29] been net sellers of credit protection (though possibly to diversify credit risk portfolios away from their home regions).

Germany apart, the European banking sector with the lowest profitability ratios was Switzerland[30]. However, the disclosed Tier 1 capital ratios for Swiss banks are high, providing a significant buffer against potential losses. In contrast, Italian banks on average have lower disclosed Tier 1 ratios but higher reported profitability ratios, with net interest margins and cost-income ratios better than the European average. Bank profitability elsewhere in Europe has remained resilient, especially in Spain and the Nordic region.

27: The 25 German-owned banks present in London accounted for 13% of UK-resident banking sector assets at end-April 2003.

28: All current landesbank liabilities will continue to benefit from explicit state guarantees and remain highly rated (see June 2002 *Financial Stability Review*, page 44). Credit rating agencies have now clarified their methods for rating future unguaranteed liabilities, focusing on the financial strength of each bank, and on nature of public ownership and likelihood of support, including timely payment.

29: Fitch Ratings, Global Credit Derivatives Survey, March 2003.

30: Comparing national banking sector weighted average return on assets, return on equity, net interest margins and (inverted) cost-income ratios, for the 2002 sample of banks included in Charts 55 and 56.

# 1.4 Japan

## Recent economic and financial developments

The Japanese economy has experienced sustained falls in both consumer prices and – even more so – land prices since the mid-1990s (Chart 58). The decline in land prices, which has an adverse impact on the economy via wealth effects and erodes the value of banks' loan collateral, shows few signs of slowing.

The decline in consumer prices is expected to continue in 2003 and 2004, albeit at a slightly slower pace, further increasing the real value of debt. There is some evidence that long-term inflation expectations may have declined significantly. This could help to account for the sharp fall in nominal yields on ten-year JGBs since the previous *Review* to just 0.46% (Chart 59). Furthermore, the prospect of continued zero short-term interest rates may have led Japanese investors to take greater duration, credit or exchange rate risk to secure an adequate nominal return (see Section 1.1 on the 'search for yield'). Market perceptions of sovereign credit risk, as measured by the price of credit protection, have fallen slightly over the same period, despite government debt still increasing rapidly.

Japanese equity prices fell sharply in mid-February and early March though they subsequently recovered to around their level at the time of the previous *Review*. Unwinding of cross-shareholdings, together with a reduction of equity exposure by life insurers, may have contributed to market weakness.

## Domestic financial balances

*The non-financial corporate sector*

The fall in equity prices occurred despite a sharp increase in reported corporate profits. Non-financial listed companies increased their recurring profits by two thirds in fiscal 2002 and announced expectations of a further 16% increase in fiscal 2003. However, valuation losses on cross-shareholdings and continuing restructuring charges remain a drag on net profits.

In 2002, the private non-financial corporate (PNFC) sector recorded another large financial surplus (Chart 60) and continued to reduce debt. In aggregate, PNFCs repaid 6% of their outstanding loans in 2002 (Chart 61). The Bank of Japan's (BoJ) *Senior Loan Officer Surveys* suggest that the decline in borrowing from banks this year was largely due to further weakening in firms' demand for credit. However, corporate surveys, such as the Tankan, suggest that the lending attitude of financial institutions remains 'severe', particularly for SMEs.

In June, the BoJ announced the outline of its scheme for outright purchases of asset-backed securities (ABS). It plans to buy ABS backed by loans to SMEs, credit linked notes and asset-backed

### Chart 58:
### Land prices and GDP deflator
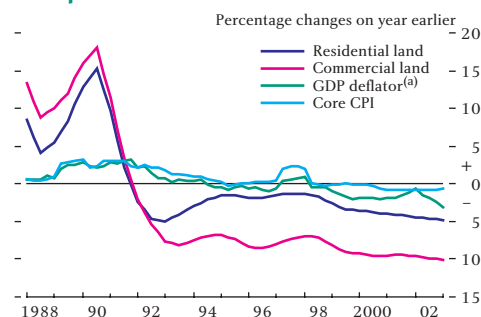


Sources: Thomson Financial Datastream and Economic and Social Research Institute of the Japanese Cabinet Office.

(a) Implied deflator.

### Chart 59:
### Japanese ten-year JGB yield and credit default swap premium[a]
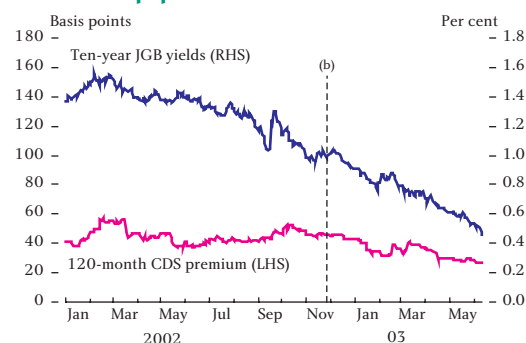


Sources: Bloomberg and CreditTrade.

(a) Annual premium for credit protection on issuer using standard ISDA documentation, measured as mid-point between last bid and ask quotes.

(b) Dec. 2002 *Review*.

### Chart 60:
### Japanese financial balances[a]
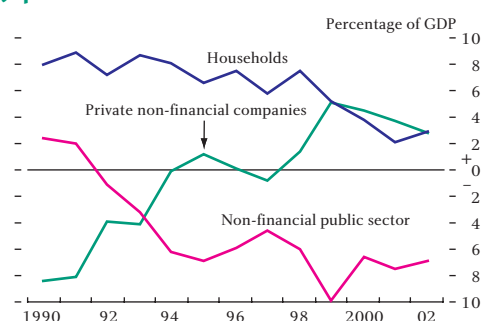


Sources: Bank of Japan and Economic and Social Research Institute of the Japanese Cabinet Office.

(a) Financial years, except for the latest observation which is calendar 2002.

## Chart 61:

**PNFCs' financial liabilities**
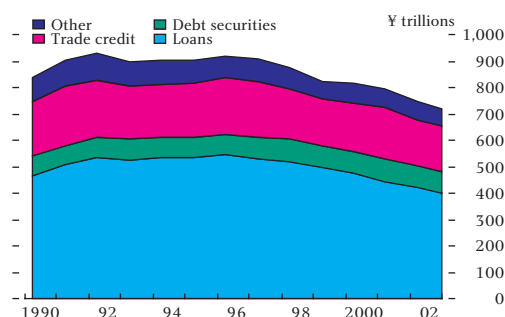


Source: Bank of Japan.

(a) End-March, except for the latest observation which is end-December.

## Chart 62:

**PNFCs' gross financial assets and liabilities**
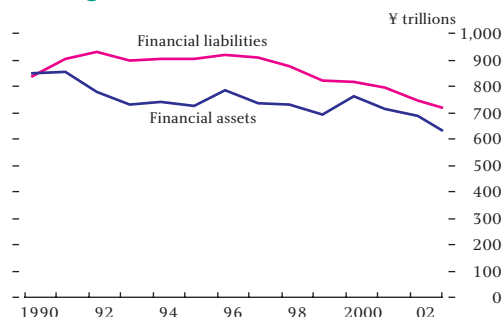


Source: Bank of Japan.

(a) End-March, except for the latest observation which is end-December.

## Chart 63:

**Lending to household sector**(a)
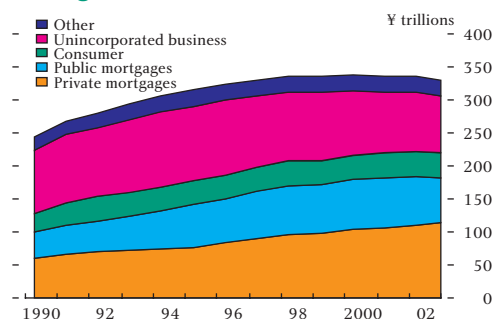


Source: Bank of Japan.

(a) End-March, except for the latest observation which is end-December.

commercial paper backed by SME trade debtors[31]. The BoJ set an initial ¥1 trillion limit on its holdings of these securities. The proposal is designed to increase SMEs' access to funding and improve the liquidity of the ABS market, while strengthening the monetary transmission mechanism.

The market value of PNFCs' net financial assets has fallen over the past three years despite the sector running a large financial surplus, reflecting valuation losses on equity holdings (Chart 62). The decline in land prices probably implies that the total net worth of the PNFC sector declined further last year.

The number of corporate failures per month has fallen back since the previous *Review*, helped by the recovery in corporate profits and low income gearing. The gross liabilities of failed firms also declined, as there have been fewer large-scale bankruptcies.

*The household sector*

Borrowing by households, particularly unincorporated businesses, fell last year (Chart 63). However, the household debt-to-income ratio may have increased since disposable income appears to have fallen further. The number of personal bankruptcies increased by over a third last year to 215,000, probably a lagged response to the rise in unemployment, even though household income gearing remained relatively low. The direct impact on the banks of the rise in personal bankruptcies is likely to be relatively limited because lending to households accounts for less than one seventh of their domestic assets.

## The financial system

*Major banks' profitability and capital ratios*

The major banks reported a combined loss of ¥4.6 trillion for the fiscal year to end-March, having forecast a loss of just ¥0.3 trillion last November, largely due to higher-than-expected valuation losses on their equity holdings and higher-than-expected loan loss charges. Before the year end, each of the five largest banking groups took steps to offset the impact on their capital ratios of the anticipated increased losses by reducing risk-weighted assets and raising ¥2.1 trillion additional capital via issues of ordinary and preferred shares.

For the four largest banking groups, these capital issues were sufficient to ensure that they met their required capital ratios (Chart 64). However, as a result of an unexpectedly large loss, the total capital ratio of Resona Holdings, the fifth largest banking group, fell to 3.8%, below the 4% minimum for domestic banks and that of Resona Bank, the group's main operating subsidiary, to just 2.1%.

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31: At least half of the underlying assets must relate to SMEs.

*Financial crisis management*

In the light of Resona Bank's capital shortfall, the Prime Minister called a meeting of the Financial System Management Council on 17 May and judged that it was necessary to use public funds to maintain "orderly functioning of financial markets in Japan and in local areas". He decided to inject sufficient capital to raise Resona Bank's total capital ratio to over 10%[32]. On the same day the BoJ's policy board decided to provide liquidity, when necessary, to the bank.

Equity, bond and foreign exchange markets reacted relatively calmly to the announcement. Share prices of the major internationally active banks fell on the first day's trading following the announcement but recovered by the end of the week (Chart 65). There have been no signs of significant movements of deposits or problems in the interbank markets. As a result, Resona Bank has not needed to draw upon the BoJ's emergency facility.

This was the first occasion on which the present crisis management arrangements[33] had been used. Although they worked well, the Financial Services Agency (JFSA) is still considering introducing an additional mechanism for making pre-emptive capital injections into weakly capitalised banks.

*Deferred tax assets*

The increased loss at Resona mostly reflected the write-down of allowable deferred tax assets (DTAs) by its auditors. As discussed in the June 2002 *Review* (page 49), deferred tax, which mainly reflects timing differences on tax deductibility of loan-loss provisions[34], accounts for a high proportion of the major banks' assets. Auditors usually allow banks to include DTAs up to the value of tax due on earnings expected over the next five years. In Resona's case, the auditors took a more conservative view and only allowed DTAs on three years' profits. The treatment of DTAs by auditors is uncertain, which could add to the market nervousness that has often surrounded the March and September book-closings. At end-March, the seven major banking groups held DTAs totalling ¥8.2 trillion, equivalent to over half of their Tier 1 capital.

**Chart 64:**

**Tier 1 capital ratios of major internationally active Japanese banks**
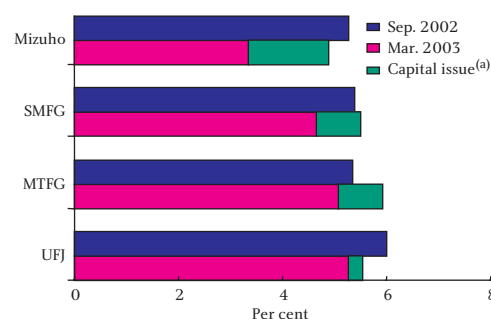


Sources: Annual reports and Bank calculations.
(a) Capital raised between Dec. 2002 and end-Mar. 2003.

**Chart 65:**

**Japanese banks' equity prices**
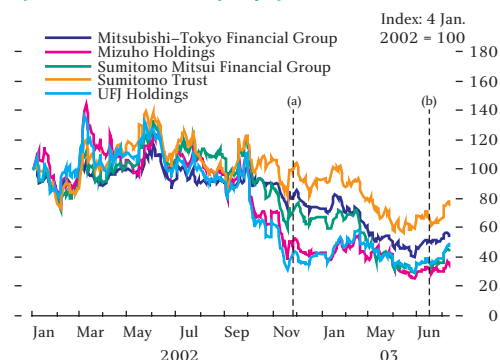


Source: Bloomberg.
(a) Dec. 2002 *Review*.
(b) Date of Resona Bank's application for public funds.

32: On 10 June, the Deposit Insurance Corporation (DIC) agreed to purchase ¥296 billion ordinary shares and ¥1,663 billion voting convertible preference shares in Resona Bank. These will be exchanged for shares in Resona Holdings on 7 August giving the DIC 50.2% of ordinary shares and just over 70% voting rights. Resona will receive ¥1.96 trillion out of the ¥15 trillion available for crisis management.

33: If the failure of a bank poses an extremely serious threat to the stability of the financial system and local and national economies, then the Prime Minister can order the DIC to buy shares in an undercapitalised bank, provide financial assistance to, or nationalise, an insolvent bank.

34: Loan-loss provisions count as a tax-deductible expense only when the loss is finalised rather than when the provision is made. When the loss is finalised it creates a loss-carry forward which must be used within the following five years. Hence deferred tax assets are created when specific loan-loss provisions are made.

## Chart 66:
## Securities holdings of Japanese banks

Percentage of banks' total assets

Central government bonds

Equity securities

Other domestic bonds

Foreign securities

(a)

Source: Thomson Financial Datastream.
(a) Data available at Dec. 2002 *Review*.

## Chart 67:
## Banks' purchases of foreign bonds[(a)(b)]

¥ trillions

Source: Ministry of Finance.
(a) Excluding purchases by trust banks.
(b) Settlement basis except the latest observation which is on a contract basis.

### Banks' non-performing loans

The level of future loan loss charges will depend on the state of the economy and the adequacy of existing provisions. Last October, the JFSA announced several steps to tighten the assessment of major banks' loans, including another round of special inspections of loans to large borrowers. ¥14.4 trillion of loans were inspected, around 5% of outstanding loans, of which 17% were downgraded, compared with 58% in the previous round. All the major banks used discounted cash flows to determine provisions against loans to borrowers classified as 'need special attention'.

### Banks' exposure to market risk

Over the past few years, the major Japanese banks have suffered substantial losses on their large equity holdings. As a result, the BoJ and the JFSA have taken steps to reduce banks' exposure to equity market risk. Banks have sold ¥1.4 trillion shares to the BoJ, under its share purchase scheme, and have also sold shares directly to the market. On 25 March, the BoJ increased the limit on its share purchases, from ¥2 trillion to ¥3 trillion.

Current JFSA rules require banks to reduce their equity holdings below Tier 1 capital by September 2004. As of March 2003, four of the five major internationally active banking groups had already met the requirement and the other, Mizuho, was only 7% over. Nevertheless, all the major banks' equity holdings remain high relative to their Tier 1 capital and several of them are planning further reductions.

Japanese banks' holdings of JGBs have risen further since the December 2002 *Review* and as of end-April accounted for 11.5% of their assets (Chart 66). They have also increased their holdings of foreign securities, mainly government bonds, significantly (Chart 67). Anecdotal evidence suggests that these purchases tend to be currency hedged or locally funded.

Japanese investors, especially regional financial institutions, faced with very low yen interest rates, have for several years been buyers of callable structured notes in a 'search for yield' as described in Section 1.1. One of the most popular types, known as power reverse dual currency notes, are typically issued by highly-rated international organisations or banks but the market risk is invariably transferred, via a swap, to one or more dealers, usually an investment bank (see Box 3). With an estimated US$40–US$50 billion of such notes outstanding, many dealers therefore have a complex, long-dated exposure to the US dollar/yen exchange rate and yen market interest rates. In the event of a sharp appreciation of the yen this could prove to be difficult and costly to hedge and is, therefore, one significant potential transmission mechanism from yen markets to the international financial system.
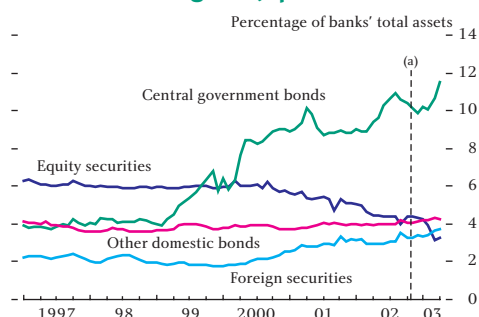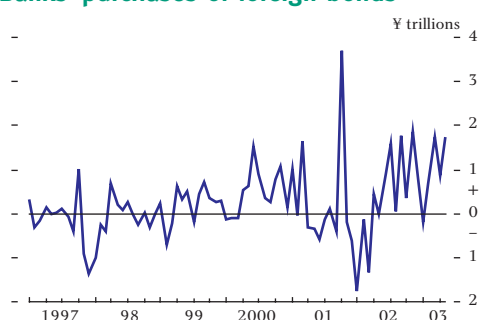
# Box 3: Structured notes and the US dollar/yen exchange rate

Power reverse dual currency notes have been one of the most popular types of callable structured notes. They have been principal-protected and pay a high initial coupon but expose investors to a potentially long period – often up to thirty years – of low coupons (minimum 0%) if the yen appreciates against the US dollar in line with the path implied by forward interest rate differentials. If the yen depreciates, coupons rise but dealers typically have a series of call options to prepay the notes, limiting the upside to investors. In practice, most notes have been called at the first opportunity with investors often buying new notes.

The annual coupon on a typical note might be defined as:

$$max (0, [S * 20\% / 120] - 15\%) * face value$$

where S is the US dollar/yen exchange rate just prior to payment. This can be seen as a series of call options sold to the investor on the US dollar/yen exchange rate with strikes of ¥90 (Chart A).

long maturity[1]. However, with few natural sellers of such options and demand dominated by dealers with similar positions, hedging is difficult and expensive. In practice, dealers often buy short-dated options and roll them, and hence are not fully hedged.

The interaction between the dealers' hedge and movements in the US dollar/yen exchange rate is complex[2], but it is likely that a sustained appreciation of the yen would require them to purchase more options. Anticipation of this potential demand may well be priced into the options market. Out-of-the-money yen call options tend to be significantly more expensive than out-of-the-money yen put options. This can be seen in the US dollar/yen volatility 'smile', which is strongly negatively sloped[3] (Chart B). Over the past few years this skew has tended to increase when the yen appreciates. It is possible that hedging could even affect the underlying US dollar/yen exchange rate, perhaps accelerating any significant yen appreciation.

## Chart A:
## Relationship between exchange rate and coupon rate



Source: Bank calculations.

## Chart B:
## Volatility 'smile' in one-year US$/¥ options
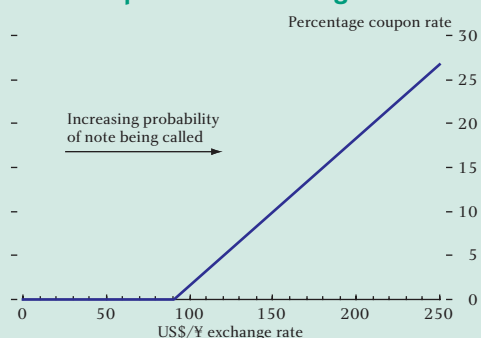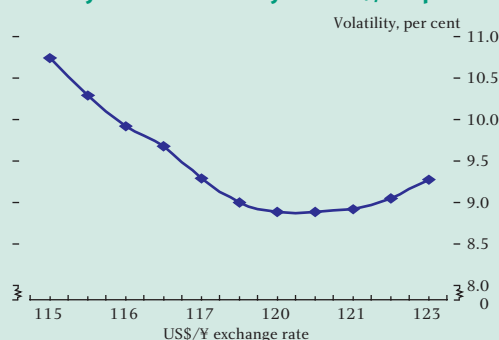


Sources: UBS and Bank calculations.

If the yen were to appreciate above the strikes, dealers would profit, but they would still be exposed to the risk that the yen might later depreciate. To hedge this, dealers would need to buy options with opposite payoffs. But because the notes are of long maturity, the options required for the hedge would also be of

1: The exposure will probably be at its highest before the notional maturity of the bond, but likely beyond ten years.

2: As the yen appreciates, the likelihood of paying a high coupon in the immediate future falls, but the expected maturity of the note increases which, in turn, increases the likelihood of paying a higher coupon at a later date.

3: Markets tend to quote option prices in terms of implied volatility.

## Chart 68:
## EME sovereign US$ bond spreads
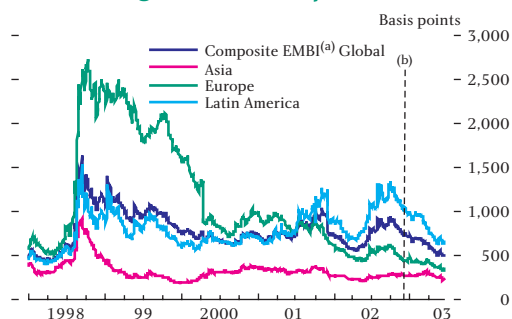
Source: JP Morgan Chase & Co.

(a) Emerging Market Bond Index.

(b) Dec. 2002 *Review*.

## Chart 69:
## Latin America (excluding Argentina) credit rating and spread (percentage deviation from mean)
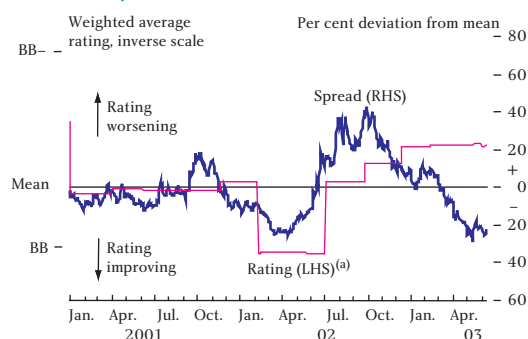
Sources: JP Morgan Chase & Co, Standard & Poors and Bank calculations.

(a) Individual country (long-term foreign currency) ratings are converted into numbers using a linear scale, before weighting together for Latin America using sample average EMBI Global weights.

## Chart 70:
## EME sovereign US$ bond spreads: distribution over time[a]

Sources: JP Morgan Chase & Co and Bank calculations.

(a) Unweighted cross-country distribution across components of the EMBI Global index.

# 1.5 Emerging market economies

Since the December 2002 *Review*, against the backdrop of low world real interest rates, and despite subdued global macroeconomic conditions, financing conditions have eased for many highly indebted emerging market economies (EMEs). But sovereign debt remains high in these EMEs, and its structure leaves them vulnerable to financial, economic or political shocks. There are also potential vulnerabilities in private sector balance sheets in some EMEs – for example, the dependence of some firms in Latin America on foreign-currency borrowing, and the rise in household indebtedness in parts of East Asia. The Institute of International Finance has revised slightly upwards its forecast for net private inflows to EMEs in 2003 to US$139 billion, though that remains well below the average of US$192 billion in the previous ten years.

## Sovereign balance sheets

The average spread of EME sovereign bond yields over US Treasuries has continued to fall, after peaking in September 2002. At around 500 basis points, it is at its lowest since June 1998, before the Russian default (Chart 68). Sovereign bond issuance has also been robust, totalling US$28.2 billion in the first five months of 2003, compared with US$15.4 billion in the previous five months, and US$26.8 billion in the same period in 2002.

The buoyancy of sovereign bond issuance in some EMEs is mirrored in sub-investment-grade debt markets in developed economies (see Section 1.1). One possible explanation is the 'search for yield' discussed elsewhere in this *Review*. But market anecdote is that demand from highly leveraged investors is less than in the boom period in 1997 before the Asian crisis.

Chart 69 suggests that average EME spreads in Latin America (excluding Argentina) have fallen to unusually low levels since the December 2002 *Review*, relative to agency credit ratings. And as Chart 70 shows, the overall dispersion of spreads has fallen back in 2003, suggesting that investors may be discriminating less among sovereign credits.

Notwithstanding this general fall in dispersion, there have been some important country-specific developments. Asset prices have increased sharply in Brazil since the December 2002 *Review*, with spreads falling by over 900 basis points to under 750 basis points, the lowest since April 2002[35]. This easing of financing conditions led Brazil to access international capital markets for the first time in a year in April, with a US$1 billion issue maturing in 2007, followed more recently with a US$1.25 billion issue due in 2013[36]. The real has appreciated by around 25%

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35: Brazil has a weight of 17.5% in the JP Morgan Chase EMBI Global index.

36: These issues include Collective Action Clauses – see *Strengthening financial infrastructure*, this *Review*).

since the December 2002 *Review*, and equity prices in local currency terms have risen by around 17%.

Positive fiscal news, including the government's initiation of reform to the social security and tax system, has contributed to the recovery in Brazilian asset prices. As 40% of federal public debt is linked to short-term interest rates and a further 45% to the exchange rate, the fall in bond spreads and the appreciation of the real have taken the value of public sector debt back to 52.2% of GDP in April from 62.5% at the end of September 2002 (Chart 71). Whether the improved outlook for debt sustainability persists depends, however, on asset prices remaining strong. That in turn hangs on the government keeping up a strong fiscal performance.

Asset prices have also risen sharply in Argentina, on the back of recovering activity, large trade surpluses and falling inflation, although spreads remain very high. The second review of Argentina's transitional programme with the IMF was approved in June. But, while fiscal and monetary targets were met, there has been slow progress on structural reforms relating to banks and creditor rights. These are likely to form a key part of any comprehensive IMF programme.

In Turkey, asset prices have been volatile since the December 2002 *Review*. Market participants have revised successively their views on the prospects for war in Iraq, bilateral financial assistance from the United States, and the government's commitment to structural reforms (Chart 72). The IMF completed the fourth review of Turkey's Stand-By Agreement in April, in which it re-phased disbursements to make them less front-end loaded. Turkey's financing needs remain challenging. The government is exposed to significant roll-over risk, especially on its domestically issued debt, where the average maturity fell from around 44 months in January 2002 to 29 months in April 2003. The government also faces an ambitious primary surplus target of 6.5% of GNP in 2003. As in Brazil, the sustainability of the debt position remains highly sensitive to asset prices, reflecting the size and structure of its debt: in April 2003, the central government debt was US$165.6 billion, of which over 80% was linked to either domestic interest rates or the exchange rate. Market confidence is likely to be sustained only if the authorities remain committed to the IMF programme.

In Venezuela, the ability of the government to finance its debt depends crucially on oil revenues, which accounted for over 80% of exports in 2002. Strikes led to large falls in oil revenue in the first quarter of 2003. But, as in some other EMEs, foreign exchange reserves are high relative to short-term external debt, making Venezuela less vulnerable to external pressures in the near term than would otherwise be the

**Chart 71**

**Brazil: fiscal indicators and the exchange rate**
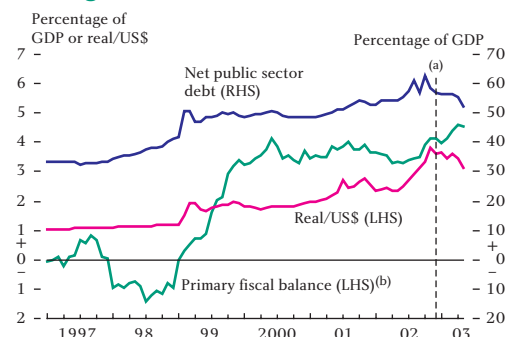


Sources: Banco Central do Brasil and Bloomberg.
(a) Dec. 2002 *Review*.
(b) Twelve-month rolling sum.

**Chart 72**

**Turkey: spread and exchange rate**
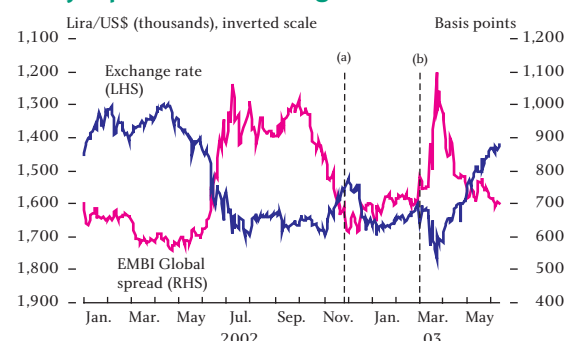


Sources: Bloomberg and JP Morgan Chase & Co.
(a) Dec. 2002 *Review*.
(b) Parliament votes to reject US request for land access for US troops for war in Iraq (1 Mar. 2003).

## Chart 73:
## Asset price changes since December 2002
### *Review*



Legend:
- Spreads (in basis points)
- MSCI equity prices (US$)
- Exchange rates (US$ per unit of local currency)

Categories: Argentina (-1556), Brazil, Mexico, Russia, Turkey, Korea, Philippines

Per cent/Basis points
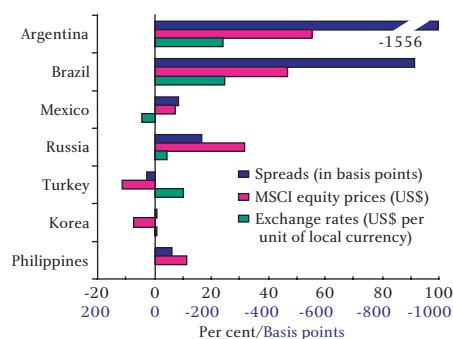
Sources: Bloomberg and JP Morgan Chase & Co.

## Chart 74:
## Corporate sector debt-equity ratios[a]



East Asia and Pacific; Latin America
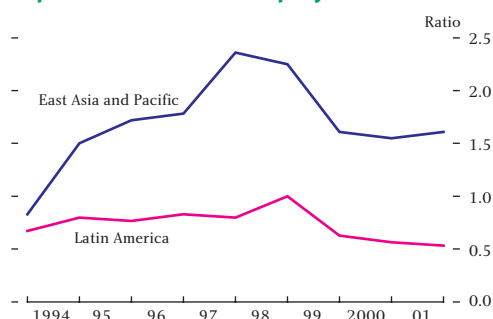
Sources: BIS, IMF, United Nations Conference On Trade and Development, World Bank World Development Indicators and Bank calculations.

(a) Using macro-level data based on methodology of World Bank Global Development Finance 2003. East Asia and Pacific ratio includes Korea, Malaysia and Thailand (1993-2001), China (1994-2001) and Philippines (2000-2001). Latin America ratio includes Argentina, Chile and Mexico (1993-2001), Brazil (1996-2001) and Peru (1997-2001).

## Chart 75:
## Ratio of foreign currency to total corporate debt[a]



Latin America; East Asia and Pacific
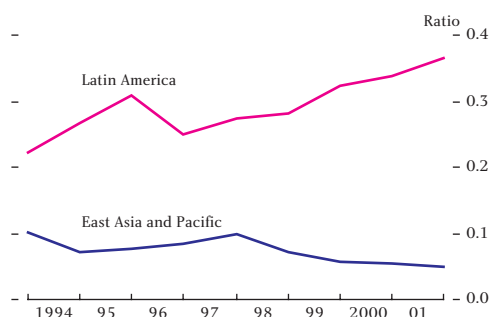
Sources: BIS, IMF, World Bank and Bank calculations.

(a) Using macro-level data based on methodology of World Bank Global Development Finance 2003. East Asia and Pacific ratio includes Korea, Malaysia and Thailand (1993-2001), China (1994-2001) and Philippines (2000-2001). Latin America ratio includes Argentina, Chile and Mexico (1993-2001), Brazil (1996-2001) and Peru (1997-2001).

case[37]. The Philippines remains vulnerable to a tightening in external financing conditions. Public sector debt is around 70% of GDP, of which around half is issued externally (and mainly denominated in foreign currency).

## Private sector balance sheets

*Non-financial corporate sectors*

Firms in many EMEs have also benefited from an easing in financing costs since the end of last year. In the first five months of 2003, bond issuance by large firms was particularly high in Asia and Emerging Europe, in Emerging Europe reaching record levels of US$4.7 billion. Equity prices rose sharply in some EMEs (Chart 73). But equity issuance and syndicated borrowing was weak.

These developments need to be seen in the context of the corporate deleveraging that began after the 1997–98 Asian financial crisis in many EMEs. Aggregate corporate debt-equity ratios in East Asia fell from 2.4 in 1997 to around 1.6 in 2001 (Chart 74), explained in part by falls in foreign-currency debt (Chart 75). Over the same period, debt-to-equity ratios declined from around 0.8 to 0.5 in Latin America. In this region, over one third of total corporate debt is now foreign-currency denominated. For example, the IMF estimated that in Mexico[38], in 2001 Q4, around two thirds of the debt of firms listed on the Mexican stock exchange was denominated in foreign currency. Absent any natural hedge, such as the dollar earnings of exporters, this exposes Mexican corporate balance sheets to any depreciation of the peso[39].

*Household sectors*

As firms in East Asia have reduced their dependence on debt, including bank loans, banks in some EMEs have increased their exposure to households. That has diversified the risks faced by the banking sector, but has also created new vulnerabilities. The December 2002 *Review* noted that in Korea, for example, the stock of household lending as a share of commercial bank lending had almost doubled since 1996. Although there are small definitional differences, Chart 76 shows that the household debt-to-income ratio in 2002 had reached levels comparable to those in economies with highly developed financial markets. More timely indicators, however, suggest that new bank lending to households fell sharply in 2003 Q1. Financial Supervisory Service data show that the credit card delinquency ratio for nine Korean credit card companies increased from 6.6% in

37: The accumulation of foreign exchange reserves has been particularly marked in non-Japan Asia, as discussed in Box 4.

38: The UK banking system's exposure to Mexico was US$5.1 billion in 2002 Q3, or 0.37% of total foreign exposures. That increased significantly in 2002 Q4, following HSBC's acquisition of GF Bital, a large retail bank with assets of US$22 billion.

39: Although information on firms' foreign exchange derivative operations is unavailable, a recent IMF report concluded that many of these exposures are likely to be unhedged.

December 2002 to 9.6% in March 2003. That echoes Hong Kong's experience discussed in the December 2002 *Review*.

In Hong Kong[40], the domestic macroeconomic outlook, at least in the short term, deteriorated following the outbreak of the SARS virus. Household balance sheet indicators have been weak for some time: property prices have fallen by around 60% since 1997, and residential mortgage loans (RMLs) in negative equity increased further to 25% of RMLs at end-March 2003. Credit card charge-offs rose sharply in 2001 and 2002, and remain high, despite falling back in 2003 Q1.

These developments have already had an effect on banking system profits in Hong Kong. But banks have high published capital ratios, and remain liquid and profitable compared with banks in other international financial sectors. While they are vulnerable to a potential rise in credit risk on their household portfolio, the recent IMF Article IV report for Hong Kong refers to stress tests suggesting that the banking sector as a whole is robust to a broad range of shocks.

**Chart 76:**

**Ratio of household sector liabilities to disposable income**[(a)(b)]
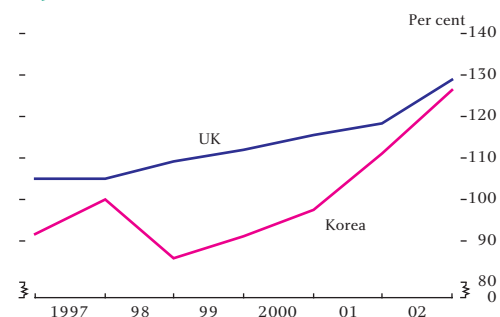


Sources: Bank of Korea, Thomson Financial Datastream and ONS.

(a) The Korean series includes unincorporated businesses and the self-employed. The UK series includes non-profit institutions serving households and some unincorporated businesses.

(b) Disposable income in Korea is measured net, and the UK measured gross, of depreciation.

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40: BIS data show that UK reporting banks' on-balance-sheet foreign claims on Hong Kong were US$129 billion at end-2002, 9.5% of total foreign exposures, and second only to the USA.

# Box 4: Foreign exchange reserve accumulation in non-Japan Asia

## Chart A
### Global total reserves (excluding gold)[(a)]
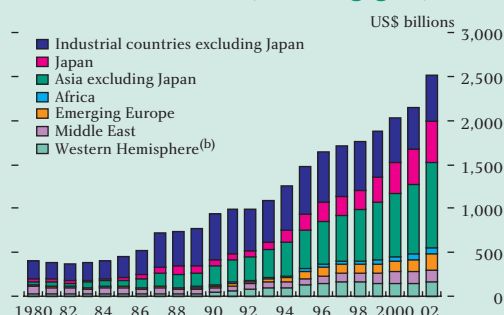


Source: IMF.

(a) Reserves also include SDRs and countries' reserve position with the IMF. But these are typically small relative to the foreign exchange component.

(b) Western Hemisphere is the American continent except the USA and Canada.

## Chart B:
### Total reserves and short-term external debt[(a)] in EMEs in December 2002
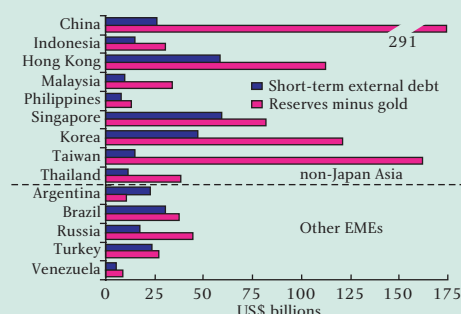


Sources: IMF and joint BIS-IMF-OECD-WB statistics on external debt.

(a) Short-term external debt is the sum of liabilities to foreign banks, debt securities issued abroad and non-bank trade credit. As these categories partly overlap, the figures overstate somewhat total short-term debt. However, this only reinforces the point that NJA reserves sufficiently cover external short-term financing requirements.

Global gross official sector reserves have increased rapidly over the past five years, to around US$2.5 trillion at end-2002. Over three quarters of the rise in reserves during 2001 in the main currencies reflected increased accumulation, rather than revaluation effects. In 2002, the significant increase in foreign exchange reserves was driven in large part by central banks in non-Japan Asia (NJA) (Chart A), where reserves rose by nearly 23% to US$975 billion, mainly in Taiwan, China and Korea. NJA now holds about 40% of world reserves.

There are at least two reasons why Asian governments have chosen to accumulate foreign exchange reserves.

First, they may be regarded as an insurance policy, to guard against a possible lack of access to international financial markets. In 1997–98, some economies in the region, such as Korea, Thailand and Indonesia, were shut off from international capital markets and experienced significant debt roll-over difficulties. The resulting 'Asian crisis' caused major financial and economic distress. Since then, alongside the gradual build-up of reserves, external short-term borrowing has been cut, with the effect that during 2002 reserves in most of NJA more than covered external-debt liabilities falling due within one year (Chart B)[1]. Increased risk aversion, possibly in response to the enormous economic fall-out caused by the Asian crisis, may have amplified this motive[2]. Reflecting the role of the US dollar as a reserve currency, central banks generally invest a large share of their reserves in US dollar-denominated assets, in particular in low-risk US treasury bonds and US government-sponsored agency bonds. At end-2001, just under 65% of reserves of developing countries' central banks were US dollar-denominated[3]. And data on portfolio flows show that NJA economies' holdings of US dollar assets have increased rapidly over the past five years (Chart C).

A second motive for stockpiling reserves is to help maintain exchange rate stability: either fixed pegs, as in Hong Kong and Malaysia, or implicit exchange rate targets, designed to lock in (or prevent the erosion of) gains in competitiveness.

But a policy of holding large reserves entails direct costs and carries its own risks.

1: This rule of thumb refers to a suggestion in 1999 by Pablo Guidotti, former Deputy Minister of Finance of Argentina that countries should be able to live for at least one year without requiring foreign borrowing. Extensions of this guideline allow for the potential for capital flight and the type of exchange rate regime.

2: Aizenman, J and Marion, N (2002), 'The high demand for international reserves in the Far East, what is going on?', NBER working paper 9266.

3: See the 2002 IMF Annual Accounts. Breakdowns by country are, for reasons of confidentiality, unavailable.

First, there is a direct financial cost if reserves are held in low-yielding safe assets. As Section 1.5 points out, JP Morgan Chase Asian EMBI yields, one measure of the potential return earned on Asian assets, remain well above comparable US Treasury yields.

Second, some NJA central banks have 'sterilised' the accumulation of foreign exchange reserves to avoid large increases in the domestic money supply. Consistent with this, the ratio of central banks' domestic assets relative to reserves has fallen in some countries (Chart D). But sterilisation policies are difficult to maintain over an extended period. The risk is that money supplies might rise eventually and exacerbate potential inflationary pressures.

Third, the significant holdings of US dollar bonds may expose central banks to valuation losses, if there were a sudden downward correction to US bond prices or further significant depreciation of the US dollar. However, official foreign exchange reserves are generally actively managed[4]. It is therefore difficult to gauge the effects of possible price falls in US asset markets on Asian central banks' reserve portfolios.

Finally, foreign exchange reserve accumulation may have contributed to the build-up of underlying imbalances, internally and externally. Internally, the policies of reserve accumulation may have supported the export sector, perhaps to the detriment of the non-tradable sector, by holding exchange rates at a lower level than they would have otherwise been. Since 1999, growth in manufacturing output relative to services has been fast in large parts of NJA, consistent with this hypothesis. Externally, NJA capital flows, including official reserves, have been a counterpart to the large and growing US current account deficit (Section 1.1) (Chart E). Net capital flows from NJA to the USA have been considerable: total net purchases of long-term US dollar assets totalled US$110 billion in 2002, or around 20% of the US current account deficit of US$503 billion.

**Chart C:**
**Holdings of long term US assets[a] by non-Japan Asia and official reserves**



US$ billions, cumulative from Jan. 1997

- non-Japan Asia reserves
- US corporate stocks
- US corporate bonds
- US government sponsored agency bonds
- US treasury bonds and notes
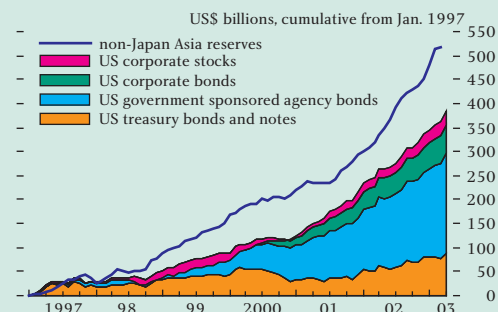
Sources: US Treasury and IMF.

(a) Estimated using non-Japan Asia's accumulated net purchases of long-term US assets.

**Chart D:**
**Central Bank domestic assets as a share of total reserves**
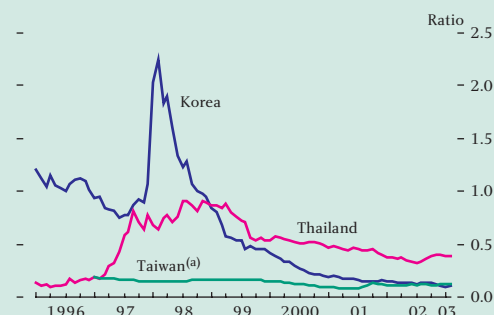


Sources: IMF and Central Bank of China.

(a) Until May 2002, linear interpolation of quarterly or yearly figures.

**Chart E:**
**The US current account deficit and measures for non-Japan Asia's supply of funds**



US$ billions

- Net purchases of long term US assets by non-Japan Asia
- Change in non-Japan Asia's reserves
- US current account deficit
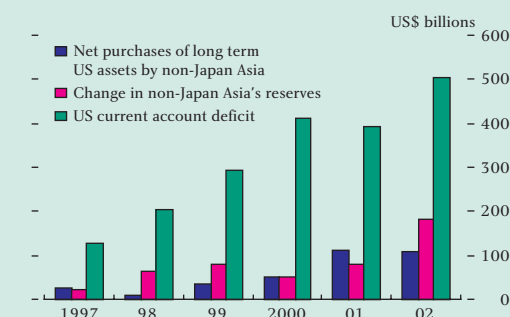
Sources: US Treasury, IMF and Bloomberg.

4: See the Box in the March 2001 BIS Quarterly *Review*, 'How active are central banks in managing their US dollar reserve portfolios?'.

## Chart 77:
## Sectoral financial balances
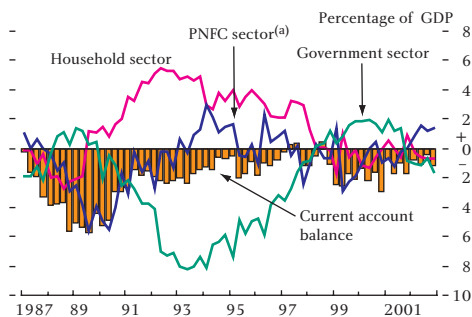


Source: ONS.
(a) Private non-financial companies.

## Chart 78:
## Current GDP projection based on constant nominal interest rates at 3.75%(a)
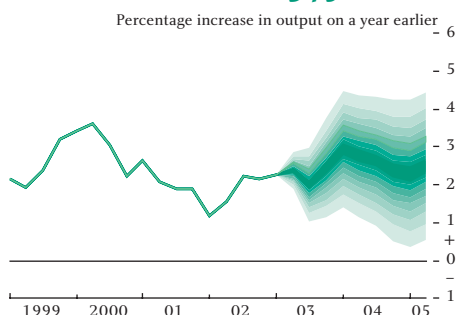


Source: Bank of England.
(a) The fan chart depicts the probability of various outcomes for GDP growth in the future. The darkest band includes the central (single most likely) projection. See also the footnote to Chart 1 in the May 2003 *Inflation Report*.

# 2 The UK environment

## 2.1 The macroeconomic background

Growth has slowed in the UK over the past six months. GDP rose by 0.4% in 2002 Q4 and provisionally by 0.2% in 2003 Q1. Services growth has fallen, while manufacturing output has continued to stagnate, affected by the sluggish world economy. The counterparts to a continuing current account deficit over the past year have been widening financial deficits in the public and, to a lesser extent, household sectors, together with a small continuing financial surplus in the corporate sector (Chart 77). This reflects the divergence over that period between buoyant public and household sector current spending and depressed corporate capital expenditure.

The short-term global outlook has deteriorated somewhat since December, as noted in Section 1. The May central projection of the Bank's Monetary Policy Committee (Chart 78) was for UK growth over the next two years to be relatively close to its long-run trend rate. Growth was projected to be slightly lower than previously thought in the near term, but stronger in 2004, as the stimulus to net trade from the fall in the sterling effective exchange rate since early February worked through.

The MPC does not formulate projections for the financial positions of the UK corporate and household sectors. However, the outlook for them can be assessed using the method described in the December 2001 *Review*[41]. A return to trend growth should benefit corporate profitability, allowing companies to finance more of their outlays from internal funds. Especially if combined with some recovery in equity issuance as markets improve, this might facilitate a further reduction in corporate capital gearing from current high levels. As financial pressures on the corporate sector recede, a recovery in dividend payouts could occur, together with a return of the sector towards financial balance. Rising profitability and falling capital gearing, if combined with continued low interest rates, could further reduce both corporate income gearing and the liquidations rate from their current low levels. The financial outlook for the corporate sector implied by the MPC's central projection does not, therefore, suggest any serious threat to financial stability.

For the household sector, low interest rates and GDP growth near trend would be likely to be associated with further growth in borrowing, but possibly at a lower rate than recently given the assumption in the MPC's central projection that house price

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41: See Benito, A, Whitley, J D and Young G (2001) 'Analysing Corporate and Household Sector Balance Sheets', December 2001 *Financial Stability Review*. The model described in this article has subsequently been developed further to incorporate adjustment by companies in response to changes in their balance sheets.

inflation will slow to around zero over the next year or so. The debt-income ratio and capital gearing could therefore continue to rise. If effective interest rates on household debt remain low, this should partly offset the adverse effect of further rises in indebtedness on income gearing, and therefore arrears, especially in the mortgage market. Again, this limits the threat to financial stability, although a further deterioration in the household sector's balance sheet position would increase its vulnerability to adverse shocks.

The MPC judged the risks around their central projection to be broadly balanced (Chart 78). Financial problems could arise for UK companies and households in the event of a delayed recovery in global demand, together with a more pronounced fall in UK consumer spending growth. That would have adverse consequences for corporate profitability and balance sheets. If that reinforced the current pressure on heavily geared companies to adjust, it might also lower household employment and incomes, thereby reducing the ability of some households to meet their debt obligations.

## 2.2 The corporate sector

Data released since the December *Review* point to flat corporate profitability in 2002 and further adjustment in response to the earlier deterioration in balance sheets. Capital gearing has therefore fallen back somewhat, but remains historically high. Low interest rates have kept income gearing relatively modest, which in turn has had a beneficial effect on company liquidations. Market indicators have improved in recent months, with some recovery in equity prices and a narrowing in corporate bond spreads.

### Profitability

Below-trend economic growth has been associated with continued modest corporate profitability. The gross operating surplus of PNFCs remained at 18.5% of GDP in 2002 Q4, its lowest level since 1993. PNFCs' net rate of return on capital was unchanged in Q4, at 11%, and the annual level of 11.4% in 2002 was also the lowest since 1993. Rates of return in both services and manufacturing remain well down on their 1998–99 peaks (Chart 79). Profit warnings, however, while still high, have fallen back somewhat in recent months.

Evidence from company accounts[42] indicates that the sales-weighted median operating profit margin was 5.9% in 2002, down from 7.6% in 2001 and the lowest since the series began in 1974. Margins fell in 2002 across most sub-sectors and the falls were particularly marked among the smallest firms,

**Chart 79:**
**Net rate of return on capital[(a)(b)]**
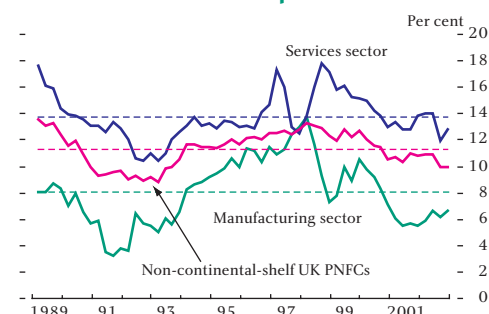


Sources: ONS and Bank of England.
(a) Basis of net estimate: net operating surplus/net capital employed.
(b) Dashed lines represent corresponding averages taken from 1989 Q1 to 2002 Q4.

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42: Based on 1,108 quoted PNFCs that have so far published accounts for 2002.

**Chart 80:**
**Percentage of companies making a loss[a]**
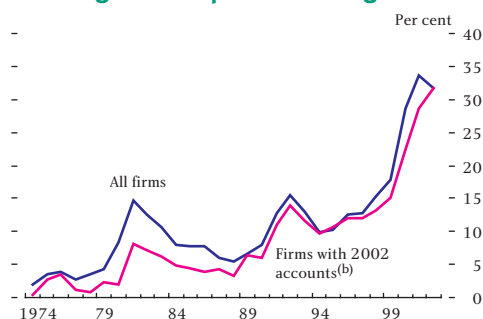


Source: Thomson Financial Datastream.

(a) Profit (loss) defined as earnings before interest and taxation.

(b) Based on sample of 1,108 quoted PNFCs.

**Chart 81:**
**Proportion of companies omitting the dividend[a]**
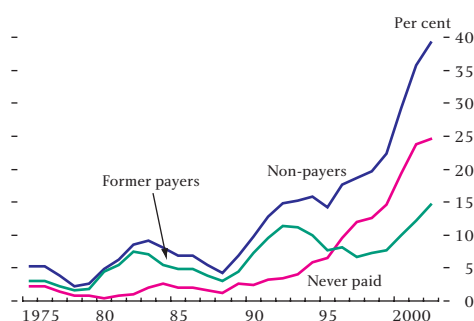


Source: Thomson Financial Datastream.

(a) Proportions relate solely to 1,108 quoted PNFCs that have produced accounts for 2002.

**Chart 82:**
**Proportion of dividend-paying companies reducing the dividend[a]**
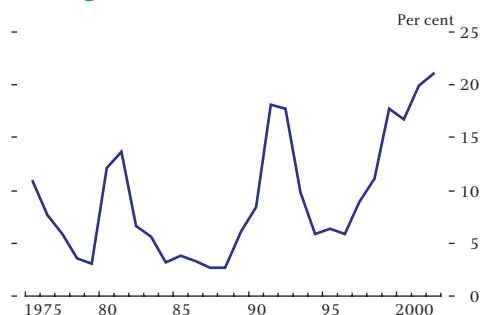


Source: Thomson Financial Datastream.

(a) Proportion relates solely to 1,108 quoted PNFCs that have produced accounts for 2002.

which have been persistently less profitable than larger companies. The proportion of quoted companies making a loss has risen rapidly since 1999 to over 30%, more than twice the levels in the recessions of the early 1980s and early 1990s (Chart 80).

## Financial adjustment

Weak profitability has reinforced the need for corporate sector adjustment in response to deteriorating balance sheets. Some companies may have targets for their capital gearing, balancing the tax advantages of debt finance against the risk of insolvency. Such targets seem unlikely to have been raised in recent years, given broad stability in corporation tax and liquidation rates. But actual capital gearing, reflecting the falling cost of debt relative to equity finance, high cash-financed M&A activity in 1999–2001 and heavy borrowing by telecoms companies in 2000–01, has increased to historical highs. In these circumstances, companies have faced growing pressures to adjust their balance sheets. In general, they can reduce cash outlays by running down inventories, cutting capital spending and/or economising on labour costs ('real' adjustment). And they can alter the structure of their financing, for example by changing dividend policy, refinancing debt or issuing more equity ('financial' adjustment)[43].

The previous two *Reviews* have described how the current period of adjustment has developed, mainly involving cutbacks in capital expenditure, inventories and dividend payments. Recent data suggest that the pace of adjustment in capital spending may be slowing. Following falls in 2001 and 2002 Q1, business investment was broadly flat in the rest of 2002 and rose somewhat in 2003 Q1. Manufacturing companies, however, have continued to run down stocks substantially. And in the labour market, costs have been contained by moderation in pay growth and falling hours worked.

Financial adjustment has continued apace. Dividend payments by PNFCs fell further in 2002 H2, and by Q4 had been reduced by over one third in just over a year. The proportion of quoted companies not paying a dividend rose further, from 36% to 39% in 2002 (Chart 81). This includes a rising proportion of companies that have never paid dividends, largely because these companies are relatively small and unprofitable. The use of dividend policy to adjust balance sheets is more likely among companies which did not pay a dividend in the latest year but have done so previously (nearly 15% in 2002). These firms, also a rising proportion of the total, are relatively highly geared. Firms that paid lower dividends may also have been trying to adjust their balance sheets. Some 21% of dividend-paying firms reduced the dividend in 2002, more than the peaks in the recessions of

43: See the Box on page 90 of the December 2001 *Financial Stability Review*, and also Benito, A and Young, G (2002) 'Financial pressure and balance sheet adjustment by UK firms', Bank of England Working Paper no. 168.

the early 1980s and early 1990s (Chart 82). On average, these firms had lower profitability, higher gearing (at market value) and lower interest cover than firms that maintained or increased dividends in 2002.

Real and financial adjustments by companies help to account for the corporate sector's move from a large financial deficit, which touched 3% of GDP in 1999, to a modest surplus, reaching 1.4% of GDP in 2002 Q4 (Chart 77). A counterpart has been reduced demand for external debt finance. Bond issuance by UK PNFCs has been lower over the past year than in the previous three, and concentrated among high-quality borrowers in less cyclical highly cash-generative sectors (Chart 83). There has been little issuance in the past year by lower-rated companies in the telecoms, transport and hotels/leisure sectors. Borrowing from banks also slowed quite markedly in 2001 H2 and 2002 H1 (Chart 84). Since then, there has been a modest recovery in borrowing, although recent discussions with companies and banks suggest that lenders in general remain cautious and discriminating in their corporate lending activities. Quarterly industrial lending data show that, excluding the commercial property sector, borrowing by non-financial companies (NFCs) from UK-resident banks grew by 4% in the year to 2003 Q1, compared with a slight fall in the year to 2002 Q3. The very rapid growth of bank borrowing by the commercial property sector is considered separately below.

As noted above, companies may also seek to lower capital gearing by raising additional equity finance. But increases in its cost, alongside continued equity market uncertainty and volatility, have made this more expensive. Equity issuance has therefore fallen markedly in recent quarters.

## Balance sheet indicators

Notwithstanding the adjustments so far undertaken by the corporate sector, aggregate capital gearing has fallen only modestly and remains high by historical standards (Chart 85). Net indebtedness relative to the capital stock measured at replacement cost has been shading down for around a year, and fell by another two percentage points in 2002 Q4. But the weakness of equity markets means that gearing relative to market values started to fall only in the fourth quarter. As pointed out in previous *Reviews*, underlying corporate sector capital gearing is higher to the extent that net pension scheme liabilities are treated as equivalent to corporate debt. Pension deficits amounted to about £70 billion for 94 of the FTSE-100 companies as of 30 April 2003, according to Bank calculations; up to half of this total can probably be accounted for by past contribution holidays.

**Chart 83:**

**Public bond issuance by UK PNFCs, by sector**
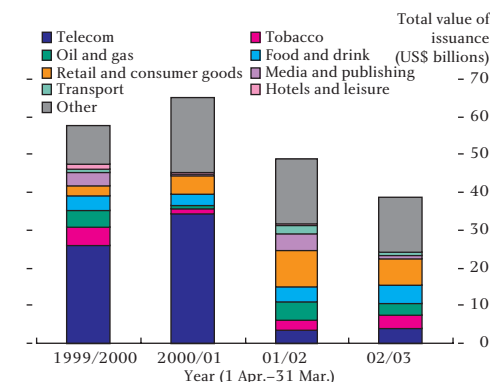


Sources: Dealogic and Bank calculations.

**Chart 84:**

**Growth of bank borrowing by UK PNFCs[a][b]**
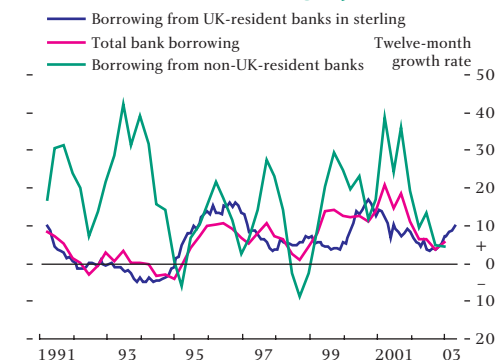


Sources: ONS and Bank of England.

(a) UK-resident data are monthly.

(b) Total and non-resident figures are quarterly, and include lending in both sterling and foreign currency.

**Chart 85:**

**Corporate sector capital gearing[a]**
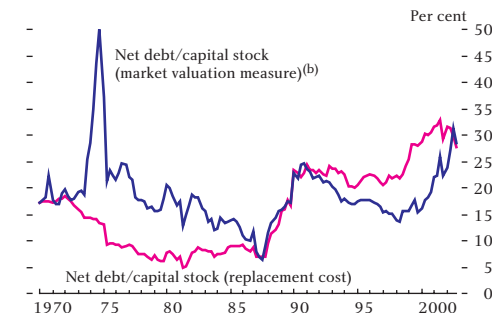


Sources: ONS and Bank of England.

(a) Data are seasonally adjusted.

(b) PNFCs' net debt divided by the sum of the net debt and market value of equity.

**Chart 86:**
**Corporate sector income gearing**[a]
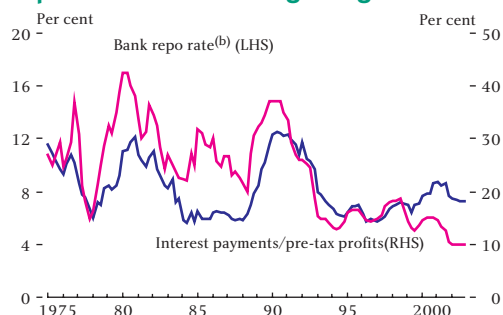


Sources: ONS and Bank of England.

(a) Data are seasonally adjusted.

(b) Data are quarterly averages.

**Chart 87:**
**Indicators of corporate liquidity**
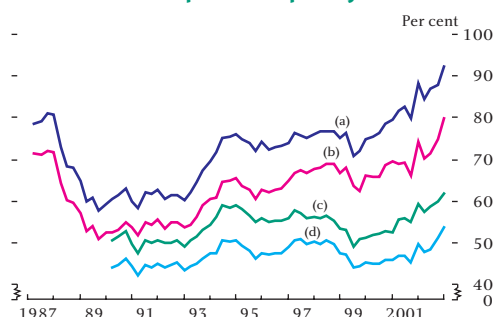


Sources: ONS and Bank calculations.

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

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

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

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

**Chart 88:**
**Rate of corporate insolvencies**[a][b]



Sources: DTI and Bank calculations.

(a) Data annualised and seasonally adjusted.

(b) Number of insolvencies divided by number of active registered companies.

Despite high capital gearing and mediocre profitability, corporate income gearing has benefited from low interest rates (Chart 86). Company accounts data show that median income gearing of profitable firms fell from 16.6% in 2001 to 14.8% in 2002. But there was a small rise, from already high levels, among companies at the top of the distribution, which tend to be both the least profitable and most highly geared. This may partly reflect the fact that the impact of falling risk-free interest rates in reducing the rate paid by companies on their debt is likely to be proportionately lower for highly geared companies[44].

Any unforeseen rise in debt servicing needs will be more easily met if companies have buffers of liquid assets. Corporate liquidity in aggregate has been rising, to levels either above or approaching historical highs (Chart 87). This build-up of liquidity may partly reflect a lack of profitable investment and M&A opportunities, although for some companies it may be precautionary and hence another element of their adjustment strategy.

## Corporate failures and debt sustainability

Modest income gearing helps to explain the continued low rate of corporate liquidations in the UK. DTI statistics suggest that, following a rise last year, the annualised rate of insolvency fell below 1% in 2003 Q1, a 15-year low (Chart 88). And the number of company insolvencies in England and Wales recorded by the DTI fell by over 8% in the year to 2003 Q1.

Forward-looking data, surveys and market indicators provide mixed evidence on the short-term outlook for insolvencies. The total number of company voluntary arrangements, administrations and receiverships – often a good predictor of subsequent liquidations – fell by 16.5% in the year to 2003 Q1. And the latest Euler Trade Indemnity survey indicated that the incidence of bad debts fell in Q4, while the number of policyholder claims under trade credit insurance policies was at its lowest for nearly three years. Discussions with trade credit insurers, however, suggest that falling claims mainly reflect earlier cuts in credit limits and tightening of the criteria for the acceptance of new risks.

Turning to market indicators, corporate bond spreads have eased in recent months (Chart 89). This has been concentrated among investment-grade telecoms, capital goods and media stocks and the lowest quality issuers. It may indicate market approval of balance sheet restructuring by such companies and also perhaps a renewed investor 'search for yield' in recent months (as discussed in Section 1.1). Models of implied corporate default
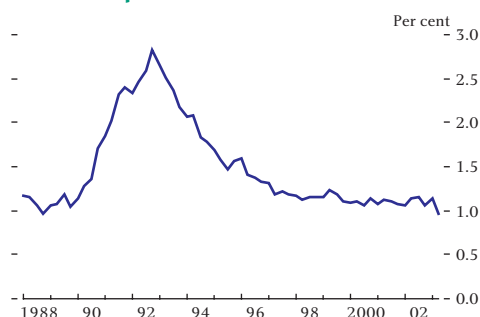
44: Reflecting the financial accelerator literature that balance sheet weakness may raise the external finance premium. See Benito, A and Whitley, J D (2003) 'Implicit interest rates and corporate balance sheets: an analysis using aggregate and disaggregated UK data', Bank of England Working Paper no. 193.

probability based on leverage, equity prices and volatilities have been more pessimistic[45], although the liquidations rate has remained considerably lower over the past year than might have been inferred from these models. That may partly reflect strong aggregate interest cover and liquidity for the corporate sector. It may also be a consequence of the survival, following successful restructurings, of companies that have defaulted on their debt. Such defaults have increased from less than £1 billion a year in 1998–2000 to £4 billion in 2001 and £16 billion in 2002, concentrated mainly in the telecoms and energy sectors.

The greater incidence of debt renegotiations suggests that, despite the adjustment that has occurred so far, a small but increasing number of underperforming companies still face debt sustainability problems. This is supported by the evidence from company accounts data, which show that the proportion of firms reporting both low profitability and high gearing rose from 13% in 2001 to 15% in 2002, while the proportion reporting all three of low profitability, high gearing and low liquidity rose from 4% to 6% (Chart 90). For such companies, adjustment will have further to run.

## Commercial property

As noted above, one part of the UK corporate sector that has continued to accumulate debt at a rapid rate is the commercial property sub-sector. Growth of borrowing by real estate companies from UK-resident banks has averaged around 20% a year since early 1999 and now represents over 30% of the stock of PNFC borrowing from such banks, compared with 17% in 1999 (Chart 91). But the latest De Montfort survey[46] suggests that much reduced participation by non-resident foreign banks in this market last year resulted in a fall in the growth of total borrowing by the commercial property sector from 20% in 2001 to 11% in 2002. It also suggests that some 80% of the borrowing in 2002 financed investment in existing property, while only a small proportion of the remainder financed speculative or only partly pre-let development. The investment seems likely to have been stimulated by high property yields relative to long-term nominal interest rates or dividend yields.

Borrowing for investment purposes – to purchase existing property – is similar to leveraged purchase of financial assets. Investment borrowers are exposed to the risk that falls in capital values, which have occurred in some sub-sectors, notably the City of London office market, will require them to inject more equity to meet loan-to-value covenants. And if this impairs their

**Chart 89:**

**Sterling asset swap spreads for selected investment grade sectors[a]**
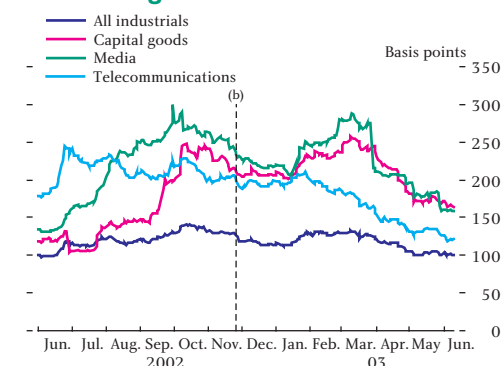
Source: Merrill Lynch.

(a) Asset swap spread is defined as the option-adjusted spread over London Inter-Bank Offered Rate of a matched floating rate bond.

(b) Dec. 2002 *Review*.

**Chart 90:**

**Coincidence of corporate financial health indicators, 2002 and 2001[a][b][c]**
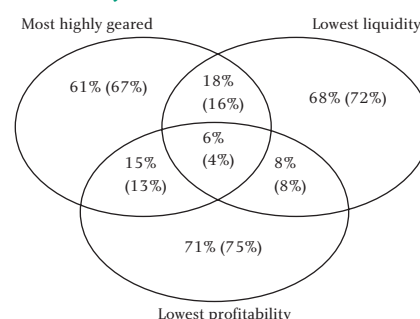
Source: Thomson Financial Datastream.

(a) 2002 data cover 1,108 quoted PNFCs.

(b) Figures in brackets are for 2001 for firms with 2002 accounts.

(c) Rankings and percentages relate to quintiles.

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45: As shown in Tudela, M and Young, G (2003) 'Predicting default among UK companies: a Merton approach' in this *Review*. See also Tudela, M and Young, G (2003) 'A Merton model approach to assessing the default risk of UK public companies', Bank of England Working Paper, no. 194.

46: See Maxted, W and Porter, T (2003) 'The UK commercial property lending market', De Montfort University, May.

## Chart 91
## Bank borrowing by the real estate sector[a]
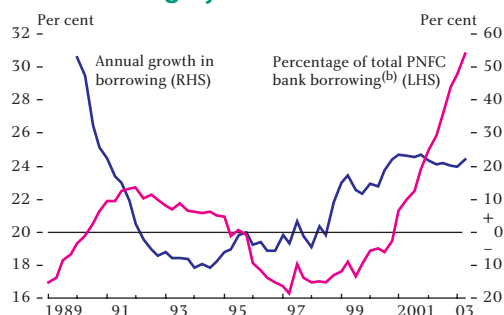


Sources: ONS and Bank of England.

(a) Borrowing by PNFCs includes banks' holdings of securities, but borrowing by real estate and construction companies does not.

(b) Stock of borrowing by real estate sector as a percentage of total stock of PNFC borrowing from UK-resident banks.

## Chart 92:
## Capital and rental values in the commercial property market
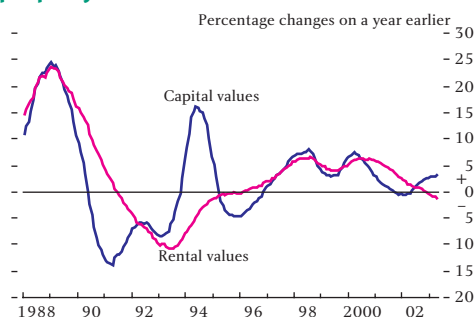


Source: Investment Property Databank.

## Chart 93:
## Households' secured and unsecured borrowing[a]
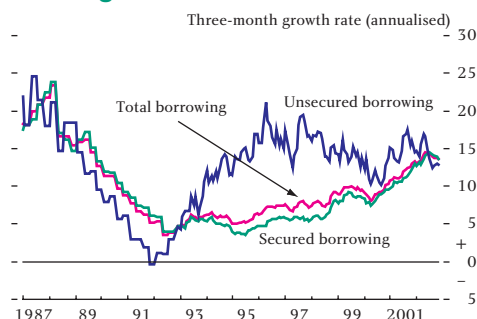


Source: Bank of England.

(a) Data before Apr. 1993 are quarterly and thereafter monthly.

creditworthiness, they could face rising credit spreads on their borrowings, causing problems in refinancing loans. In the short term, borrowers are generally insulated from the risk of an increase in interest rates, since most borrowing is either at fixed rates or hedged. But around 50% of existing loans are due for repayment within five years, according to the De Montfort survey. These risks could be aggravated in future by the trend towards shorter loan periods, associated with declining lease lengths, especially if this increases the residual amount of debt outstanding at the end of original loan terms.

The strength of investor demand for property contrasts with a weakening occupier market. This has been associated with recent falls in rental values (Chart 92), especially in the City office market where vacancy rates have risen from a low of around 2% in 2000 to over 10%. Discussions at the Bank's Property Forum[47] point to less weakness in the office market in other areas and in the retail sector. But even where demand for space is weakest, the position is somewhat different from the early 1990s, when there was a much larger overhang of unlet property. In the current cycle, a large part of vacant space is leased to corporate tenants locked into rents above current market levels, but who have strong credit ratings. Borrowers' cash flows and loan repayments depend on tenant creditworthiness and so may currently be well protected. But that protection would be undermined if the recent slowdown in the economy increased substantially the incidence of tenant default. The risks of large-scale tenant default are linked to those relating to the overall macroeconomic outlook.

# 2.3 The household sector

Debt accumulation by the household sector has continued at a rapid rate. This, together with slowing income growth, has pushed the debt-income ratio up to a new historical high, but capital gearing remains close to its long-run average. Income gearing has fallen further, assisted by continued reductions in effective interest rates on households' debt. This has benefited payment arrears, especially in the mortgage market. Disaggregated and survey data point to a subset of households with much higher income gearing, but there is little evidence that this group is increasing in size.

## Income, saving and the financial position

Household income growth has fallen and the financial deficit has widened a little further (Chart 77). Box 5 contrasts recent developments in the household sector's accounts with those in the late 1980s, the last time the sector ran a significant financial

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

# Box 5: The household sector's financial balance

Over the past ten years the household sector's financial surplus has eroded to the extent that since 1999 the sector has frequently been in deficit, ie households have in aggregate moved from being net lenders to net borrowers. This Box discusses the significance of this development for household finances.

## Movements in the capital account

In the household sector's *capital account,* the financial balance is defined as the difference between saving and investment. Thus the decline in the household sector's financial surplus over the past ten years has broadly mirrored an accompanying fall in the saving ratio, which has declined to levels similar to the lows reached in the late 1980s, at least in nominal terms (Chart A)[1] However, a financial deficit on the scale recorded then has not yet re-emerged, because households' fixed investment, as a proportion of incomes, has been substantially lower, primarily as a result of weaker investment in new housing and other housing-related capital expenditure (Chart B)[2]. This is illustrative of more moderate levels of housing market activity in recent years than in the late 1980s boom[3].

## Financing the financial deficit or surplus

The financial balance is also equivalent to the difference between the acquisition of financial assets and borrowing (acquisition of financial liabilities). So a shift from surplus to deficit means borrowing has risen relative to asset accumulation. The sector's *financial account* separately identifies these components, which are illustrated in constant price terms in Chart C[4]. Changes in the household financial balance have typically reflected changes in the net acquisition of financial liabilities rather than financial assets, which have been relatively stable given that a substantial component of household saving is via 'committed' regular payments into funds held by life insurance and pension companies (see below). However, in the latest period, from a low in 1998, asset acquisition has increased materially as well as borrowing. Indeed, in real terms, *both* asset and liability acquisition in 2002 exceeded levels reached during the late 1980s.

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1: As inflation falls, households need to save less purely to maintain the real value of their financial wealth. Even though the nominal saving ratio has fallen well below its average over the past 35 years, the 'inflation-adjusted' saving ratio remains somewhat above its 35-year average. See also Davey, M (2001) 'Saving, wealth and consumption', Bank of England *Quarterly Bulletin* (Spring).

2: Household fixed investment also includes improvements to existing housing stock, investment in other buildings, plant and machinery and transactions costs, including those associated with house purchase.

3: In 2002, housing transactions were only about 74% of their 1988 peak: housing starts and completions were similarly 75% and 79% respectively of their 1988 peaks.

4: Throughout this note, 'constant price' or 'real' values are calculated by deflating by the GDP deflator (1995=100).

**Chart A:**

**Household financial balance and saving as a percentage of post-tax income[a]**
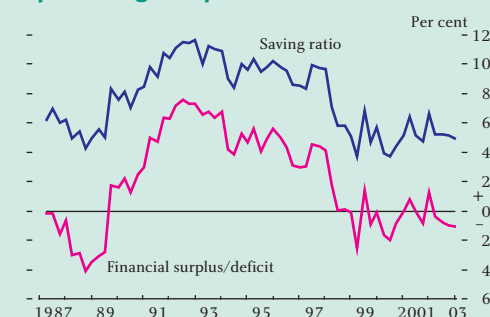


Sources: ONS and Bank of England.
(a) Data are seasonally adjusted.

**Chart B:**

**Total investment and investment in new dwellings[a][b]**
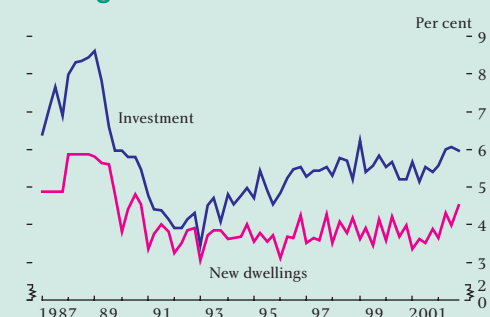


Sources: ONS and Bank of England.
(a) Investment in new dwellings is annual data until 1989.
(b) As percentages of household post-tax income.

**Chart C:**

**Real household balance sheet flows (at 1995 prices)**
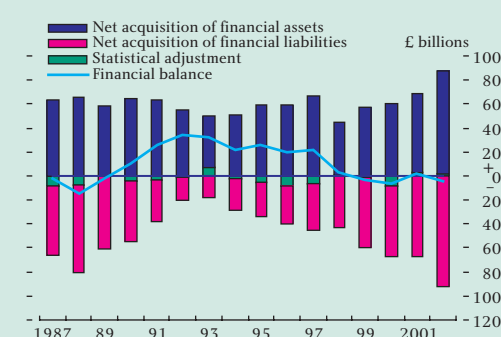


Sources: ONS and Bank of England.

## Chart D:
## Household sector acquisition of financial assets[a]
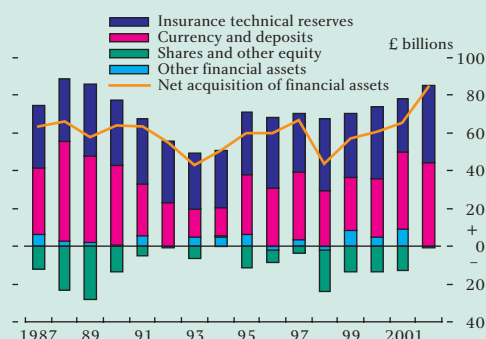


Sources: ONS and Bank of England.
(a) Deflated by the GDP deflator (1995 prices).

## Chart E:
## Measures of household sector capital gearing[a]
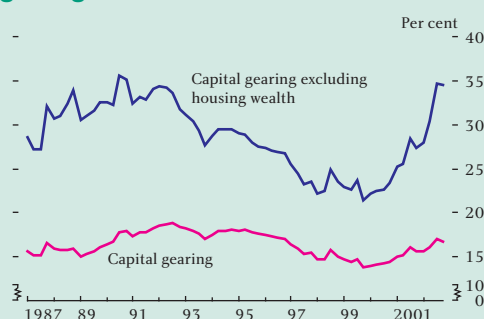


Sources: ONS and Bank of England.
(a) Data are not seasonally adjusted.

## Chart F:
## Stocks of household sector assets and debt[a]
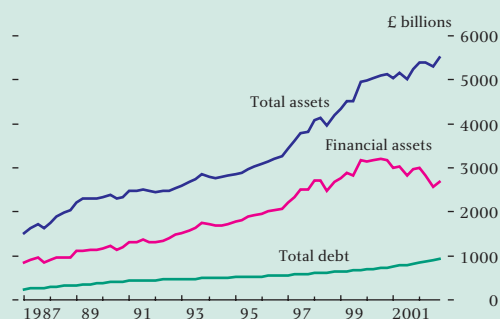


Sources: ONS and Bank of England.
(a) Data are not seasonally adjusted.

Chart D shows that the main changes since 1998 in the acquisition of assets have been a reduction in net sales of equity and a build-up of deposits. Insurance technical reserves[5], reflecting primarily net payments into insurance companies and pension funds, have been relatively stable. The reduced net retirement of equities may have partly reflected lower (cash-financed) M&A activity. The growth of deposits may be associated with the strength of mortgage borrowing for house purchase, which tends to be reintermediated within the household sector, although of course those households acquiring debt, for example first-time home buyers, are not necessarily those acquiring deposits, for example last-time sellers. More recently, deposits have benefited from a switch in saving flows from equity-based investments, such as unit trusts[6].

## The financial account and balance sheet

Savings and borrowing *flows* provide a window on how the household sector is adjusting its balance sheet. But it is the balance sheet itself – the *stock* position – that matters to the assessment of risk. In practice, changes in the household sector's net financial wealth are dominated by valuation changes, in particular to equity holdings (including those held with life insurance and pension funds). So notwithstanding net saving flows having declined over the past ten years, capital gearing fell during the 1990s (Chart E) as a result of the buoyancy of asset markets. In 2002, however, although household sector acquisition of real financial assets remained strong (£85 billion), the real value of financial assets held fell (by £343 billion). The increase in *total* household wealth[7] was accounted for by a further rise in the value of non-financial assets, largely housing (Chart F). Taking into account also the rapid debt accumulation, household capital gearing has risen in recent years, especially so if housing assets are excluded (Chart E).

In this sense, the emergence of a financial deficit has coincided with a deterioration in the household sector's balance sheet, increasing the vulnerability of the sector to financial shocks.

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5: These constitute the net equity of households in life insurance and pension funds (together with prepayment of insurance premiums and reserves for outstanding claims).

6: In spite of increased penetration of unit trusts over the past ten years, encouraged by the introduction of tax-advantaged personal equity plans (PEPs) and individual savings accounts (ISAs), the household sector has remained a net seller of equities, reflecting divestment of directly-held securities. This has been reinforced in recent years by sales of shares acquired via privatisations or building society demutualisations.

7: 'Total household assets' is total financial wealth plus housing wealth (and thus excludes, for example, assets such as plant and machinery).

deficit. Although there is tentative evidence since the December *Review* that the growth of indebtedness may be moderating slightly, it remains high (Chart 93).

## Debt accumulation

Mortgage borrowing has continued to grow rapidly, rising by 14.3% in the year to April 2003 – although the annualised three-month growth rate has edged down a little recently (Chart 93). Transactions data and surveys point to reduced activity in the housing market, to accompanying declines in loan approvals for house purchase in Q1, and to a drop in house price inflation. The three-month on three-month rate of increase in the average of the Halifax and Nationwide house price indices has fallen, from 6.0% in January to 3.4% in May. Affordability constraints may be beginning to bite, especially in the South East, at a time of falling household real income growth. That is consistent with the marked further reduction recently in the proportion of mortgage lending going to first-time buyers (Chart 94).

Although the growth of borrowing for house purchase may be slowing, remortgaging activity remains strong. Its share of gross advances recently rose above that of house purchase loans (Chart 95). This owes much to competitive pressures in the market, keeping fixed and discounted rates on new mortgages (currently averaging 4%–4.5%) significantly below standard variable rates on the existing mortgage stock (currently around 5%–5.5%), notwithstanding declines in the latter as the back mortgage book is repriced. Mortgage equity withdrawal has continued to rise towards the peak of the late 1980s (Chart 96). It may be used for various purposes, such as to finance consumption or to repay other debts. Recent surveys by the Council of Mortgage Lenders show that in both 2000 and 2002 more households used withdrawn equity in a way that strengthened balance sheets rather than weakened them[48]. Other evidence suggests that the main component of equity withdrawal is in fact last-time sales, which are perhaps more likely to augment saving than consumption[49].

Households' unsecured borrowing grew by just under 14% in the year to April 2003, compared with a peak growth rate of around 16% in the year to October 2002. Annualised three-month growth rates have fallen by a little more over this period, but remain high (Chart 97). As with mortgage borrowing, it is difficult to know how durable this recent modest slowdown will be. Survey evidence suggests that participation in the unsecured

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48: The surveys define the use of loans for home improvement as a balance-sheet-strengthening form of mortgage equity withdrawal, whereas the official statistics do not regard such loans as equity withdrawal at all.

49: See Holmans, A E (2001) 'Housing and mortgage equity withdrawal and their constituent flows: a technical report', Council of Mortgage Lenders; see also the discussion on page 10 of the May 2003 *Inflation Report*.

**Chart 94:**
**Proportion of mortgage lending for house purchase for first-time buyers**

Percentage of loans
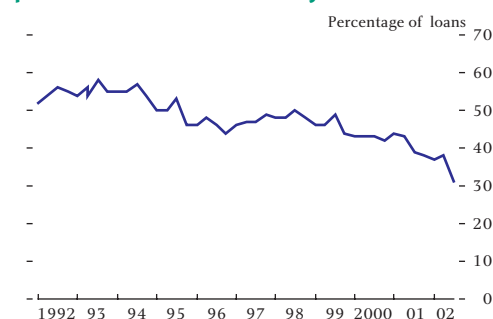
Source: Council of Mortgage Lenders.

**Chart 95:**
**Breakdown of gross mortgage advances[a]**

Percentage of all loans

Loans for house purchase

Remortgaging
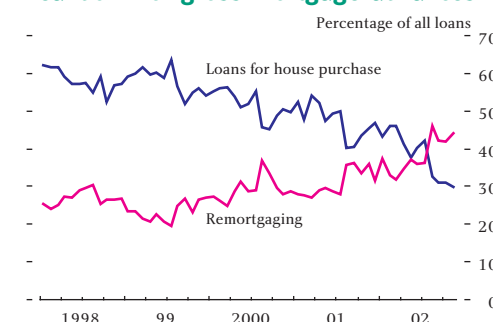
Source: Council of Mortgage Lenders.
(a) Proportions based on numbers of loans.

**Chart 96:**
**Mortgage equity withdrawal and components of net housing equity**

Per cent — Per cent

Annual growth rate of stock of secured debt (RHS)
Annual growth rate of stock of gross housing wealth (RHS)
Mortgage equity withdrawal (LHS)[a]

Sources: ONS and Bank of England.
(a) As a percentage of post-tax income.

**Chart 97:**
**Unsecured borrowing: annual and three-month growth rates**
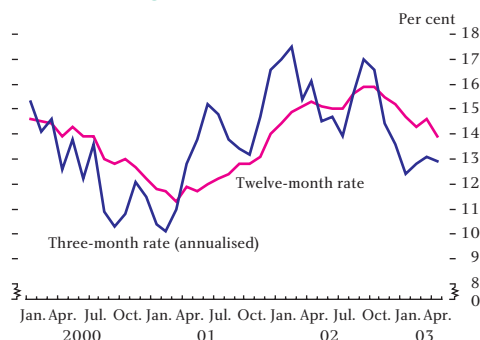


Source: Bank of England.

**Chart 98:**
**Household sector debt-income ratio[(a)(b)]**
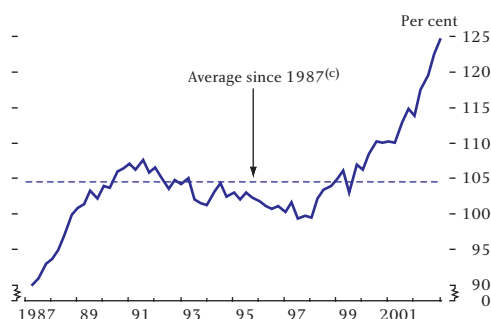


Sources: ONS and Bank calculations.

(a) Debt data are not seasonally adjusted.

(b) Debt equals total liabilities.

(c) Average taken from 1987 Q1 to 2002 Q4.

**Chart 99:**
**Household sector capital gearing[(a)(b)]**
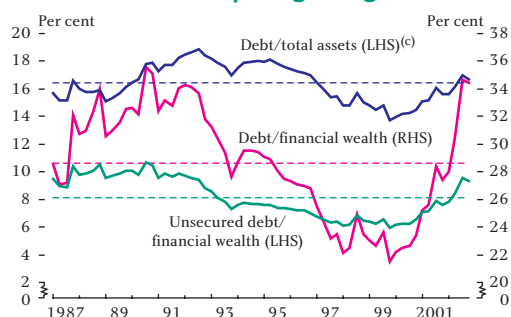


Sources: ONS and Bank of England.

(a) Dashed lines indicate average of series from 1987 Q1 to 2002 Q4.

(b) Data are not seasonally adjusted except for housing wealth.

(c) Financial plus housing wealth.

debt market is positively related to income for most types of borrowing[50].

## Balance sheet indicators and vulnerabilities

The combination of slowing income growth and continued rapid debt accumulation has raised the debt-income ratio further, to a new historical high in 2002 Q4 (Chart 98). But with housing wealth boosted by the buoyancy of house prices and financial wealth assisted by some recovery in equity markets, capital gearing fell a little in Q4 and was close to its average over the past 15 years (Chart 99). The smaller rise in capital gearing than in the debt-income ratio since 1999 owes much to the strength of house prices. Total debt in relation to financial wealth has risen much more rapidly and in Q4 was close to the highs of the early 1990s, while the ratio of unsecured debt to financial wealth has risen above its 15-year average (Chart 99).

These developments have left households more vulnerable to unexpected falls in incomes or rises in interest rates. And their balance sheet position is more susceptible to major asset price corrections, especially in the housing market. Recent evidence points to the prospect of a 'soft landing' there, and the MPC's latest assumption is that house price inflation will slow to a halt over the next year or so[51]. A sharper housing market correction could significantly reduce the value of the collateral underlying mortgage lending. It would also raise capital gearing, but income gearing and therefore households' rate of default would be less affected in the short run. There might, however, be adverse second-round effects on incomes and employment, and therefore income gearing, if households responded to deteriorating balance sheets by reducing consumption. The size of any such effect would depend on the extent to which housing market activity and the value of housing equity were reduced. Despite the rapid growth in mortgage equity withdrawal, sustained rises in housing wealth in recent years have increased undrawn housing equity to over 75% of total housing wealth by 2002 Q4 (Chart 100). Given also modest loan-to-value (LTV) ratios on existing mortgages and recent declines in the incidence of high LTV ratios on new mortgages (see Section 3.2), it would take substantial nominal house price falls to generate widespread incidence of negative equity.

## Indicators of distress and debt sustainability

Notwithstanding slowing income growth and continued debt accumulation, household income gearing fell further in 2002 Q4 (Chart 101). This reflected continued reductions in effective interest rates on household debt. A measure of income gearing that includes regular secured principal repayments has been

50: Based on a survey by NMG Research in April 2003, which asked a nationally representative sample of 1,589 adults about their participation in the unsecured debt markets and their average amounts of debt by different product types.

51: See the May 2003 *Inflation Report*, page 6.

stable at around 10% over the past few years, below its longer-term average (Chart 101). These modest levels help to explain the low rates of household sector payment arrears in recent years (see Section 3.2). Mortgage arrears, in particular, have continued to fall to historical lows. Credit card arrears, however, have been rising since 1995, as has the proportion of credit card accounts moving from two to three payments overdue (according to data from APACS), probably reflecting increases in penetration of the household market, including to 'sub-prime' customers. The 12% increase in personal bankruptcies in the year to 2003 Q1, to the highest level since 1994 Q1, is a sign that some households are finding it more difficult to repay unsecured debts.

In assessing debt sustainability, it is necessary to consider what levels of income gearing might be associated with distress. According to the newly released British Household Panel Survey (BHPS)[52] for 2001, those households reporting problems in servicing their mortgage debt and those reporting two or more months of mortgage arrears had mortgage income gearing of 28.6% and 24.6% respectively in 2001, compared with 18.4% for households reporting no mortgage problems[53] (Chart 102). These differences have narrowed over time, largely reflecting a substantial fall since 1998 in mortgage income gearing of households reporting arrears, while that of the other two groups has remained broadly stable. But the proportion of households with mortgages that reported any form of distress was only 5% in 2001, well down on 1991. Similar findings on income gearing were reported in surveys carried out last year. Kempson (2002)[54] found that most individuals building up arrears over several months had income gearing in excess of 25%. According to a survey by B&W Deloitte commissioned by the FSA[55], average income gearing for families reporting it hard to make repayments was 24% for those with just mortgage debt, 18% for those with just unsecured debt and 31% for those with both kinds of debt.

The survey evidence identifies a subset of more vulnerable households with high income gearing who report difficulties in meeting their debt obligations. It also suggests that the gap between their income gearing and that of households not reporting problems may have narrowed in recent years. For the households reporting problems, even a small rise in interest rates or fall in incomes could mean that they are unable to service their debts. But this group remains a small proportion of the household sector as a whole, and there is little evidence as yet to suggest that it has been growing over time.

52: For more information on the BHPS, see Cox, P, Whitley, J D and Brierley, P G (2002) 'Financial pressures in the UK household sector: evidence from the British Household Panel Survey', Bank of England *Quarterly Bulletin* (Winter).

53: These estimates relate solely to households with mortgages and are therefore rather higher than those based on national accounts, which cover all households.

54: Kempson, E (2002) 'Overindebtedness in Britain', Personal Finance Research Centre.

55: Financial Services Authority (2003) 'Financial Risk Outlook', page 41.

**Chart 100:**
**Undrawn housing equity**[(a)]
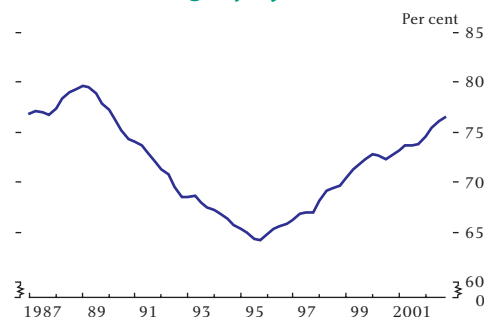


Sources: ONS and Bank of England.
(a) As a percentage of total housing wealth.

**Chart 101:**
**Household sector income gearing**[(a)]
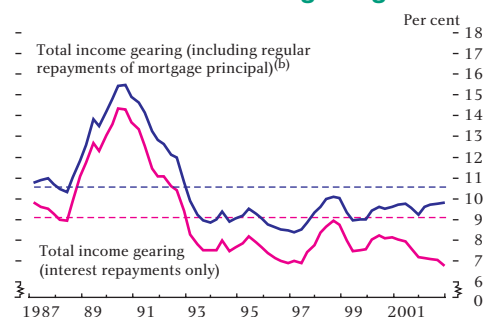


Sources: ONS and Bank of England.
(a) Dashed lines indicate averages from 1987 Q1 to 2002 Q4.
(b) See page 82 of the Jun. 2002 *Review* for how this series is constructed.

**Chart 102:**
**Mortgage income gearing of different households**[(a)]
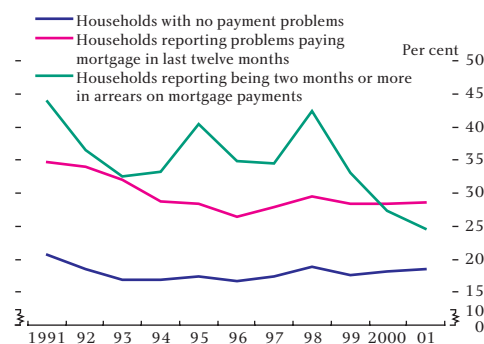


Source: British Household Panel Survey.
(a) Income gearing figures relate solely to mortgage-holding households.

# 3 The UK financial system

As Sections 1 and 2 have highlighted, the past six months have seen weaker growth than expected and a moderate but widespread deterioration in the short-run macroeconomic outlook both abroad and in the UK. This was accompanied by volatile equity markets, including sharp falls in March. This Section reviews the implications for UK banks and life insurers, which, together with pension funds, form the major part of the UK financial system (Chart 103).

## 3.1 The UK non-bank financial sector

### The impact of falling equity prices

Continued falls in equity prices during the first quarter of 2003 affected the UK's long-term savings institutions, notably life insurers. The UK life insurance industry has traditionally invested heavily in equities. Their equity holdings have been declining as a proportion of total assets in recent years, from 53% on average at end-1999 to 30% at end-2002 (Chart 104). In part this reflects the valuation effect of the fall in equity prices over the period (see Section 1.1). But they have also been net sellers of equities and purchasers of government and corporate bonds (which now account, on average, for 24% and 25% of total holdings respectively). Life insurers' reported financial strength – as measured by their free asset ratios – has continued to decline as asset prices have fallen (Chart 105). Concerns about their prospects were reflected in market indicators, such as their own share prices. Nevertheless, there have been no outright failures.

In part, firms have withstood this decline in asset values by making continued efforts to strengthen their balance sheets, following widespread capital-raising during 2002. In addition to reducing their equity exposure, either through outright sales or hedging in derivative markets, some have closed their with-profits funds to new business. Most have reduced payments to policyholders: reducing annual and final bonuses, and increasing 'market value adjusters' (ie reducing the value of policies that are cashed in before maturity). Dividend payments to shareholders have also fallen, again reflecting the need to conserve capital.

The industry has been aided in its efforts to manage its liabilities by the early introduction of elements of a new regulatory regime for life insurers by the Financial Services Authority (FSA). In January, the FSA announced its willingness to consider applications for waivers from elements of the existing regime on a case-by-case basis. A number of large insurers were subsequently granted such waivers, which have the effect of

adjusting measured liabilities or the yield used to discount liabilities[56]. This allows the FSA to apply greater discretion firm by firm, providing the firms can demonstrate to the FSA a sufficient margin of solvency under 'realistic' assessments of their liabilities (discussed in the article *Strengthening financial infrastructure* in this *Review*).

To date, policyholders and shareholders have felt the effects of pressures on the life insurance industry, but wider effects on the UK financial system have been limited.

### The impact on the large UK-owned banks

Six of the ten largest UK-owned banks have life insurance subsidiaries. They are typically small in relation to total balance sheet size – on average just 2%, and ranging up to 18% (Chart 106). Like others in Europe (see Section 1.3), UK bancassurers have experienced strains as a result of the developments summarised above. Pressures on a life insurance entity can affect the parent bank's income and Tier 1 capital – the latter through any need to inject capital or changes in subsidiaries' embedded value[57]. Indeed, many of the UK bancassurers earned lower income from life insurance during 2002.

In addition to any ownership ties, the large UK-owned banks have other exposures to the global insurance sector, both life and general. These include direct lending and off-balance-sheet counterparty exposures, as discussed in Box 1 in Section 1.1. Although, taken together, the direct lending exposures of the ten largest UK-owned banks to insurance companies in the UK are small, at around 5% of Tier 1 capital, total credit exposures to insurers – particularly US and EU companies – are material.

## 3.2 The UK banking sector

There are over 400 banks and building societies resident in the UK. Of these, the ten largest UK-owned banks[58] account for the largest share of both deposit taking and lending activity (Chart 107). This section therefore concentrates on these large UK-owned banks, while the smaller UK-owned banks and building societies, which together account for 26% of household deposits, are described in Box 6. Foreign banks provide a small part of UK households' and non-financial companies' banking

**Chart 106:**

**Life assurance assets as a proportion of total balance sheet size for the ten largest UK-owned banks[a]**
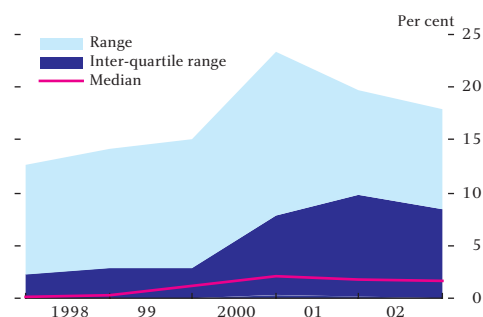


Source: Published accounts.

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

**Chart 107:**

**UK-resident financial institutions' UK-based banking services as at December 2002**
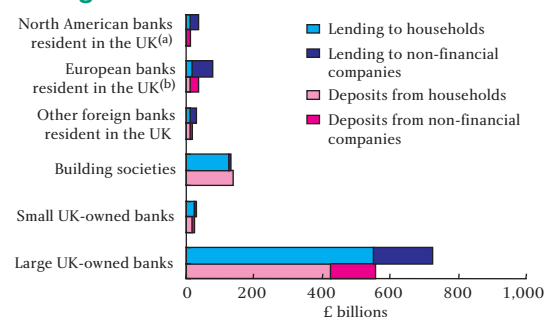


Source: Bank of England.

(a) 'North American banks' includes Canadian banks.

(b) 'European banks' includes Swiss banks.

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56: As life insurance firms' liabilities typically have long maturities, small changes in the discount rate used to calculate their present value can have a significant effect.

57: Embedded value is the value of business in force, plus the value of any net assets. Any increase is included within a bank's regulatory Tier 1 capital, as discussed in the December 2002 *Financial Stability Review*.

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

**Chart 108:**
**Credit default swap premia for large UK-owned banks and other firms[a]**
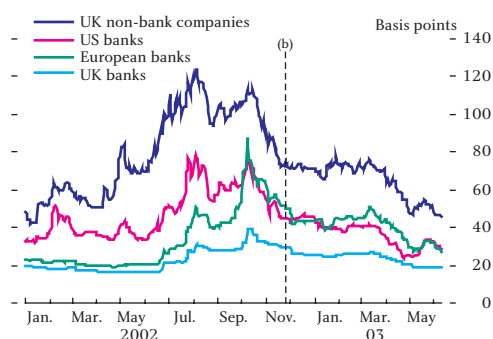


Sources: JP Morgan Chase & Co, CreditTrade and published accounts.

(a) Data are available for seven large UK-owned banks, 26 other FTSE-100 companies, 26 continental European and seven US banks. Individual company data are weighted by 2002 assets.

(b) Dec. 2002 *Review*.

**Chart 109:**
**Large UK-owned banks' twelve-month return on equity[a][b]**
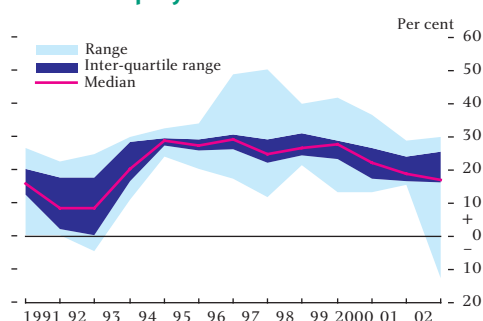


Sources: BBA, published accounts and Bank calculations.

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

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

**Chart 110:**
**Large UK-owned banks' Tier 1 capital ratios[a]**
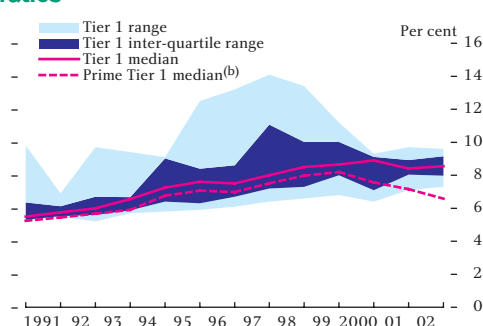


Sources: Published accounts and FSA regulatory returns.

(a) Please see footnote (a) in Chart 109 above.

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

services, but generally are heavily involved in wholesale markets. Overseas banking systems are discussed in Section 1.

The market's view of the large UK-owned banks' credit quality remains favourable – credit default swap premia have fallen slightly over the past six months and remain low relative to many foreign banks and other UK companies (Chart 108). Similarly, there was little change in rating agencies' views of UK banks.

## Profitability and capitalisation

Profits and capital enable banks to absorb losses arising within their portfolios. Although one bank reported a loss in 2002 – the first loss for one of the large UK-owned banks for around a decade – the pre-tax return on equity of most increased (Chart 109), and remained high relative to the average for other European banks (Chart 55, Section 1.3). The prolonged period of robust profits has also helped to maintain high capital levels.

For the large UK-owned banks, net interest income accounts for the largest share of total income (60%). Over the past six months, and despite a further decline in lending spreads, net interest income rose for most banks as retail lending growth remained rapid. Prospects for *future* income depend on both spreads and borrower demand. On the one hand, lending rates are likely to remain under some downward pressure because of continuing competition, of which the scale of remortgaging and introductory 'zero' interest rates on credit cards are reportedly indicators. On the other hand, not all of the most recent repo cut was passed through to customers, and competition over fees has, according to Bank contacts, been less marked – fee income generally rose slightly over the period. Households' demand for borrowing continues to be influenced mainly by the housing market, as discussed in the May 2003 *Inflation Report*. The MPC's central projection is that house price inflation will slow to a halt over the next year or so. This may suggest that growth in banks' secured lending to households will be less rapid, although Bank contacts were not expecting growth to slow markedly.

Annual accounts for 2002 reported high Tier 1 capital ratios for all the large UK-owned banks (Chart 110). Some of the components of Tier 1 capital are, however, potentially less able to meet losses than common equity, given that they carry debt-servicing obligations that may be less easy to defer. The use of such non-equity instruments has increased somewhat in recent years, as discussed in the December 2002 *Review*. UK regulators are consulting on their likely future stance towards these instruments[59]. The banks' published Tier 1 ratios would, however, typically remain high even if such non-prime capital were excluded.

59: 'Tier 1 capital for banks: update to IPRU (Banks)', FSA consultation paper 155, October 2002.

## Asset growth, funding and liquidity

Growth of consolidated balance sheets slowed for most of the large UK-owned banks during the second half of 2002. But, at 7%, annual growth remains strong relative to other major banking sectors. Lending to households grew particularly strongly, although the large UK-owned banks' increased use of securitisation removed some of this lending from their balance sheets. Indeed, during the first quarter of 2003 new securitisations totalled some £10 billion.

Over the past six months, the large UK-owned banks' lending to UK household customers continued to grow rapidly, even after securitisations, and exceeded the strong growth in UK households' deposits. The implications for *households* of their net indebtedness to banks are discussed in Section 2.3. For the *banks*, the excess of lending over deposit growth has been funded in wholesale markets. Non-bank deposits now account for just 55% of the large UK-owned banks' liabilities (Chart 111). Of the wholesale instruments, marketable securities (14%) and deposits from banks (10%) – including foreign banks – are important. Use of notes and bills has increased over the past six months.

Wholesale funding has different characteristics from household deposits: it is typically more expensive, lumpier and more volatile. These factors combine to pose challenges for banks' liquidity management. For the large UK-owned banks, the regulatory measure of their liquidity – the Sterling Stock Liquidity Ratio (SLR) – remains broadly stable (Chart 112). Under the SLR regime, the required holding of high quality assets[60] – those eligible in the Bank of England's open market operations – is determined in relation to a measure of potential sterling outflows. Although there is no all-currency quantitative requirement[61], banks' accounts for 2002 suggest that total holdings of liquid assets as a proportion of balance sheets were little changed.

## Credit risk

According to backward-looking indicators, the credit quality of the large UK-owned banks' asset portfolios was little changed over the past six months (Chart 113). Such indicators may, however, underestimate changes, given rapid loan growth and possible lags in accounting recognition of changes in credit quality. While most Bank contacts suggest that there has been some deterioration in their corporate portfolios, the credit quality of lending to households, particularly in the UK, reportedly remains high. Sections 1 and 2 have highlighted some slight deterioration in the macroeconomic environment for the large UK-owned banks relative to expectations six months ago.

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60: Banks can also use a limited amount of certificates of deposit. They are excluded from Chart 112 because as 'inside' assets they might not help absorb system-wide strains.

61: The FSA are currently preparing a consultation paper setting out changes to the liquidity regime in the UK.

# Box 6: Small UK-owned banks and building societies

## Chart A:
## Composition of small UK-owned banks' and building societies' assets, 2002 H2[a]

As a percentage of total assets

- ■ Building societies' median
- ■ Building societies' inter-quartile range
- ■ Small UK-owned banks' median
- ■ Small UK-owned banks' inter-quartile range



Claims on: Non-residents, Public sector, UK-resident banks, Non-bank private sector

Sources: Bank of England and FSA regulatory returns.

(a) Data are UK-resident only. Data only available for 24 of the larger building societies.

## Table A:
## Profitability and capitalisation of small UK-owned banks and building societies, 2002 H2[a]

| | Return on assets (per cent) | | | |
|---|---|---|---|---|
| Risk asset ratio (per cent) | less than 0 | 0 to 1 | 1 to 5 | more than 5 |
| 0 to 10 | 0 (0) | 0 (0) | 0 (0) | 0 (0) |
| 10 to 15 | 2 (0) | 2 (36) | 2 (0) | 0 (0) |
| 15 to 20 | 1 (0) | 4 (23) | 6 (0) | 1 (0) |
| 20 to 30 | 1 (0) | 1 (5) | 5 (0) | 0 (0) |
| 30+ | 5 (0) | 3 (1) | 6 (0) | 3 (0) |

Source: FSA regulatory returns.

(a) Values refer to the number of banks (building societies) in each bucket.

## Chart B:
## Real twelve-month growth rates of small UK-owned banks' and building societies' assets[a]

- ■ Building societies' inter-quartile range
- ■ Small UK-owned banks' inter-quartile range
- — Building societies' median
- — Small UK-owned banks' median

Per cent



1997 98 99 2000 01 02
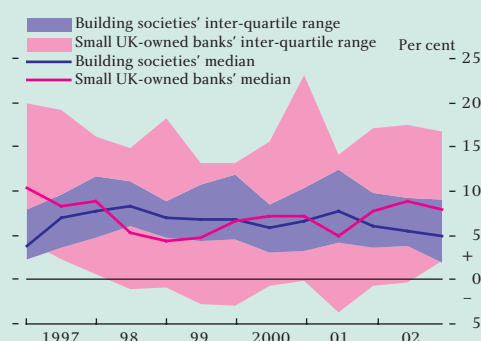
Sources: FSA regulatory returns and ONS.

(a) Nominal growth rates deflated by prevailing twelve-month RPIY inflation.

By asset size, the 42 smaller UK-owned banks (£57 billion) and 65 building societies (£193 billion) are a small part of the UK financial system – the ten largest UK-owned banks have assets of £2,148 billion. Interest in the small UK-owned banks and building societies is motivated by a concern that they may be vulnerable to a common shock, and indeed a number of small UK-owned banks failed at about the same time during the early 1990s[1].

The pattern of lending and hence exposures to risks differs between the two sectors (Chart A), although credit risk within the UK is most important for both. Building societies' lending is largely residential mortgages, in part reflecting statutory restrictions. There has, however, been some slight expansion into newer areas, such as commercial property (Chart 118). The small UK-owned banks are considerably more diverse, but lending to the UK private sector again dominates. As discussed in the UK's Financial System Assessment Programme (Box 1, page 74 in this *Review*), both sectors hold large claims on banks.

The small UK-owned banks are, on the whole, profitable and report high capital ratios. There is, however, considerable variation across the sector and, historically, small banks' profits have been more volatile than those of larger banks. Around 20% of small UK-owned banks made losses during 2002, and for many this followed losses during 2001. Profitability has, moreover, declined across the sector. Losses within the small UK-owned banking sector in 2002 typically reflected a failure to generate revenues rather than credit losses. The loss-making banks' capital ratios were typically high and some of the banks have potential access to non-bank parents.

The building societies also report high capital ratios (Table A) and the quality of their capital appears high – being largely Tier 1 retained reserves. Profitability of building societies is lower, possibly reflecting their mutual status, but none of the current building societies has made a loss in the past.

Rapid growth of assets has been established as a leading indicator of future failure for smaller banks[2]. Current rates of growth for small UK-owned banks are diverse but no higher now than over much of the past decade (Chart B), and some banks continue to shrink. The building societies' asset growth has slowed over the past six months, but the sector has broadly maintained its share – around 18% – of the UK mortgage market.

1: See Logan, A (2000), 'The early 1990s small banks crisis: leading indicators', *Financial Stability Review*, December.

2: See, for example, footnote 1 and Bell, J, and Pain, D (2000), 'Leading indicator models of banking crises', *Financial Stability Review*, December.

The impact of this on banks' future credit quality will depend on the composition and management of banks' balance sheets.

UK exposures remain, on average, a majority of total *on-balance-sheet* assets for the large UK-owned banks (Chart 114), and so the UK environment will have a material bearing on the overall quality of portfolios. Domestic exposures are largely to households and non-financial companies, some of which arise through the lending of banks' non-bank subsidiaries (for example, asset-backed lending[62]). Growth of lending to UK households and some corporate sectors remained strong over the past six months and has largely driven overall domestic balance sheet growth. Lending within the UK to other banks and non-bank financial institutions forms an important link amongst banks, as discussed below.

Overseas exposures amount to some nine times Tier 1 capital for the large UK-owned banking sector. The USA remains the largest country exposure (Chart 115) and prospects for the USA are examined in Section 1.2. Over the past five years, all large UK-owned banks have expanded their lending in the USA, driven in part by acquisitions of local banks and finance companies. Lending through local branches and subsidiaries accounts for the majority of exposures in the USA, as well as in Hong Kong.

Notwithstanding the growing importance of local lending in foreign countries, lending cross-border remains about four times Tier 1 capital. Of this, public sector exposures are just 15% – half of which are within Europe. Cross-border lending to banks is some 40%, and whilst default rates on such lending have been very low, it is a potential channel through which any problems overseas could be transmitted into the UK banking sector. The remainder of total cross-border lending – and almost twice Tier 1 capital – is to non-banks, particularly in USA and Europe. Such lending is typically to larger companies and US exposures have seen a marked increase over the past year.

*Corporate exposures*

According to Bank contacts, there has been some mild deterioration in the credit quality of corporate lending during the past six months, driven mainly by larger companies. Lending to individual large firms potentially increases the scale of any losses for banks – as highlighted by recent provisions against the debts of some very large companies. Moreover the largest UK-owned banks do have some *common* exposures to some very large – often US – companies. Recently, UK-owned banks may have increased their share of the global syndicated lending market (Chart 116), following a withdrawal of foreign banks (Section 1.1 and 1.3).

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62: See, for example, Hewitt, A (2003), 'Asset Finance', Bank of England *Quarterly Bulletin*, Summer.

**Chart 114:**

**Large UK-owned banks' domestic claims as a proportion of on-balance-sheet assets[(a)]**
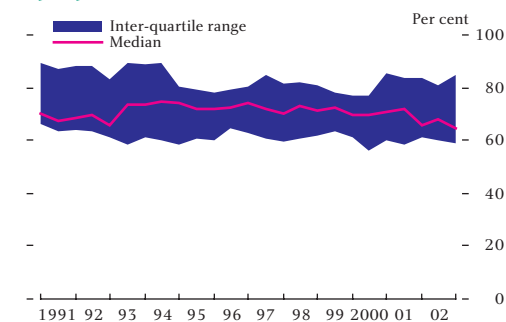


Sources: Bank of England and FSA regulatory returns.

(a) Domestic claims are calculated as the residual between total assets and foreign claims.

**Chart 115:**

**Large UK-owned banks' foreign claims[(a)]**
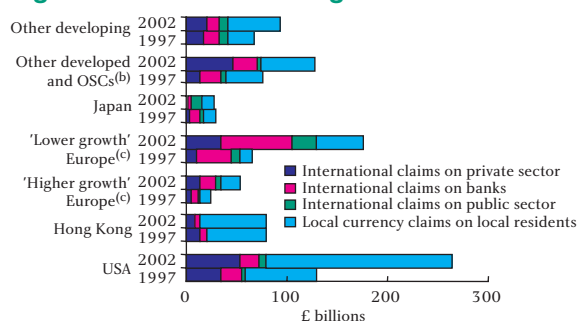


Source: Bank of England.

(a) All claims are gross of risk transfer. For detail see Box 3, page 47 in the Dec. 2001 *Review*.

(b) 'Other developed' excludes Japan. OSCs (offshore centres) excludes Hong Kong.

(c) 'Lower growth' EU countries are those, as detailed in Section 1.3 Chart 46, with expected real GDP growth for 2003 of less than 1.5%. 'Higher growth' Europe includes all others.

**Chart 116:**

**Large UK-owned banks' share of new worldwide syndicated lending[(a)(b)]**
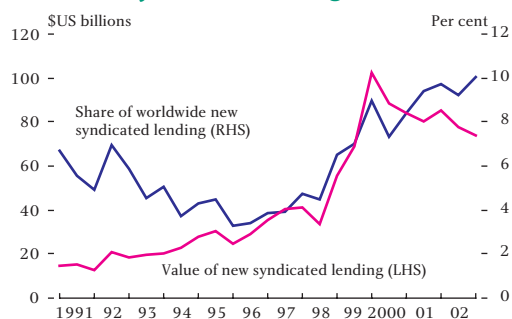


Source: Dealogic.

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

(b) 2003 data as reported at 13 Jun. 2003 and pro-rated to a six-month equivalent.

**Chart 117:**

**Large UK-owned banks' UK-resident claims on UK non-financial companies**[a]



As percentage of Tier 1 capital

| | | |
|---|---|---|
| Manufacturing | 2002 | (52) |
| | 1997 | (77) |
| Transport, storage and communication | 2002 | (22) |
| | 1997 | (16) |
| Commercial property | 2002 | (82) |
| | 1997 | (42) |
| Hotels and restaurants | 2002 | (18) |
| | 1997 | (16) |
| Other non-financial corporations | 2002 | (144) |
| | 1997 | (150) |

■ Drawn facilities
■ Undrawn facilities

£ billions
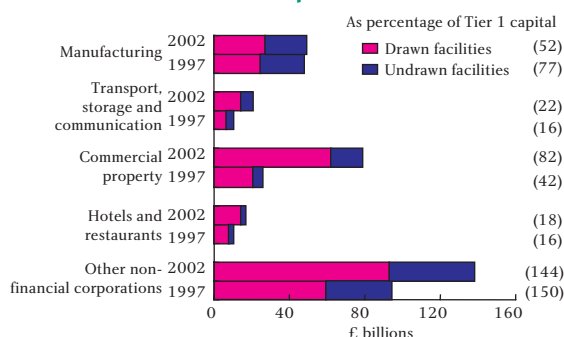
Sources: Bank of England and published accounts.

(a) Figures in brackets show large UK-owned banks' total facilities as a percentage of Tier 1 capital.

**Chart 118:**

**UK lenders' commercial property lending, by type of underlying project**[a][b]



■ Total loans outstanding (building societies)
■ Total loans outstanding (banks and other non-building society lenders)

£ billions
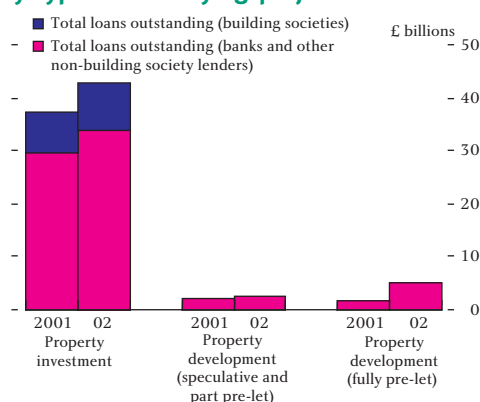
Source: De Montfort University study.

(a) UK-owned banks account for 85% of the surveyed UK lenders' (excluding building societies) exposures.

(b) The De Montfort study accounts for around two-thirds of the UK-owned banks' total UK commercial property loans.

**Chart 119:**

**Incidence of higher loan-to-value ratios on new UK retail mortgages**[a]



Per cent
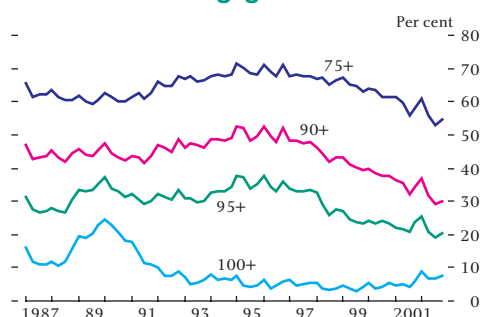
Source: Council of Mortgage Lenders.
(a) By number of loans.

Despite signs of corporate balance sheet adjustment, some firms, sectors and regions remain vulnerable. Section 2.2 discussed the credit conditions of the UK corporate sectors. Of these, commercial property is the most material for the large UK-owned banks and, in aggregate, now accounts for more than a quarter of their total lending to UK non-financial companies. Growth of exposures to commercial property continues to be driven by a few banks and has been marked in recent years (Chart 117), which may present risk management challenges. Prospects for the credit quality of banks' exposures are uncertain. On the one hand, Section 2.2 discusses the possibility of a deterioration in borrowers' ability to maintain payments, and valuation of commercial property is typically more uncertain than for residential property, because the market is even less liquid. On the other hand, most lending is reportedly for established properties (Chart 118) and exposures are secured. Loan-to-value (LTV) ratios have, on average, fallen over the past year, although there are reports of lending at high LTVs.

Section 1.2 discussed the US corporate environment. UK banks have significant exposures to US companies, both locally and cross-border, and backward-looking indicators may suggest some slight deterioration in the credit quality of lending to US companies since the December 2002 *Review*. UK banks' European corporate exposures – particularly in Ireland, France and the Netherlands – are also significant. Prospects for economic growth have, as described in Section 1.3, fallen across Europe and remain low for many countries. Such a decline in economic conditions could have implications for the quality of UK banks' exposures.

*Household exposures*

The large UK-owned banks' domestic household exposures continue to increase – now amounting to around £550 billion or almost six times Tier 1 capital. The majority of these exposures are residential mortgages. Lenders therefore typically incur material losses only if the borrower defaults and house prices fall far enough to leave negative equity. House price falls would need to be significant to generate widespread negative equity, given that most of the large UK-owned banks estimate that the average LTV across their stock of existing mortgage lending is below 50%. Low LTVs on the overall stock reflect repayments and house price rises since the loans were made, despite remortgaging and mortgage equity withdrawal. Recent lending is more vulnerable to house-price falls but is typically quite a small percentage of the total mortgage stock. Moreover the incidence of high LTV lending appears lower than during the late 1980s (Chart 119).

There are, however, some differences in mortgage lending practice between now and the late 1980s that may, at the margin, increase the sensitivity of lending to macroeconomic changes. The use of mortgage indemnity guarantees has declined sharply,

as discussed in the June 2002 *Review*. Provision of buy-to-let lending has increased rapidly, and, while this represents only 5% of the overall stock, it is more material for some banks. Buy-to-let arrears are currently below those on other mortgages, although borrower behaviour under stress remains untested. Banks are similarly still amassing data on the behaviour of borrowers who have taken on lending in new products, such as 'flexible mortgages'. Use of securitisation has increased, which, while allowing banks to move exposures off their balance sheets, may not entirely remove the associated risks. Although retained positions are typically small, banks require robust operational controls to manage the legal process of securitisation.

Losses on domestic mortgage lending did not present a major financial problem for the large UK-owned banks even during the early 1990s when house prices were falling. Domestic mortgage arrears are currently at historical lows (Chart 120) and, looking forward, in the light of the MPC's macroeconomic projections, they seem unlikely to rise far enough to generate losses even as large as those of the early 1990s. There is also little indication of market concerns: the spreads at which UK banks are issuing mortgage-backed securities (MBS) are little changed (Chart 121) and issuance volumes continue to grow. Bank contacts nevertheless report some pre-emptive action – for example tightening maximum LTV limits on higher-risk lending.

The large UK-owned banks' overseas mortgage lending, while smaller, has similarly seen little strain to date although macroeconomic conditions in Hong Kong have been difficult (Section 1.5). US mortgage exposures amount to some US$40 billion and there has been little change in arrears, as discussed in Section 1.2.

Unsecured exposures to UK households are smaller than mortgage exposures – at around £120 billion – but have continued to grow rapidly, particularly on credit cards. Bank contacts report little deterioration in the credit quality of their unsecured portfolios. Whilst credit card arrears have risen – in part with increased penetration – this has yet to be reflected in write-offs (Chart 122). Fraud is a further source of losses on credit card portfolios, which reportedly[63] reached a new high during 2002 of over £420 million – by comparison write-offs were around £1 billion.

The credit quality of banks' unsecured lending portfolios will be vulnerable to similar macroeconomic shocks as mortgage and corporate lending. Indeed it may, according to Bank contacts, form a leading indicator of overall household credit quality. Stress testing is the best means, despite its flaws, of assessing a common vulnerability to macro-shocks – as described in the

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63: 'Card fraud: the facts, 2003', APACS.

**Chart 120:**

**UK-resident financial institutions' arrears on UK mortgage lending**[(a)]
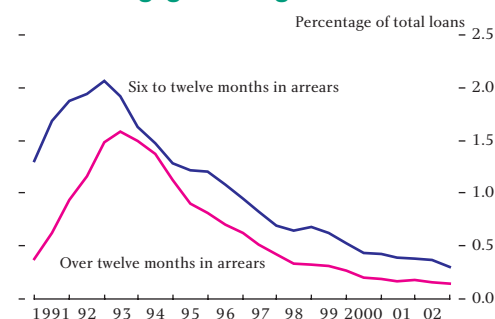


Source: Council of Mortgage Lenders.

(a) UK-resident financial institutions are those banks, building societies and other lenders who are members of the CML and who, together, undertake around 98% of all residential mortgage lending in the UK.

**Chart 121:**

**Spreads at issue on residential MBS issues by large UK-owned banks**[(a)]
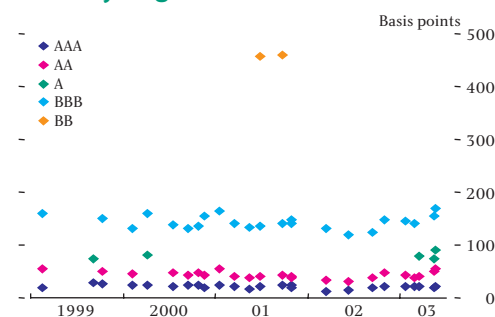


Source: Bondware.
(a) Spreads at issue above libor and euribor.

**Chart 122:**

**UK-owned banks' twelve-month write-off rate on UK credit cards**[(a)]
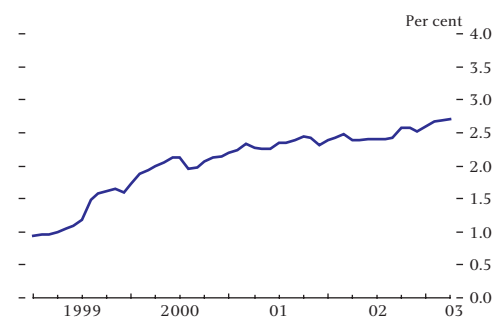


Source: Bank of England.

(a) The series will differ from that in the Bank of England's published statistics as data have been adjusted to reflect a bank's change in accounting methodology.

article *Assessing the strength of UK banks through macroeconomic stress tests* in this *Review*. The stress test results reported in the recent UK Financial System Assessment Programme (FSAP)[64] suggested that the large UK-owned banks appeared robust to large shocks, including market price moves, across their portfolio.

## Market risk

Rather less detailed data are available on market risks, to which banks are exposed through a variety of channels: through their trading book; any unhedged interest rate exposures in their banking books; and any equity holdings outside the trading book – for example through insurance subsidiaries, investment funds and defined-benefit pension schemes.

Trading book assets typically remain a small part of the large UK-owned banks' balance sheets – on average 10%. As measured by average value at risk (VaR), UK-owned banks take less market risk through the trading book than many other large financial institutions. Their reported maximum VaR is also lower (Chart 123). Interest rate risk remains the largest component of UK banks' VaR, with both foreign exchange and equity risk reportedly negligible.

Value at risk is, however, not a complete measure of market risk. Interest rate risk also arises on the banking book as a result of the banks' role in providing maturity transformation. The asset-liability mismatch profile of the large UK-owned banks appears little changed since the December 2002 *Review*. While banks' earnings could be affected by very significant movements in the yield curve, option prices suggest that such a large move is unlikely. The large UK-owned banks' direct holdings of equities are minimal, but the banks also hold equities in their life insurance operations (as discussed above) and in their own defined-benefit pension funds. All of the large UK-owned banks disclosed pension fund deficits. And while the funding position of schemes was generally in line with the FTSE 100 average, banks' deficits were relatively smaller in relation to market capitalisation.

## Links between financial institutions

The large UK-owned banks interact with banks and other financial institutions both in UK and overseas markets. Such links arise from a variety of activities: direct lending – often for liquidity management; as counterparties in OTC derivatives transactions; as members of payment and settlement systems; or via provision of services to other banks and financial firms – for example, correspondent banking and prime brokerage.

**Chart 123:**

**Indicative average trading book VaR as a percentage of total shareholders' funds**[(a)(b)]
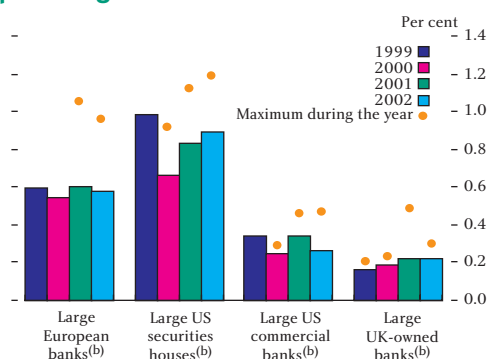


Sources: Published accounts and Bank calculations.

(a) For comparability purposes, published VaRs have been adjusted to a ten-day holding period and a 99% confidence interval. This assumes independent and normally distributed returns.

(b) Median of the average and maximum for those large UK-owned banks and LCFI members reporting VaR results. See Dec. 2002 *Review* for LCFI population.

64: www.imf.org/external/pubs/ft/scr/2003/cr0346.pdf.

*Direct lending*

The large UK-owned banks' largest financial system exposures arise through interbank lending (Chart 124). Lending to banks within the UK accounts for a significant proportion of their exposures, but overseas interbank lending is also important. The large UK-owned banks' total interbank lending has declined over the past year, reflecting, in part, both an increased net need to borrow funds and some reported deliberate withdrawal.

The UK interbank market remains large and, according to monetary data, predominantly unsecured. The large UK-owned banks are a material part of the UK interbank market but their involvement is less marked than the data might suggest. Mergers and acquisitions over the past five years have created larger groups of UK banks and hence more intra-group lending, which inflates the interbank figures (Chart 125). As intra-group lending is often unsecured, it is also likely that the unsecured portion of the UK interbank market is materially overestimated, though nonetheless significant – as discussed in the UK's FSAP (summarised in this *Review's Strengthening financial infrastructure* article).

Section 1.1 reviewed the position of internationally active banks and LCFIs in particular. Such entities are also an important part of the UK interbank market: foreign banks account for 18 of the top 30 lenders and 20 of the top 30 borrowers. The large UK-owned banks also have cross-border exposures to foreign banks, of which lending to German banks remains most important.

Other entities such as insurance companies, large non-financial companies, money market funds and securities dealers are also active investors in money market instruments[65] and an important part of banks' funding and liquidity management.

*Off-balance-sheet counterparty exposures*

The large UK-owned banks' counterparty claims under derivative contracts have continued to grow: from £44 billion at end 2001 to £50 billion at end 2002. Growth of over-the-counter (OTC), rather than exchange-traded, derivatives has been most marked, and the banks' counterparties are typically other banks and securities dealers. The large UK-owned banks, like others, have made increased use of netting and collateral to manage these counterparty exposures (Chart 126), such that the net value of exposures is little changed.

An alternative approach to managing counterparty risk in derivative contracts is to use a central counterparty (CCP). They have been widely used for many years for exchange-traded contracts but are being increasingly employed to clear OTC

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65: The UK's money markets are discussed more fully in the regular *Markets and operations* article in the Bank of England *Quarterly Bulletin.*

**Chart 124:**

**Large UK-owned banks' financial system exposures relative to Tier 1 capital**
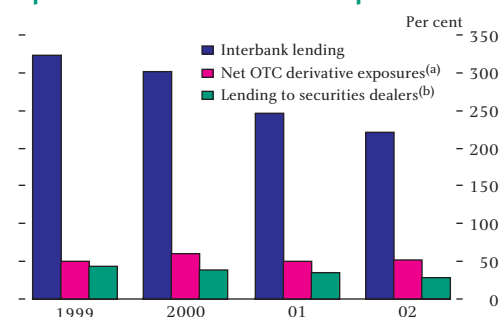


Sources: Published accounts and Bank of England.

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

(b) Lending to UK-resident securities dealers.

**Chart 125:**

**UK-resident banks' participation in the all-currency UK interbank lending market(a)**
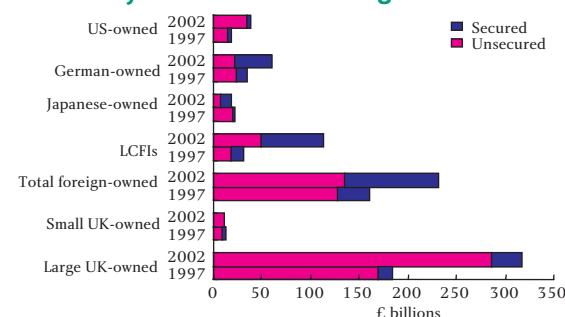


Source: Bank of England.

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

**Chart 126:**

**Large UK-owned banks' percentage reduction in derivative exposures as a result of netting and collateral(a)(b)**
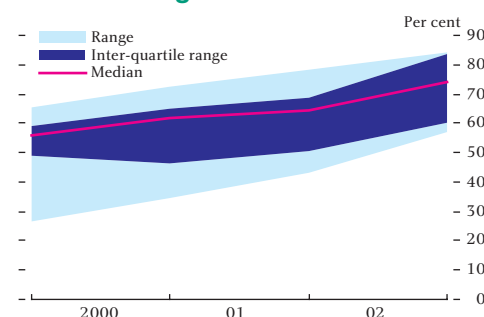


Source: Published accounts.

(a) Derivative exposures measured by replacement cost.

(b) For those banks reporting sufficient information.

markets. Whilst a CCP serves to reduce banks' bilateral exposures, in the process risks are concentrated on the CCP itself. In 2002, London Clearing House (LCH) cleared some 370 million contracts and, for example, held US$11 trillion in swaps contracts at the end of April 2003. This highlights the importance of good risk management by CCPs[66] and the need for legal certainty in relation to their rules and procedures. LCH's recent designation under the Settlement Finality Directive is, in this context, an important further advance – as discussed in the *Strengthening financial infrastructure* article in this *Review*.

*Payment and settlement activity*

The large UK-owned banks are members of various payment and settlement systems, here and abroad. System design can mitigate or reduce *credit* risk between system members. For example, CHAPS Sterling and CHAPS Euro – the UK's high value payment systems – provide real-time gross settlement. Advances continue to be made, for example the movement of money market instruments' settlement to a full delivery versus payment environment in CREST, discussed in the *Strengthening financial infrastructure* article.

However not all business flows through any particular system. For instance, Continuous Linked Settlement (CLS), which was an important advance in forex settlement (Chart 127), probably only currently settles around an estimated 25% of all FX transactions[67]. CHAPS Sterling has only twelve direct members, so some members provide substantial payment services to other banks. The values involved can be significant, underlying the need for the intra-day (and usually unsecured) exposures of members to their customers to be properly managed. The role of system members in providing payment services to other banks also highlights the importance of their internal operational controls. Furthermore, risks remain even within well-designed systems. For example, developments such as CLS have increased the importance of members' liquidity management[68]. The following article discusses recent developments in enhancing market infrastructure and provides an update on the Bank's oversight of UK systems.

**Chart 127:**
**Daily values settled in CLS**[(a)(b)]
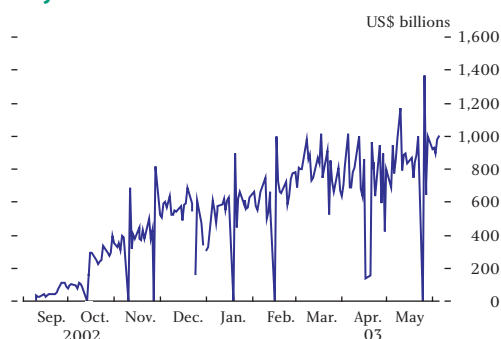


Source: CLS Bank International.

(a) Each trade consists of two sides.

(b) Values settled in CLS are typically very low on US holidays, accounting for the six lowest daily settlement values. The values settled on days around Easter 2003 were also low.

66: Hills, Rule, Parkinson and Young (1999), *Financial Stability Review*, June.

67: This estimate is based on the 2001 BIS triennial survey of forex market activity.

68: Box 3 in *Strengthening financial infrastructure* in this *Review* explores whether CLS has led to increased liquidity pressures in CHAPS.

# Strengthening

# financial infrastructure

**SINCE THE DECEMBER *REVIEW***, central banks, other public authorities and the private sector have taken a number of measures designed to strengthen financial infrastructure, thus reducing the likelihood of crises. Steps have also been taken to improve the framework for crisis management. This article reviews the most significant initatives. Further noteworthy developments are briefly summarised in Box 5.

In addition, the annex to this article provides an update on the Bank of England's activities in overseeing payment systems.

## Law and financial regulation

*Progress on the new Basel Accord*

On 29 April 2003, the Basel Committee on Banking Supervision (BCBS), of which the Bank and the FSA are members, released its third Consultation Paper (CP3)[1] on the proposed new Basel Capital Accord (Basel II). This was informed by a third quantitative impact study (QIS 3) on the effects of the proposals on banks' regulatory capital requirements[2].

The new Accord comprises three 'pillars' – Pillar 1 (minimum capital requirements), Pillar 2 (supervisory review of capital adequacy) and Pillar 3 (public disclosure).

QIS 3 tested the calibration of Pillar 1 and the appropriateness of the Pillar 1 rules, confirming that the BCBS' objective of maintaining broadly the current levels of capital in the system as a whole was being met. For most banks, QIS 3 showed a reduction in the capital requirement against credit risk, mainly reflecting the nature of their retail portfolios (and in particular their residential mortgage lending). This is shown in Chart 1, which sets out, for major G10 banks, capital requirements under the advanced internal ratings based (IRB) approach relative to current levels, broken down by portfolio type. Chart 1 also shows the impact of the new charge for operational risk.
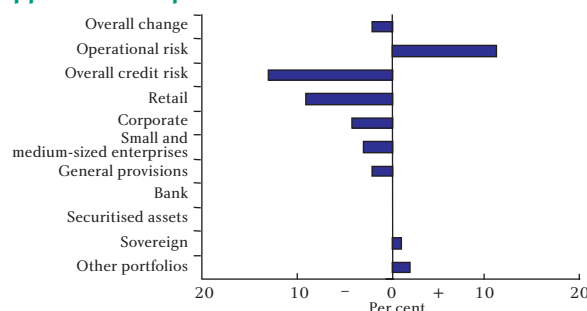
Source: Basel Committee on Banking Supervision.

In light of the results of QIS 3, CP3 included amendments to a number of proposed Pillar 1 rules. These involve targeted reductions in minimum capital requirements under the standardised approach (a lower 35% risk weight for residential mortgages and more generous treatment of specific provisions) and fine-tuning of the rules for the more sophisticated IRB approaches. The IRB changes include floors for at least two years on capital requirements for retail exposures and a new capital charge for 'high volatility commercial real estate' exposures (imposed at national discretion). An alternative standardised treatment for operational risk will be available for use with any of the three credit risk approaches (at local supervisory discretion).

Although Pillar 1 has attracted most attention, the other two Pillars are of no less importance.

Pillar 2 enables supervisors to impose discretionary capital requirements (and take other supervisory actions) in addition to the Pillar 1 charges, so as to deal with risks inadequately covered under Pillar 1. Pillar 2 capital assessments will also encourage intensified dialogue between banks and supervisors concerning the risk in banks' businesses.

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1: www.bis.org/bcbs/bcbscp3.htm.

2: An overview of the results of QIS 3 was published by the BCBS on 5 May 2003, with further supplementary information provided on 27 May 2003. The documents are available from www.bis.org/bcbs/qis/index.htm.

# Box 1: The IMF/World Bank assessment of the UK financial sector

The joint IMF/World Bank Financial Sector Assessment Programme (FSAP) makes in-depth assessments of the soundness of countries' financial systems. Introduced in May 1999 and supported by experts from a range of national agencies and standard-setting bodies, the programme seeks to identify the strengths and vulnerabilities of a country's financial system and to determine how key sources of risk are being managed. The UK financial system was examined during the course of 2002 and the main findings were published on 3 March 2003[1]. As well as providing an assessment of the overall stability of the UK financial system, the published report also includes summary assessments of the UK's compliance with the relevant international standards. This Box provides a summary of the FSAP team's main conclusions, drawn from the IMF's Overall Stability Assessment.

The IMF assessment team concluded that overall the UK benefits from a strong financial stability policy framework. Nevertheless, they made some technical recommendations in a number of areas to make the framework even stronger. The UK authorities recognise the significance of these issues and in most cases already had programmes under way to address them; details of specific initiatives can be found elsewhere in this article[2].

*Institutions, markets, and infrastructure*
The IMF team concluded that the UK's large and sophisticated financial sector features fundamentally sound and highly developed financial institutions, markets and infrastructure. They made the following specific comments:

'Based on a variety of quantitative approaches alongside more qualitative analysis, UK banks ... appear sufficiently profitable and well capitalised overall to be able to absorb the effects of the more likely shocks without major distress. … In contrast, the insurance industry sector is under considerable stress, especially the life and private pensions sector. … The difficulties in the insurance sector, while significant, do not currently appear to constitute a

systemic vulnerability.… Nevertheless, close monitoring of the situation is clearly required.…'

'… The UK financial exchanges function well. …The London Stock Exchange (LSE) and the London International Financial Futures Exchange (now Euronext.liffe) have taken steps to enhance their trading systems and adapt their rules to ensure their markets remain attractive to investors.'

'While the unsecured interbank sector of the money market functions well, it could potentially act as a contagion channel in the unlikely event that a major participant experienced financial distress. The traditional structure of the UK banking system (a few large, direct clearing banks, and a large number of smaller, indirect clearers) may exacerbate this risk, since the smaller institutions tend to hold most of their liquidity in the form of unsecured deposits with the largest institutions. … The authorities were encouraged to continue intensifying their surveillance of these exposures, so that they can obtain a better sense of the distribution of these claims in the banking system.'

'The global financial market activity that takes place in London does not appear to pose significant risks to the stability of UK financial markets.'

'... With respect to the infrastructure, major reforms of the UK payments and securities settlement systems have been made in recent years and the CHAPS and CREST systems are of a very high standard internationally. ... The authorities are rightly focusing on bringing the settlement of money market instruments into the CREST real-time delivery-versus-payment (DvP) arrangement and on addressing the payment arrangement for the central counterparty clearing house, LCH, which results in large albeit short-lived intraday exposures. The authorities were encouraged to continue their work on resolving these issues, ... and also to continue seeking risk management improvements in BACS, the largest retail payment system.'

1: www.imf.org/external/pubs/ft/scr/2003/cr0346.pdf.

2: See also the article *Assessing the strength of UK banks through macroeconomic stress tests* in this *Review* for further details of the quantitative approaches employed to assess the stability of the banking system.

*Institutional and policy framework for financial stability*
The IMF concluded that the UK financial stability policy framework had been significantly strengthened in a number of ways in recent years, and that in many respects it was at the forefront internationally. The assessment team noted that:

'… A great deal of thought has gone into making the institutional structure work – how to sharpen focus, accountabilities, and transparency; and how at the same time to encourage and facilitate co-ordination between the main players under the umbrella of the financial stability Memorandum of Understanding and the associated Financial Stability Standing Committee….'

'… It seems fair to characterise the UK supervision regime as somewhat less prescriptive overall than in some other countries, but with relatively more emphasis on policies to promote good corporate governance and market discipline. Regulatory principles on the responsibilities of owners/managers and proportionality of regulation are noteworthy in this context. Continued further efforts to promote market discipline … may be necessary to complement and underpin the UK supervisory philosophy.'

'Broader financial sector surveillance is a key component of an overall stability policy regime; thus, the work and publications of the Bank of England and the FSA reflect a considerable emphasis on financial stability analysis and research. … The authorities were encouraged to continue to standardise and extend the availability of aggregate financial soundness indicators, and to consider the scope for using macro-financial stress testing analysis … as an ongoing instrument of stability analysis.'

'The safety-net arrangements and underlying legal framework for failure management enable the UK authorities to effectively manage instances of serious financial difficulties in financial institutions.'

*Supervisory, transparency and market integrity standards*
The IMF team were generally positive about the UK's compliance with the relevant international standards, but made some recommendations, which the UK authorities agreed to examine from a cost-benefit

perspective. In some cases, the recommendations merely confirmed the importance of existing initiatives. The IMF commented in particular that:

'The quality and effectiveness of financial sector supervision in the UK is strongest in the banking and securities areas. … The FSA either fully or largely observes the Basel Core Principles for Effective Bank Supervision and the International Organisation of Securities Commissions (IOSCO) Objectives and Principles of Securities Regulation. ... Some further technical improvements were suggested. ... For banking supervision, in particular, the issues mainly revolved around strengthening 'baseline' supervision (ie the elements applying to all supervised financial institutions, irrespective of their risk/impact rating) and ensuring strong assessments of systems and controls.'

'In the case of the insurance industry, UK authorities are developing proposals to significantly strengthen supervision. … Although the UK observes the regular prudential International Association of Insurance Supervisors (IAIS) Core Principles, the proposed reforms are likely to deal with most of the weaknesses observed in the current supervisory framework relative to the enhanced standards that are more pertinent for an advanced and international insurance centre like the UK.'

'With respect to the oversight of payment and securities settlement systems, the major progress in infrastructure reform in recent years illustrates how these functions have been significantly improved. Assessments against the relevant standards … show a high degree of observance.'

'The authorities' strong commitment to policy transparency is reflected in the assessments of a very high degree of observance of the IMF Code of Good Practices on Transparency in Monetary and Financial Policies.'

'The UK has a comprehensive legal, institutional and supervisory regime for anti-money laundering and counter-terrorist financing. … Further improvements are expected once key provisions of the Proceeds of Crime Act 2002 become effective.'

Pillar 3 aims to reinforce capital regulation and other supervisory efforts by requiring more extensive public disclosure by banks, with the intention of enhancing market discipline[3]. The Pillar 3 disclosure requirements are designed to assist market participants in assessing the key risks in banks. Pillar 3 will also require disclosure of the processes banks use for assessing and managing risk, particularly where banks rely on internal methodologies to calculate capital requirements (ie under the IRB approaches).

With the completion of QIS 3 and release of CP3, attention is shifting to implementation. The dispersion of QIS 3 results across banks in part reveals the challenge for banks and supervisors in validating IRB data and models (including ensuring consistency across banks in individual jurisdictions and on a cross-border basis). A further important implementation issue concerns the way in which national regulators will apply Pillar 2.

The new Accord will be implemented in the EU through a new Risk-based Capital Directive, which it is intended will apply to all credit institutions incorporated in the EU. The FSA proposes to consult formally on the translation of the Directive into its Prudential Sourcebook in 2004. The US authorities, by contrast, have indicated that they will limit the mandatory application of Basel II to their largest internationally active banks (which do however account for around 95% of all foreign assets held by US banks)[4].

The BCBS is aware that material divergences in national implementation could pose problems for internationally active banks. Consequently, it has established an Accord Implementation Group to co-ordinate implementation across the G10.

*Amendment to life insurance company solvency rules*
Since the December 2002 *Review*, the FSA has accelerated changes to the regulatory regime for UK insurers. Under the current regime, regulatory

calculations of solvency margins do not correspond fully to economic reality. This led to concern that insurance companies' response to recent financial pressures (and their disposals of equity holdings in particular) may have been determined by regulatory rules.

In January 2003, the FSA sent an open letter to all CEOs of UK life insurance firms[5]. The letter emphasised the distinction between regulatory solvency (measured on a statutory basis with additional margins) and economic solvency (measured on a 'realistic' basis). Provision has been made to enable life insurers to waive some regulatory rules on the calculation of solvency, provided that they remain strong on the 'realistic' solvency measure and continue to meet EU minimum requirements. This foreshadows proposed changes to formal regulatory requirements, originally planned for introduction in respect of the year ending December 2004. The FSA now intends, however, to introduce a requirement to provide a report on 'realistic' solvency alongside statutory returns for the year ending December 2003.

The proposed new regime is part of a wider review of UK insurance regulation (the Tiner review), which is also expected to include changes to the governance of with-profits funds[6]. The FSA's work forms part of broader international efforts to establish an appropriate regulatory regime for insurance. These include a fundamental review of insurers' capital requirements in the EU (known as Solvency II[7]) and work by the International Accounting Standards Board (IASB) on a standard for accounting for insurance contracts.

*UK government action plan on occupational pension schemes*
Following a Green Paper on occupational pension schemes published in December 2002, the UK government announced a number of intended reforms to existing regulatory arrangements on 11 June 2003[8]. Proposed measures include:

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3: Bank of England research presented in the article *Market discipline and financial stability: some empirical evidence* in this *Review* aims to provide some assessment as to how disclosure may affect banks' behaviour.

4: The US authorities' plans for implementation of Basel II were explained in a speech delivered by Roger Ferguson (Vice Chairman of the Federal Reserve Board) on 9 April 2003, a transcript of which is available from www.federalreserve.gov/boarddocs/speeches/2003/20030409/default.htm.

5: www.fsa.gov.uk/pubs/press/2003/017.html.

6: www.fsa.gov.uk/pubs/cp/cp167.pdf.

7: The Solvency II Directive forms part of the broader European Commission Financial Services Action Plan (FSAP), recent progress on which is summarised in Box 5.

8: The documents are available on the Department for Work and Pensions web-site, www.dwp.gov.uk/consultations/consult/2002/pensions.

- the establishment of a pensions compensation scheme to be funded by a mandatory levy on pension schemes;

- a higher required level of funding before schemes can be wound up; and

- replacement of the Minimum Funding Requirement by a more flexible approach based around scheme-specific 'Statements of Funding Principles' (to be agreed individually between companies and their pension scheme trustees).

The government's proposals are made at a time of widespread pressure on occupational (particularly defined benefit) pension schemes, which have arisen through increased longevity, pension investment losses in equity markets, and pressures on company operating profits.

### International market practices

*Implementation of the Sarbanes-Oxley Act*

The December 2002 *Review* discussed the response of US legislators to evidence of weaknesses in corporate governance, accounting and auditing practices. In July 2002, the US Congress passed the Sarbanes-Oxley Act on Corporate Responsibility ('The Act'), which mandated the Securities and Exchange Commission (SEC) to implement a wide range of measures, many of which were adopted in January and April 2003[9].

The new rules apply to all companies issuing equity or debt securities in the USA, and to accountancy firms participating in the preparation of audit reports with respect to these issuers. There are, however, limited exemptions for non-US firms (in parentheses below). Since the December 2002 *Review*, rules have been passed that, *inter alia*:

- require audit committee members to be independent (other audit committee structures would be allowed 'where provided for under local law') and to disclose whether at least one member is a 'financial expert';

- restrict the non-audit services that accountants are able to provide to audit clients, although tax services remain permissible (extra guidance is given on the provision of non-audit services by foreign accounting firms);

- require the rotation of lead and review audit partners every five years, and every seven years for other audit partners (foreign accounting firms have been granted additional time to comply);

- demand disclosure of all material off-balance sheet transactions (for foreign firms the requirement is limited to their annual SEC filings);

- require *pro forma* financial measures to include a presentation of the most directly comparable US Generally Accepted Accounting Principles (GAAP) financial measure and a reconciliation to the US GAAP measure (foreign private issuers will be exempt if their securities are listed on a non-US exchange, the non-GAAP financial measure is not derived from US GAAP and the disclosure is made outside the United States);

- prohibit directors and executive officers from dealing in equity securities of the company during a pension-plan blackout period[10] (foreign issuers are exempt if the number of US plan participants is below a given threshold);

- require attorneys to report evidence of a material violation (foreign attorneys who provide legal advice regarding US law would be covered to a degree); and

- require investment banks to separate research from investment banking activities, including a prohibition on the tying of analyst compensation to investment banking revenues.

The SEC also established a Public Company Accounting Oversight Board (PCAOB), which, on 6 May 2003, published final rules on the registration of accounting firms, for approval by the SEC. It did not exempt foreign accounting firms from registration requirements, but made some concessions, as follows:

- the PCAOB will liaise with non-US accounting oversight bodies to reduce administrative burdens;

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9: SEC rules and reports arising from the Sarbanes-Oxley Act can be seen in more detail at www.sec.gov/spotlight/sarbanes-oxley.htm.

10: Any period of more than three consecutive business days during which at least half of the participants or beneficiaries under all individual account plans maintained by a company are temporarily suspended from purchasing or selling any security of the company.

- non-US applicants can withhold information where they demonstrate that disclosure would violate non-US laws; and

- non-US firms were given an extra 180 days to register.

Some aspects of the Act's original proposals were inconsistent with existing rules in some non-US countries, such as the requirement to have audit committees comprised only of independent directors (some countries have compulsory employee participation). The SEC has taken account of a number of these inconsistencies, and has granted several concessions to address concerns raised by non-US issuers and accounting firms, where consistent with the spirit and intent of the Act.

*Regulatory reforms arising from the global settlement with investment banks over conflicts of interest*
On 28 April 2003, US regulators[11] announced that enforcement actions against ten investment banks – arising from an investigation into possible conflicts of interest in research and initial public offerings (IPOs) – had been filed. This finalised a global settlement agreed in principle in December 2002. The settlement included a number of reforms designed to improve the integrity of investment banks' research.

Specifically, investment banks undertaking research are required to:

- strengthen internal firewalls between their research and investment banking operations;

- establish independent management for research (with independent budgets);

- prohibit research analysts from receiving compensation for investment banking activities or participating in efforts to solicit investment banking business;

- prohibit investment bankers from contributing to company-specific decisions concerning research coverage; and

- furnish (over a five-year period) independent research by contracting with no less than three independent firms such that independent research is made available to customers.

These reforms were largely foreshadowed in December 2002, and some firms have stated that they have already instituted changes to improve the independence of their research.

### Market infrastructure
*Development of the Euroclear single settlement engine*
The December 2002 *Review* reported the merger between Brussels-based Euroclear and CRESTCo, and the plans of the enlarged group to offer both domestic and cross-border securities settlement. Development work on the single settlement engine (SSE) – the processing platform that from 2005 will support Euroclear's settlement services – is underway. From a financial stability perspective, the means by which the SSE will enable securities trades to be settled on a delivery-versus-payment (DvP) basis in central bank money is of particular importance.

Following discussions with the relevant central banks, on 20 June 2003 Euroclear released a consultation document[12] on the SSE, outlining the proposed settlement arrangements within the SSE and explaining how it will interact with each national system.

The Belgian and UK authorities (Bank of England and FSA) have signed a bilateral Memorandum of Understanding (MoU) on the regulation and oversight of the enlarged Euroclear group, governing co-operation and information sharing between the relevant parties[13]. It is consistent with the recommendations jointly published by the Committee on Payment and Settlement Systems (CPSS) and the International Organisation of Securities Commissions (IOSCO) in November 2001[14].

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11: The SEC, the New York Attorney General, the North American Securities Administrators Association, the National Association of Securities Dealers, the New York Stock Exchange and state securities regulators.

12: www.euroclear.com/EOC/Level0/MA0154%20.pdf.

13: A similar MoU exists between the Belgian and French authorities.

14: 'Recommendations for Securities Settlement Systems: A report of the Committee on Payment and Settlement Systems and the Technical Committee of the International Organisation of Securities Commissions', Bank for International Settlements and International Organisation of Securities Commissions, November 2001 (www.bis.org and www.iosco.org).

# Box 2: The Group of Thirty: clearing and settlement seminar

On 13 May 2003, the Bank of England hosted a Group of Thirty (G30) seminar to assess how best to meet the recommendations set out in the Group's January 2003 Report 'Global Clearing and Settlement: A Plan of Action'[1]. The Report made 20 detailed recommendations, centred on three main principles: increasing efficiency, mitigating risk and enhancing governance. If implemented, these recommendations should enhance greatly global clearing and settlement of securities.

The seminar was chaired by Sir Andrew Large, Deputy Governor of the Bank of England, who also chaired (in a personal capacity) the G30 Steering Committee on the project. It brought together nearly 100 senior figures from central banks, financial regulators, users and providers of clearing and settlement services, and other interested parties. The seminar, which was intended to develop momentum for the improvements, focused on what actions needed to be taken, and by whom.

The desirability of creating a strengthened, interoperable clearing and settlement environment was widely acknowledged. Greater interoperability was seen as essential in enhancing the efficiency of cross-border clearing and settlement. Participants recognised the benefits of further risk reduction and enhanced business continuity planning. Many emphasised effective governance as key to ensuring that the clearing and settlement providers met the needs of users. Underlying all of these issues was the need for open and fair access to the infrastructure.

The seminar first discussed those areas where the G30 proposals would raise the current standard, and in what respects. It also identified some of the main challenges that needed to be overcome, how they differed between regions, the benefits which could be realised and the practical steps which could be taken to meet the individual recommendations.

One key theme was the need to balance risk and efficiency, and the extent to which further investment could be justified in trying to avoid low probability but high impact events. A further important challenge lay in ensuring consistency in the implementation with other recent initiatives in this field, such as the work of the Giovannini Group and the joint work of the Committee for Payment and Settlement Systems (CPSS) and the International Organisation of Securities Commissions (IOSCO).

In line with the conclusions of the G30 Report, participants agreed that the private sector should take the initiative in carrying forward the majority of the recommendations. There were some areas, however, such as legal or competition issues, where close public sector involvement would be necessary. Developing a partnership would be of overriding importance.

Key to ensuring progress was the ability to monitor and assess what was being achieved, and where. A matrix of recommendations and progress against them had been developed. This would prove a crucial framework for logging progress on each recommendation and highlighting where further effort was most necessary.

The seminar also discussed the role of the recently established Monitoring Committee. The Committee is chaired by Sir Andrew Crockett, a member of the G30 and formerly General Manager of the Bank for International Settlements, and composed of senior private sector representatives and public sector observers. It has been formed to monitor progress on the work programme, co-ordinate action where appropriate and prepare in due course a progress report on implementation. This should help to promote progress toward the high standards of technical performance, business practice and governance necessary to produce a safe, efficient and fully integrated international system for clearing and settlement.

1: The Group of Thirty is a private, non-profit, international body composed of senior representatives of the private and public sectors and academia. Further details and an executive summary of the Report can be found on the G30 web-site, www.group30.org.

*Update on dematerialisation of money market instruments*
Since the December 2002 *Review*, significant
progress has been made towards implementing the
final outstanding major recommendation of the Bank
of England's Securities Settlement Priorities Review[15],
published in 1998. This involves integrating
dematerialised equivalents of money market
instruments (known as eligible debt securities) into
the CREST system, allowing these instruments to be
settled on a DvP basis in central bank money and
eliminating the intraday exposures between
settlement banks currently present in the Central
Moneymarkets Office (CMO).

The integration process is on schedule to commence
in September 2003. The requisite legislation[16] to
amend the Uncertificated Securities Regulations
2001 was laid before Parliament on 6 May 2003, and,
following debates in both Houses, will come into
force shortly.

In parallel, the Bank of England is finalising *pro forma*
terms of issuance for eligible debt securities, and,
jointly with CRESTCo, has held a series of seminars to
provide user education concerning the new
arrangements, with the aim of ensuring a smooth
transition. It is envisaged that CMO will be closed by
the end of the year.

*London Clearing House designated under the Settlement
Finality Directive*
On 23 April 2003, following consultation with the
Bank of England on the payment aspects, the FSA
designated London Clearing House (LCH) under
the EU Settlement Finality Directive (SFD)[17].

The increasingly significant role LCH plays in
clearing securities and derivatives transactions is
illustrated by Chart 2, which shows how the amount
of initial margin deposited with LCH by its members
has grown over recent years.

**Chart 2:**

**Initial margin required by LCH for its largest cleared
markets at end-month**
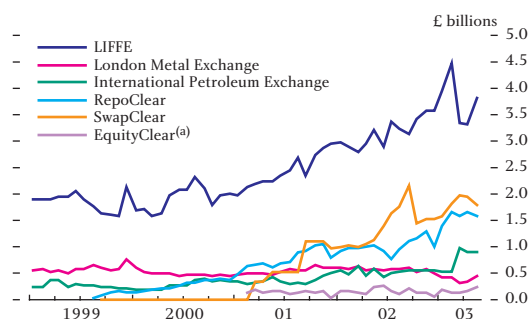


Source: London Clearing House.

(a) Since 5 May 2003, EquityClear initial margin includes margin held
against trades on the virt-x exchange, as well as against trades on the
London Stock Exchange.

Four other high-value payment and settlement
systems have already been accorded SFD protection
through a designation under UK law – CHAPS
Sterling, CHAPS Euro, CREST and Continuous Linked
Settlement (CLS).

**Crisis management**
*EU Memorandum of Understanding on crisis management*
EU central banks and regulators, including the
Bank of England and the FSA, agreed in March on a
Memorandum of Understanding (MoU) on high-level
principles of co-operation in crisis management
situations[18]. The MoU aims to enhance practical
arrangements for handling crises at EU level and in
particular for sharing information among the relevant
authorities.

*Business continuity planning*
On 8 April 2003, three US regulatory agencies[19]
issued the final version of their paper 'Sound
Practices to Strengthen the Resilience of the US
financial system'[20]. The paper is directed at two
categories of institution – core clearing and
settlement organisations (including those private
sector firms with a significant aggregate market
share) and firms that play a significant role in critical

15: www.bankofengland.co.uk/markets/payments/sspr9809.pdf.

16: The draft Uncertificated Securities (Amendment) (Eligible Debt Securities) (Regulations) 2003.

17: The Settlement Finality Directive is implemented in the UK by the Financial Markets and Insolvency (Settlement Finality) Regulations 1999.

18: This complements an earlier MoU on routine information sharing agreed between payment systems overseers in EU central banks and banking supervisors in 2001.

19: Board of Governors of the Federal Reserve, the Office of the Comptroller of the Currency (OCC) and the Securities and Exchange Commission (SEC).

20: www.federalreserve.gov/boarddocs/press/bcreg/2003/20030408/default.htm.

# Box 3: Assessing the impact of CLS on CHAPS Sterling

The Continuous Linked Settlement (CLS) system started live operations on 9 September 2002, since when it has settled foreign exchange trades in seven major currencies, including sterling. The December 2002 *Review* described how CLS uses a payment-versus-payment model to eliminate principal risk in the settlement of foreign exchange deals in virtually all cases. It also highlighted the expected fall in the value of payments flowing through national RTGS systems (such as CHAPS Sterling) following the introduction of CLS, and noted that liquidity pressures on members of the system had been managed successfully during the first weeks of live CLS operations. This Box examines the actual impact on aggregate payment values in CHAPS Sterling, and looks for evidence of increased liquidity pressures.

*Impact of CLS on payment values*

Trades submitted to CLS are settled across accounts held by members of the system with CLS Bank International (CLSB). Before the daily settlement process, which takes place between 6am and 11am UK time, CLSB uses the details of all the trades to be settled that day to calculate each member's (multilateral) net position in each currency. Members are required to cover their short positions by means of a series of 'pay-ins' to CLSB, which are effected through the RTGS system of the currency concerned (either by the members themselves or by nostro agents acting on their behalf). As settlement continues, members with net long positions in a particular currency receive the value owing to them in the form of 'pay-outs' from CLSB, also through the relevant RTGS system.

Because the design of CLS requires actual payments equal only to members' net positions, the total value of payments processed in the major RTGS systems could be expected to fall as foreign exchange settlement migrates to CLS. The value flows associated with gross (or possibly bilateral net) settlement in the form of individual RTGS payments are replaced by lower value multilateral net payments to and from CLSB.

The volume and value of trades settled by CLS have continued to grow steadily, and by end-March 2003 the daily value of sterling sides[1] settled in CLS had reached nearly £50 billion (Chart A). The value of the sterling pay-ins required to allow these sides to settle was around £2 billion (of course, an equivalent daily value was also paid out by CLSB), implying a sterling 'netting factor'[2] of approximately 25.

## Chart A:
### Daily value of sterling pay-ins to CLS and the value of sterling sides settled (ten-day moving averages)
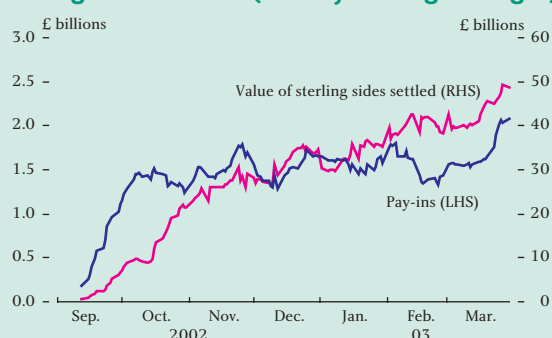


Source: CLS Bank International.

This implies that, if all the sterling sides now being settled in CLS would have been settled individually, gross in CHAPS Sterling in the absence of CLS, the aggregate value of payments flowing through CHAPS Sterling would have been higher by around £46 billion. It is likely, however, that many CLS settlement members had in place arrangements to net bilaterally obligations arising from foreign exchange trades, so a more realistic estimate of the effect of CLS would be significantly smaller.

Nonetheless, the added efficiency of a multilateral netting over bilateral netting means the introduction of CLS could have been expected to result in a fall in CHAPS Sterling payment values. This fall would be expected to have been gradual, in line with take-up of the CLS service. Chart B shows, however, that the daily value of payments processed in CHAPS Sterling has remained broadly stable over the period CLS has been operating.

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1: A foreign exchange transaction consists of two sides – one in each of the currencies being traded.

2: The netting factor is a standard measure of the efficiency of netting processes in payment systems. In this context, it is defined as the ratio of gross value settled in CLS to the aggregate value of pay-ins.

**Chart B:**
**Daily value of payments in CHAPS Sterling**
**(ten-day moving average)**

£ billions

CLS goes live

Jul. Aug. Sep. Oct. Nov. Dec. Jan. Feb. Mar.
2002                                          03
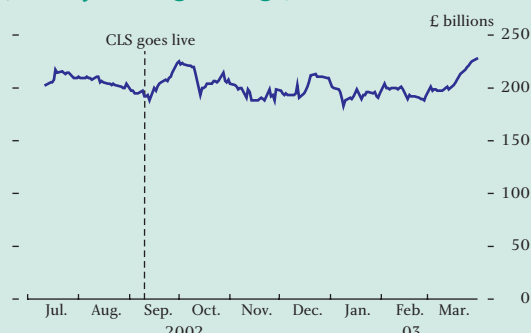
Source: Bank calculations.

The absence of any apparent impact from CLS is, at first glance, surprising. There are a number of possible explanations. As noted above, one relevant factor is the bilateral netting arrangements banks had in place prior to CLS going live. In addition, the introduction of CLS may have 'created' the need for banks to make some extra payments through CHAPS Sterling. For instance, a number of banks (and other financial institutions) previously able to settle foreign exchange transactions directly now participate in CLS indirectly as third-party users. These institutions' trades are settled across settlement members' accounts with CLSB, an arrangement that will ultimately result in payment obligations between the parties concerned.

*Impact of CLS on liquidity requirements and liquidity risk*
The CLS settlement process operates to a very tight time schedule, driven by the opening hours of the RTGS systems through which payments to and from CLSB are made. Delays to member pay-ins therefore have the potential to cause disruption on a global scale, implying that these payments should be seen as 'time critical'. Given that the daily value of payments in CHAPS Sterling (the most significant determinant of sterling liquidity requirements) has changed little since the introduction of CLS, the advent of these time critical payments suggests that the amount of intraday liquidity members of CHAPS Sterling need to

obtain from the Bank of England is likely to have risen. A measure of peak liquidity use reveals a small rise in the amount of liquidity required over the period CLS has been operating (Chart C).

An increase in the CHAPS Sterling liquidity *requirement* does not, however, translate directly into an increase in liquidity *risk*. Liquidity risk in an RTGS system concerns the likelihood of settlement of a payment obligation being delayed due to the sending bank having insufficient funds available. Liquidity risk is thus crucially dependent on how extensively banks are using the liquidity they have available – higher utilisation ratios (all other things being equal) imply increased liquidity risk.

**Chart C:**
**Intraday liquidity usage in CHAPS Sterling[a][b]**

Per cent utilisation                    £ billions

CLS goes live

Peak intraday liquidity use
(ten-day moving average) (RHS)

Maximum intraday liquidity
utilisation ratio (LHS)

Jul. Aug. Sep. Oct. Nov. Dec. Jan. Feb. Mar.
2002                                          03
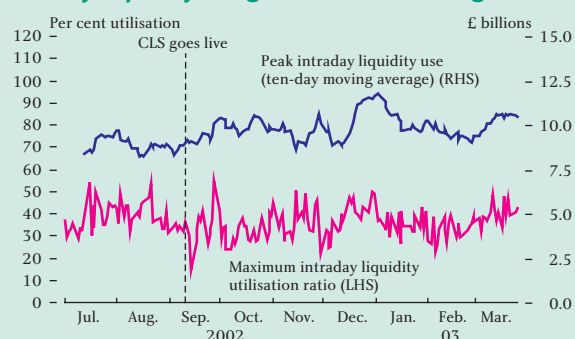
Source: Bank calculations.

(a) Based on settlement account balances and collateral postings (observed at ten-minute intervals), controlling for liquidity transfers to and from CREST.

(b) 29 Oct. and 18 Nov. not considered due to data discrepancies.

Bank of England research presented in the article *A statistical overview of CHAPS Sterling* in this *Review* highlights how member banks typically post considerably more liquidity in CHAPS Sterling than they actually use, implying that the extent of any liquidity risk within the system is small. Chart C shows that the maximum daily liquidity utilisation ratio in CHAPS Sterling is generally below 50%, and that this has continued to be the case since CLS started live operations, suggesting little increase in liquidity pressures.

markets. It suggests suitable objectives for continuity planning in these institutions. Core clearing and settlement organisations are expected to be able to recover and resume key clearing and settlement activities within the normal business day, while firms that play a significant role in critical markets are expected to be able to complete settlement of transactions already initiated.

In the UK, the financial authorities and private sector have continued to engage in co-operative initiatives aimed at strengthening business continuity planning in the financial sector[21]. These have included extensive discussion in a number of market groups and at roundtable events.

In addition, on 25 February 2003, HM Treasury published a consultation paper on 'The financial system and major operational disruption'[22]. Its primary purpose was to seek views on whether new statutory powers should be sought to help deal with extreme events such as a major terrorist attack or natural disaster. The paper also asked for views on whether more could be done to strengthen private sector, market-based approaches to these issues, for example increased use of '*force majeure*' clauses.

Two types of statutory power were suggested – a power to suspend obligations (without preventing any two parties who wish to discharge their bilateral obligations from doing so) and a power to allow the authorities to direct providers of market infrastructure. The latter would confer the ability to instruct recognised exchanges, clearing houses and payment systems to close, to remain open, or to revise certain rules.

The proposals generated a substantial market response. The majority of respondents argued that more time was needed in order to decide whether legislative proposals were required, and, if so, in what form. On 19 June, HM Treasury announced the establishment of a Task Force[23], chaired by Sir Andrew Large, Deputy Governor of the Bank of England, to consider what steps should be taken, if any, to supplement or modify existing powers. The

Task Force has been asked to produce interim recommendations by November 2003 and a final report by February 2004. The Financial Markets Law Committee (FMLC)[24], in coordination with the Task Force, is taking forward analysis of the legal issues raised by the consultation paper.

*Insurers reorganisation and winding-up regulations*
In April 2003, new regulations on the reorganisation and winding-up of insurers came into force in the UK, implementing an EU Directive[25]. Insolvency proceedings can be started only in the insurer's home state, and will apply to all its EU branches. The regulations do not apply to Lloyd's of London or to pure reinsurers.

The new regulations give direct policyholders improved status as creditors. Since policyholders will be protected as high priority creditors, the assets backing life insurance policies will no longer be wound up separately.

*Resolution of international financial crises*
Since the Asian crisis of the late 1990s, there has been some progress in developing and implementing measures aimed at preventing crises in emerging market economies. Progress in crisis resolution has been slower, but there have been some forward steps over recent months.

Prior to the IMF Spring meetings held in April 2003, the UK and other G7 countries were committed to a 'twin-track' approach to crisis resolution, which encouraged further work on both collective action clauses (CACs) in bond issues and a sovereign debt restructuring mechanism (SDRM). The common objective of these initiatives was to make sovereign debt restructuring more orderly and predictable.

A proposal for the SDRM was tabled at the IMF Spring meetings, but the conclusions were against moving ahead with this proposal at present. There has however been progress on CACs, with a number of issuers opting to include them in their international bonds (further details in Box 4).

21: The main initiatives are summarised on the HM Treasury, Bank of England and FSA tripartite website, www.financialsectorcontinuity.gov.uk.

22: www.hm-treasury.gov.uk/consultations_and_legislation/major_operational_disruption.

23: www.hm-treasury.gov.uk/newsroom_and_speeches/press/2003/press_75_03.cfm.

24: Further details of the activities of the FMLC can be found on The Committee's web-site, www.fmlc.org.

25: europa.eu.int/eur-lex/pri/en/oj/dat/2001/l_110/l_11020010420en00280039.pdf.

## Box 4: Collective action clauses in international bond issues

The inclusion of collective action clauses (CACs) in international bond issues can help strengthen the international financial infrastructure. In particular, CACs can facilitate debtor-creditor agreement in cases where sovereign debt restructuring is necessary. Support for the principle of CACs has grown recently, for example through G7 advocacy (notably in the Action Plan for emerging market debt launched in April 2002), and through the publication of model clauses by both a G10 Working Group and a group of private sector trade associations in early 2003. At this year's IMF Spring meetings, the G7 and EU member states reaffirmed their commitment to promoting CACs and to including them in their own bonds governed by the laws of a foreign jurisdiction.

Since the December 2002 *Review*, market practice has shifted towards wider use of CACs in sovereign bonds, including in bonds issued under New York law, where CACs have not hitherto been standard. Since February 2003, a number of issuers, including Mexico, Brazil, South Africa and Korea, have included CACs in their new issues. In addition, Uruguay has included CACs in the new bonds issued as part of its exchange offer.

These bonds all include majority action clauses that enable a supermajority of creditors to agree changes to reserved matters, such as payment terms, which then apply to all bondholders. In most recent issues the threshold for such votes is 75% of outstanding principal, while Brazil included a slightly higher 85% threshold. The bonds also include provisions for majority action on acceleration of payments, and disenfranchisement provisions that exclude from voting any bonds held directly or indirectly by the sovereign issuer.

Uruguay's new bonds also contain two additional features that should discourage investors from disrupting a restructuring deal. First, the issue includes a trust deed that restricts individual bondholders' ability to initiate litigation and requires that any litigation proceeds be pro rated. Second, an innovative aggregation clause is included, allowing changes to all of these bonds to be agreed simultaneously by 85% of principal aggregated across the bonds, but subject to the consent of two thirds (by principal amount) of each issue.

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These proposals do not, however, offer a complete model for the resolution of international debt crises. For example, they each deal only with sovereign debt, whereas many recent crises have originated with private sector debt.

Progress on a wider set of crisis resolution tools is therefore needed. On this front, the recent strengthening of the framework for IMF access policy (which defines the amount that can be lent and the conditions attached to the lending) is especially significant. Decisions regarding the scale of IMF financing provide an anchor for the expectations of debtors and creditors, which is central to resolving crises efficiently and expeditiously.

Alongside access policy, there has also been growing interest in developing a voluntary Code of Good Conduct. This aims to provide a scheme for dealing with sovereign debt crises, by defining the roles and responsibilities of the different parties. The Code would be intended to embrace a wider range of potential debts and a broader range of situations than either CACs or the SDRM. It would serve as a complement to IMF access limits by helping anchor the expectations of debtors and creditors when crises occur. The next step is to develop a code that is acceptable to the different interests.

# Box 5: Other developments in the financial infrastructure

| Initiative | Significance | Progress |
|---|---|---|
| Amendment to the UK Non-Investment Products (NIPs) Code[1]. | The amendment to the NIPs Code is designed to discourage undisclosed principal trading in the foreign exchange market, allowing banks better to assess their credit exposures and legal risks. | The revised wording of the Code was announced on 28 May 2003 and will come fully into effect in June 2004. |
| Treasury shares legislation. | The possibility for UK firms to hold up to 10% of their own shares 'in treasury' will make balance sheet restructuring easier by facilitating limited adjustments to capital gearing through equity transactions. | The Regulations[2] were laid before Parliament on 15 April 2003, and will come into force in December. |
| UK corporate governance and auditor independence. | Adoption of good or better practice in corporate governance and financial reporting, typically encouraged through codes of conduct rather than by legal rules, can play a vital role in protecting the interests of investors in tradable securities. Excessively prescriptive 'rules' can however lead to large compliance burdens on firms. | The Higgs[3] and Smith[4] reports reviewing the roles of non-executive directors and audit committees were published in January 2003. Although the Financial Reporting Council (FRC) has deferred adoption of the proposed revisions to the Combined Code on corporate governance, it is expected that the broad thrust of the Higgs recommendations on the role of non-executive directors will be adopted later in the year, along with the entirety of the proposals on audit committees. The FRC has also agreed to take on the functions of the Accountancy Foundation, amended in some significant respects. |
| European Commission Communications on corporate governance and reinforcing audit. | The Communications propose action plans to modernise EU company law, to raise corporate governance standards, and to strengthen regulation of auditing across Europe. | The Communications[5] were published on 21 May 2003. The Communication on corporate governance, which responds to the high level Winter Group recommendations published in November 2002, is open to public consultation until 31 August 2003. |
| EU Financial Services Action Plan. | A series of legislative and non-legislative measures aimed at consolidating the EU single market in financial services, for completion by 2005. | Since the December 2002 *Review*, there have been two significant developments:<br><br>● The Directive on insider dealing and market manipulation (Market Abuse)[6] has been finalised. It is intended to reinforce market integrity and contribute to the harmonisation of rules for combating market abuse in the EU; and<br><br>● The proposed Transparency Obligations Directive[7] has been published. It specifies ongoing disclosure requirements for listed companies. |

1: For further details of the amendment to the NIPs Code, see Bank of England *Quarterly Bulletin*, Summer 2003, page 157.

2: The Companies (Acquisition of Own Shares) (Treasury Shares) Regulations 2003.

3: www.dti.gov.uk/cld/non_exec_review/pdfs/higgsreport.pdf.

4: www.frc.org.uk/publications/content/ACReport.pdf.

5: europa.eu.int/eur-lex/en/com/cnc/2003/com2003_0284en01.pdf and europa.eu.int/comm/internal_market/en/company/audit/docs/2003-05-comm-reinforcement_en.pdf.

6: europa.eu.int/comm/internal_market/en/finances/mobil/abuse.htm.

7: europa.eu.int/eur-lex/en/com/pdf/2003/com2003_0138en01.pdf.

| Initiative | Significance | Progress |
|---|---|---|
| EU Pension Funds Directive. | The Directive is designed to facilitate cross-border pension provision under 'prudent person' investment rules and establishes a scheme of mutual recognition of supervisory regimes for pensions within the EU. | The Directive was definitively adopted on 13 May 2003. |
| Launch of the STEP2 pan-EU automated clearing house. | STEP2 fulfils the European banking industry's public commitment to enhance the infrastructure available for settling cross-border retail payments denominated in euro. | Live operations involving a group of pilot banks began on 28 April 2003. |
| New central counterparty (CCP) services introduced. | The introduction of a CCP in a market can contribute to the management of the counterparty risk that inevitably arises in any trading market. | CCP services for Deutsche Börse and Borsa Italia were introduced on 27 March and 23 May 2003 respectively. A CCP for the virt-x pan-European exchange (provided by LCH and x-clear, the Swiss CCP) began live operations on 5 May 2003. |
| US accounting standards for consolidation of the assets and liabilities of variable interest entities[8]. | A new standard – FIN 46 – aims to tighten the rules determining whether variable interest entities should be consolidated in the accounts of a bank or other institution retaining a 'controlling financial interest' in the vehicle, to reflect more accurately the distribution of risks and rewards. | Financial Accounting Standards Board (FASB) guidelines were issued in January 2003, for implementation by mid-year. The consolidation will lower US banks' reported risk-weighted capital ratios but their current regulatory capital should be able to absorb the change comfortably. |
| Recommendations to enhance the integrity of initial public offerings (IPOs). | The 20 measures proposed are designed to avoid instances of IPO underwriters allocating shares to preferred clients (in return for lucrative contracts in other business lines), and biased recommendations by research analysts acting for the underwriters. | The joint New York Stock Exchange/National Association of Securities Dealers IPO Advisory Committee, established at the behest of the SEC in October 2002, published its final report on 29 May 2003[9]. |
| Initiative to improve data on credit risk transfer (CRT) instruments. | Access to comprehensive and reliable data on CRT instruments should enable central banks, regulators and private institutions to monitor the transfer and accumulation of credit risk. | Following the publication of a Report by the Committee on the Global Financial System (CGFS), central banks and other interested parties are discussing how to improve the data they have available. In May 2003, the BIS published the results of its 2001 survey on public disclosures by banks[10]. The survey found that, whilst disclosures on credit risk modelling and credit derivatives had increased since the previous survey, there were still important gaps. |
| Early termination ('tear-up') of interest rate swaps. | The termination of packages of swaps serves to reduce market participants' credit exposures and the associated capital charges. | A private sector tear-up service – TriReduce – completed its first production run on 25 April 2003, terminating euro-denominated swaps with nominal value in excess of €400 billion. |

8: A variable interest entity is a legal structure used for business purposes that does not have equity investors with voting rights, or has equity investors that do not provide sufficient financial resources for the entity to support its activities.

9: www.nasdr.com/pdf-text/ipo_report.pdf.

10: www.bis.org/publ/bcbs97.pdf.

## Annex: Oversight of payment systems

As part of its broader financial stability work, the Bank of England is responsible for the oversight of payment systems used in the UK[26]. This annex describes the oversight process and the focus of the Bank's oversight activities since the December 2002 *Review*.

System operators have primary responsibility for ensuring the robustness of payment systems, and the Bank does not seek to supplant their judgement. It does, however, encourage operators to take reasonable steps to identify and manage risks within their systems[27]. The intensity of the Bank's oversight varies across different systems, based on an assessment of the financial and operational risks posed by each system. Accordingly, highest priority is accorded to those systems where the failure or malfunction of the system, or the default of a participant, could be a source of systemic risk.

Even where the amounts transferred through a system are not large enough to create systemic risk, if the system is widely used, its failure could cause significant disruption and damage confidence in the financial infrastructure. The Bank therefore pays significant attention to these systems.

The Bank also seeks to understand the structure and operation of card payment schemes – including MasterCard, Switch and Visa – and, in particular, how they manage risk in their clearing and settlement processes.

The Bank's practical application of payment system oversight is largely based on the ten 'Core Principles'[28] developed by the Committee on Payment and Settlement Systems (CPSS), which provide a framework within which to assess the effectiveness of a payment system's architecture and risk management. The Principles – which cover legal soundness, financial and settlement risk, security and operational reliability, efficiency, access rules, and governance – are aimed at systemically important

payment systems, but are also useful for oversight more generally.

The recent review of the UK financial system conducted as part of the joint IMF-World Bank Financial Sector Assessment Programme (FSAP) included an independent assessment of risk management within the UK's main payment systems. A summary of the main findings and recommendations of the overall IMF assessment can be found in Box 1.

Looking beyond the domestic arena, the Bank also contributes to the collective oversight of international payment (and payments-related) systems. Two prominent examples of systems overseen in this way are CLS and SWIFT (the Society for Worldwide Interbank Financial Telecommunication). In addition, EU-level collective oversight of the TARGET (Trans-European Automated Real-time Gross settlement Express Transfer) system has commenced recently. In future, more systems are likely to be subject to international collective oversight, as market participants in particular increasingly focus on the provision of efficient cross-border payment and settlement facilities[29].

### CHAPS

CHAPS is the UK's main high-value payment system, settling both sterling and euro transactions on an RTGS basis; values transferred through CHAPS Sterling and CHAPS Euro together currently average over £300 billion per day.

The Bank's view is that CHAPS complies fully with the nine Core Principles relevant to it. But CHAPS can continue to improve. There have been welcome moves towards greater involvement of the CHAPS Board in the system's risk management framework. This follows changes to the governance structure of the Association for Payment Clearing Services (APACS) aimed at separating responsibility for clearing services, such as the operation and development of the CHAPS system, from APACS' industry-wide activities.

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26: The Bank's general responsibilities were set out in October 1997 in the Memorandum of Understanding (MoU) between HM Treasury (HMT), the Bank, and the Financial Services Authority (FSA), which established a framework of co-operation in respect of financial stability. It falls to the Bank to advise the Chancellor on any major problem inherent in payment systems.

27: The Bank's role and objectives in this area are explained in 'Oversight of Payment Systems', Bank of England, November 2000 (reproduced in *Bank of England Financial Stability Review*, December 2000, page 169), available from www.bankofengland.co.uk.

28: 'Core Principles for Systemically Important Payment Systems', Bank for International Settlements, January 2001 (www.bis.org).

29: An example of this is provided by the work of the Group of Thirty (G30) on the global arrangements for clearing and settling securities transactions (Box 2).

A review of the arrangements to be used in 'RTGS by-pass mode' (the emergency procedures allowing the system to revert to net end-of-day sterling settlement if neither the primary nor secondary payment processing sites were operational) is also under way. 'By-pass' has never been invoked but, if used, would create credit risks for members. In order to limit these risks, CHAPS members have agreed to implement caps on payments input to CHAPS Sterling, when operating in by-pass mode, from July 2003. Consideration is also being given to how settlement would be completed in the event of a member default whilst the system was operating in by-pass mode.

*CREST*

Another key system is CREST, the real-time settlement system for equities, UK government bonds, and other corporate securities. The daily settlement values processed in CREST's embedded payment mechanism are similar to those in CHAPS Sterling (approximately £200 billion).

The FSA has prime responsibility for the regulation of CREST, but the Bank has an interest in view of the payments aspects and broader relevance of the system in terms of financial stability and the containment of systemic risks. Developments arising from the merger between CRESTCo and Euroclear (concluded in September 2002) are discussed in the main article.

The Bank is content with the design of and the management of risk in CREST, and is working with Euroclear and with other central banks to achieve DvP settlement in central bank money for cross-border transactions.

The FSA similarly regulates the Central Moneymarkets Office (CMO) and London Clearing House (LCH), with the Bank also taking an interest in the payments aspects. The main article describes recent developments in these systems.

*BACS*

Although BACS is not regarded as systemically important, it is a widely-used payment system handling 15 million direct debits, credits and standing orders each day[30]. Most of these items are of low value, but the total daily value processed in BACS is typically around £10 billion.

The Bank has been encouraging improvements in BACS' systems and risk management. In particular, the Bank called for and has been encouraging an APACS project to establish explicit default procedures for both BACS and the Cheque and Credit Clearing Company (C&CC). The probability of default by a member is low in both systems, but the impact on other members and their customers of a default is potentially high. Formal contracts between the systems and their members, which underpin the legal soundness of each system's netting arrangements, have recently taken effect. In addition, the Bank has been facilitating work on collateral arrangements to enable settlement to complete in the event of default.

Another important complement to risk management and efficiency is effective governance. BACS – in common with other member-owned systems – is taking steps towards separating the governance of its 'scheme' (which determines system rules) from that of its 'infrastructure' (which provides the related processing services). Formal separation is planned for December 2003. This change is intended to simplify governance arrangements and to distinguish thinking and decision-taking on the long-term development of payment products from that concerning the best use of the technology that delivers them.

Additionally, the Bank encourages advances in BACS' network technology and in 'NewBACS', the project to upgrade BACS' infrastructure. The first stage of migration to the new communications network, BACSTEL-IP, is expected to be completed later in 2003. BACSTEL-IP will enable users of BACS to benefit from up-to-date network security management. 'NewBACS' is scheduled for delivery in 2005. Its introduction will, among other things, potentially enable the provision of faster clearing and settlement services, facilitate the management of future increases in volumes, and could offer new options to mitigate settlement risk.

*Continuous Linked Settlement (CLS)*

CLS started live operations in September 2002, settling foreign exchange transactions in seven major currencies. The system reduces foreign exchange settlement risk by settling trades individually on a payment-versus-payment basis over accounts held (by

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30: In 2001, over 90% of all monthly salary payments were effected through BACS.

settlement members) with CLS Bank International (CLSB), the US-incorporated institution that provides the CLS service[31].

Values and volumes settled in CLS have been increasing steadily as more users come on stream[32]. By the end of May 2003 the total daily value of sides[33] settled was typically around US$800 billion, with peak-day values in excess of US$1 trillion. At end-May, there were 54 settlement members using the CLS service, together with 47 third-party users (whose trades settle across the CLSB accounts of settlement members).

Each of the central banks whose currencies settle in CLS contribute to the oversight of the system. The Federal Reserve Bank of New York (FRBNY), as supervisor of CLSB, is the lead overseer, reporting to the other central banks as necessary through a sub-group of the CPSS.

With the sole exception of a service incident that disrupted settlement on 25 March, CLS has been operating reliably. That incident is currently being discussed with overseers, who are also working with CLS on ensuring the smooth introduction to the system of four additional currencies – the Norwegian krone, Danish krone, Swedish krona and Singapore dollar – during the second half of 2003.

*SWIFT*

SWIFT is not a payment system, but nonetheless falls within central banks' international collective oversight remit because it is the primary provider of messaging services to payment systems and other market infrastructures world-wide (including CHAPS and CREST). Oversight is conducted by the G10 central banks, led by the National Bank of Belgium.

Recently, the main focus for oversight of SWIFT has been system resilience and, in particular, improvements to SWIFT's business continuity arrangements to implement lessons learned from the events of 11 September 2001. SWIFT has been addressing these lessons through its 'Four Pillars II' programme.

In 2001, SWIFT out-sourced the operation and development of its networks to Global Crossing. Global Crossing subsequently filed for Chapter 11 bankruptcy protection in the US. SWIFT is now developing its own global Secure Internet Protocol Network (SIPN). Users are to have a choice of up to four providers of connectivity to the SIPN, enabling them to diversify their risks. The process of migrating all existing SWIFT messaging services onto the SIPN began in August 2002 and is scheduled to be completed by end-2004.

*Card schemes*

MasterCard is in the process of moving its global processing operations onto a common platform, with enhanced functionality and standardised message formats. One benefit of the project is the scope for the currently separate European processing site to be integrated with, and backed-up by, MasterCard's other processing centres. Switch transaction processing is expected to complete a phased migration to the new MasterCard infrastructure and message formats in 2005. The settlement arrangements have yet to be finalised.

Visa regards itself as being under the primary jurisdiction of the US authorities. The Bank has yet to receive sufficient information to have a clear understanding of Visa's risk management processes, but is not aware of any particular issues that it wants to pursue with the scheme.

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31: The impact of the introduction of CLS on payment flows and liquidity requirements in CHAPS Sterling is assessed in Box 3 of this article.

32: The increase in values settled is illustrated by Chart 127 of *The financial stability conjuncture and outlook* in this *Review*.

33: Foreign exchange trades consist of two sides (one in each of the currencies being traded). The value figures include both sides of each trade settled in CLS.

# Assessing the strength of UK banks through
# macroeconomic stress tests

**Glenn Hoggarth, Financial Industry and Regulation Division and John Whitley, Domestic Finance Division, Bank of England**

This article describes the results of a range of macroeconomic stress tests carried out last year on large domestically based banks as part of the International Monetary Fund's (IMF's) Financial Sector Assessment Programme (FSAP) on the United Kingdom. Overall, the exercise suggests that the stability of the UK banking system is currently unlikely to be threatened by a range of plausible adverse events. But it also emphasises the importance for the authorities, and the banks themselves, of continuing to develop quantitative techniques that can be used to assess the resilience of the financial system to potential shocks.

**STRESS TESTING THE VULNERABILITY** of financial institutions to adverse macroeconomic events is an important tool in assessing financial stability. Central banks and financial regulators increasingly use this approach in calibrating the risks facing the financial system. A number of recent policy initiatives also aim to formalise a role for stress tests. One of these has been the inclusion of stress tests in the IMF FSAPs.

In 2002, the UK authorities, in consultation with the IMF, developed and carried out a stress testing exercise on the UK banking sector as part of the UK FSAP[1]. The aim was to quantify the impact on the major UK-based banks' balance sheets of adverse macroeconomic events ('shocks'). The stress tests were designed to assess the ability of the banks to absorb potential losses.

The next section of this article sets out some of the general issues involved in devising macro stress tests and describes how in the FSAP exercise the UK authorities and major banks co-operated in applying the tests. Then some of the key elements of setting up the macroeconomic stress tests are described followed by a description of the tests used and the results. The final section draws some conclusions and raises some issues to be considered in future exercises.

## How the stress tests were carried out

Stress tests involve a number of elements. First, plausible and internally consistent but 'challenging' macroeconomic scenarios need to be devised to illustrate possible extreme downside risks – so-called 'tail events'. In the FSAP exercise, a number of specific scenarios were constructed, which were judged to have a roughly equal chance of occurring. (Box 3 describes a complementary exercise, which estimates what the impact would be on UK banks' current portfolios in the event of a repeat of a historical adverse scenario – the early 1990s recession.) Second, macroeconomic shocks need to be mapped into their impact on individual bank's balance sheets. The size of the impact will depend on the composition and quality of banks' portfolios and the amount of capital they have to withstand the shock. Third, there are likely to be second-round effects of an increase in bank fragility on the financial system as a whole and more generally on the macro economy.

In the FSAP exercise, various approaches were considered. At one extreme, it might have been possible for the authorities to generate both the macro stress tests and to calculate their implications for banks' balance sheets. Although such an approach would have the advantage of being internally consistent, it would have been unlikely to capture the banks' reactions to the shocks. Alternatively, it might have been possible to describe some broad macroeconomic scenarios and to allow the banks to assess the impact on their balance sheets and profit and loss accounts. This approach would have the potential disadvantage that banks might interpret and apply such general macroeconomic scenarios in different ways. It might also make it more difficult to

repeat the exercise consistently at a later date to assess whether the robustness of the banking sector had changed.

In the end, a hybrid approach was adopted. The UK authorities constructed specific macroeconomic scenarios derived using an extension of the Bank of England's then current Medium-Term Macroeconometric Model (MTMM). The outputs from these scenarios were supplied to the UK banks as inputs to their own assessments (the 'bottom-up' approach). The banks were not obliged to use all of these inputs but could choose those that were relevant for their internal assessment. The results were then returned to the UK authorities and compared with the authorities' own analysis of the aggregate impact of the scenarios on UK banks (the 'top-down' approach)[2].

Under the bottom-up approach, the major UK banks each assessed the impact of the stress tests on their various business lines and types of risk. By contrast, under the top-down approach, the UK authorities used aggregate relationships (estimated in-house) linking changes in macroeconomic variables to banks' loan loss provisions. The bottom-up approach has the advantage of predicting how banks themselves assess the risks to their portfolios. The top-down approach, on the other hand, has the advantage of applying a consistent method to all the banks. However, the top-down approach is based on historical relationships between macroeconomic variables and banks' provisions and so might not accurately capture the quality, and thus risks, to banks' *current* portfolios.

A limitation of both approaches is that any potential second-round effects are ignored. In principle, these could be manifest in a number of ways. First, weakened banks might face an increase in funding costs and/or a withdrawal of deposits that might reduce their profits further. Second, faced with deterioration in the creditworthiness of their customers, banks might tighten the terms and conditions on their loans or adjust their portfolios in other ways. This could have second-round effects on

aggregate demand and output, leading to further potential losses in the banking system. Third, *in extremis*, if the shock were big enough to cause the failure of a large bank, this might have a direct impact on the capital, or even solvency, of other (counterparty) banks[3].

Ten large financial firms operating in the United Kingdom carried out the stress tests. The five UK-owned banking groups accounted for around three-quarters of the total assets of all UK-owned banks. Each bank was asked to identify separately the potential impact on their profits and capital arising from five main risk classes: market risk, interest rate risk, credit risk, insurance risk and a residual 'other' risk.

Since the large UK banks have worldwide operations, the geographical scope of the balance sheets to be considered is an important factor in defining stress tests for the UK banking system. For the purposes of the FSAP exercise, foreign-owned institutions were asked to report the impact in relation solely to business units operating in London. Moreover, although the UK-owned institutions were asked to consider the effects on a consolidated basis, the results do not, in all cases, capture the impact on all their non-bank and foreign operations. The tests were conducted in spring 2002, and firms assessed the impact on their profit and loss account and regulatory capital during the first year (until March 2003) – compared with their own internal forecast or base line[4].

### A macroeconomic stress test
**Assessing risk**

In conducting macroeconomic stress tests, it is important to distinguish between the likelihood of an unanticipated adverse event occurring and its potential impact. The approach used in the FSAP stress tests was to assess the size of possible reactions to a small set of specific unanticipated events (a 'deterministic' approach)[5]. This approach has the advantage of allowing each separate event to be assigned an equal chance of occurring and each scenario to be described in some detail. The latter

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2: The IMF staff also conducted their own top-down tests using a vector autoregression (VAR) model (see Box 2 and IMF (2003)).

3: See Elsinger, Lehar and Summer (2002) and Wells (2002).

4: Some banks could not provide quantitative estimates beyond a one-year horizon.

5: Providing the banks with a large number of stochastically generated shocks to evaluate would not have been practical.

was helpful in cases where the banks requested more quantitative information. Moreover, the scenarios are capable of being repeated at some later date and the results compared, in order to assess whether the robustness of the UK financial system has changed.

There are further stages in designing macroeconomic stress tests. The nature and number of the unexpected events have to be decided, as well as their size and transmission to the economy. These calibrations are facilitated if there is a suitable macroeconomic model. In this exercise, the Bank's then Medium-Term Macroeconometric Model (MTMM) was used, as extended to calculate the implications for household and corporate balance sheets (see Benito, Whitley and Young (2001)).

**Choosing the macro scenarios**

Four scenarios were chosen: a fall in global and domestic equity prices; an unexpected depreciation in the sterling exchange rate; an increase in domestic wage pressure; and a fall in house prices. Thus they included both domestic and global events, and shifts in both the demand for and supply of goods and services in the economy. These scenarios were chosen to capture some of the different aspects of the transmission mechanism thought likely to have a significant impact on the banking system.

**Calibrating the events**

The error variances from the equations in the Bank of England's MTMM were used in order to calibrate the initial shocks. The equations were estimated from 1987, so the conditional variances include the early 1990s recession. But this approach could not be applied for the shocks to the exchange rate and equity prices[6]. In these two cases historical variances and peak-to-trough estimates were used (see the Annex for a discussion of the advantages and disadvantages of different approaches to calibrating shocks).

In choosing the threshold probability for the shock to be regarded as a scenario worthy of analysis, a balance needs to be struck. On the one hand, if the probability were set too high – and thus the size of shocks too low – there would be little impact. Nothing would be learnt about how the banking

system would fare in a period of stress. On the other hand, if the size of shocks were extremely large, there would be almost no possibility of the event occurring. The size of events chosen was consistent with the range of estimates from the various methods discussed in the Annex, and broadly correspond to an event three standard deviations away from the mean. The timing of the change may be important for stress testing, especially over the relatively short time horizon used in this exercise (one year).

**The macroeconomic scenarios**

All the scenarios were estimated relative to a base case that was broadly consistent with the central outlook underlying the Bank's *Inflation Report* for November 2001. The impact of the shocks was estimated over a twelve month period (2002 Q2–2003 Q1) to provide an internally consistent set of outcomes for key macroeconomic variables, as well as for components of corporate and household sector balance sheets. The alternative scenarios also assumed that UK monetary policy (interest rates) reacted to the shocks according to a Taylor rule, which sets interest rates as a function of inflation and the output gap[7]. The assumed policy responses were intended broadly to be consistent with an inflation targeting monetary policy regime (but they should not be interpreted as necessarily indicating precisely how the Bank of England's Monetary Policy Committee would respond in practice). This assumption played an important role in the scenarios in stabilising some of the macroeconomic responses to the events.

The four scenarios used were:

(1) *Decline of 35% in world and UK equity prices.* Under this scenario, lower equity prices were assumed to result from a downward revision in expected corporate earnings. The macroeconomic transmission is largely through household balance sheets, whereby lower personal sector wealth reduces household consumption and hence aggregate GDP. But the impact on demand and output is partly offset by an easing in monetary policy in the UK and elsewhere. The main adverse consequences for the financial system are predicted to occur in the corporate sector, as a

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6: Although the macroeconomic model has rules of thumb for the determination of equity prices and the exchange rate, the equations do not have standard error distributions.

7: See Taylor (1993).

result of lower GDP and profits. Banks would be affected both by losses on their loan book and by the direct impact on the mark-to-market value of their trading book and insurance business.

(2) *Decline of 12% in UK house and commercial property prices.* This scenario is assumed to result from a general drop in demand for the flow of housing 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. Similarly, the monetary authorities are assumed to respond by cutting UK interest rates. Nonetheless, the net effect is that mortgage arrears increase relative to base, even though they remain low by historical standards. Corporate sector income is expected to fall relative to base as a consequence of weaker aggregate demand, and capital gearing rises because of the decline in commercial property prices. This shock is expected mainly to hit banks with a high concentration of property loans.

(3) *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 inflation induces a rise in official interest rates. Overall there is a marginal decline in GDP compared with the base case. Both corporate and household sectors are adversely affected. Despite higher household incomes, there is a rise in income gearing, which implies an increase in household mortgage and credit card arrears. Corporate profits fall relative to base and corporate liquidations increase.

(4) *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 (ie a rise in the sterling risk premium). Sterling depreciation results in higher inflation and, in response, nominal interest rates increase. 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. On balance, GDP growth is higher than otherwise. The corporate sector benefits from higher net exports, and profits rise relative to base, although aggregate corporate liquidations increase because of the increase in interest rates and therefore gearing. However, this scenario also hurts the household sector through the shift in the terms of trade and the rise in interest rates. Consequently, mortgage arrears increase substantially.

In addition to the scenario analysis, a number of single-factor (sensitivity) tests were carried out (Box 1).

## Implications for UK banks
### Bottom-up approach
Table 1(i) shows the overall impact of the four scenarios on the UK-owned banks' P & L account, while Charts 1–4 shows details of the effects on individual banks[8]. Tables 1(ii) and 1(iii) show the impact of the scenarios as a percentage of the banks' annual operating profits (averaged over the previous three years) and risk-weighted assets respectively.

Overall, the effects on UK banks were estimated to be quite small in all the scenarios. Aggregating across the major UK-owned banks, the adverse impact on profits varies from an average in scenario 1 (fall in world equity prices) of £432 million (23% of annual profits) to £146 million (6% of profits) in scenario 3 (rise in wage pressure). Looking at individual banks, only one was estimated to suffer a loss of more than 50% of average annual profits (over the past three years). This happened in the first scenario (Chart 2): the marked fall in equity prices reduces profits in a range of activities – loans and trading income and, in some cases, income on asset fund management and insurance business. Overall, the results suggest that under all scenarios the major UK banks would have a sufficient cushion in profits to absorb the shocks without depleting their capital. The size of the impacts (after allowing for tax) is also small in relation to UK-owned banks' risk-weighted assets – the biggest adverse impact, under scenario 1, is in the range of 0.12–0.56% of risk-weighted assets.

The largest effects for the UK-owned banks, on average, related to credit risk. This is unsurprising –

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8: The impacts of the scenarios on the foreign-owned institutions are not reported since they only cover a part of their business and are therefore not estimated on a comparable basis.

## Box 1: Sensitivity tests

In addition to the scenario analysis, the UK authorities and the IMF agreed on a number of single-factor tests – sensitivity tests – to supplement the multivariate scenarios. Each of the banks was asked to investigate the immediate impact through the trading book of the following:

(1) a 1 percentage point rise in UK interest rates;

(2) a 3 percentage point rise in UK interest rates; and

(3) a 10% depreciation of the sterling/dollar exchange rate.

The impact of the single-factor sensitivity tests on market risk show that a rise in interest rates (sensitivity tests 1 and 2) reduces trading income (Table A). The (10%) sterling/dollar depreciation

**Table A:**

**Sensitivity tests performed by the major UK-owned banks – aggregate effects on profits[a]**

| £ millions | Sensitivity test 1 | Sensitivity test 2 | Sensitivity test 3 |
|---|---|---|---|
| Mean | -60 | -195 | -1 |
| Median | -16 | -48 | 1 |
| Standard deviation | 81 | 278 | 9 |

Source: Major UK-owned banks.

(a) Negative implies stress test reduces profits, positive implies an increase in profits (relative to base).

(sensitivity test 3), on the other hand, has almost no impact on trading income for most banks, suggesting that exchange rate risk is almost fully hedged[1].

There are some drawbacks to this single-factor approach, notably the lack of specification of the underlying shock and the absence of implications for other important variables affecting banks' balance sheets.

1: The sensitivity results were estimated at a point in time – end December 2001. Since the trading book varies daily, in principle the results are sensitive to the time period chosen. But the UK banks updated the tests based on their positions as of September 2002 and the results were qualitatively similar.

the major UK-owned banks have significant loan exposures, especially to the domestic private sector, accounting for 75% of M4 lending. Moreover, the major UK-owned banks do not report large market risk positions on a relative basis – their trading book Value-at-Risk[9] is, on average, below 0.3% of shareholders' capital, significantly lower than for internationally active banks and securities firms in continental Europe and the USA.

One factor helping to explain the small size of the effects is the higher quality of banks' loan books than in the late 1980s. Over the past decade, there has been a widespread decline in the ratio of 'risk-weighted' to total assets used by regulators to calculate capital requirements. Also, aggregate sectoral data suggest that the composition of the large UK-owned banks' retail loan book has shifted away from riskier unsecured lending to relatively safer mortgage lending over the past decade[10]. And within the mortgage market, loan-to-value ratios (LTVs) are now much lower than in the late 1980s. For example, the proportion of UK banks' new mortgages

**Table 1:**

**Impact of stress scenarios performed by major UK-owned banks on profits[a]**

**(i) In £ millions**

|  | Scenario 1 | Scenario 2 | Scenario 3 | Scenario 4 |
|---|---|---|---|---|
| Mean | -432 | -252 | -146 | -214 |
| Median | -408 | -195 | -57 | -81 |
| Standard deviation | 305 | 219 | 270 | 359 |

**(ii) As a percentage of banks' annual pre-tax profits[b]**

|  | Scenario 1 | Scenario 2 | Scenario 3 | Scenario 4 |
|---|---|---|---|---|
| Mean | -22.7 | -15.0 | -6.3 | -1.8 |
| Median | -18.4 | -8.1 | -6.1 | -3.4 |
| Standard deviation | 21.2 | 18.1 | 8.3 | 18.4 |

**(iii) As a percentage of (end-2001) risk-weighted assets**

|  | Scenario 1 | Scenario 2 | Scenario 3 | Scenario 4 |
|---|---|---|---|---|
| Mean | -0.2 | -0.2 | -0.1 | -0.1 |
| Median | -0.2 | -0.1 | -0.1 | -0.1 |
| Standard deviation | 0.2 | 0.1 | 0.1 | 0.2 |

Source: Major UK-owned banks. For any given scenario the rank ordering of banks varies across the three measures shown above.

(a) Negative implies stress test reduces profits, positive implies an increase in profits (relative to base).

(b) Measured, on average, over previous three years.

9: VaRs are based on a ten-day holding period and a 99% confidence interval.

10: These changes reflect the impact of demutualisation as well as shifts in banks' portfolios.

## Impact of stress scenarios[a] on UK-owned banks – bottom-up approach

**Chart 1:**
**Impact on pre-tax profits[b]**
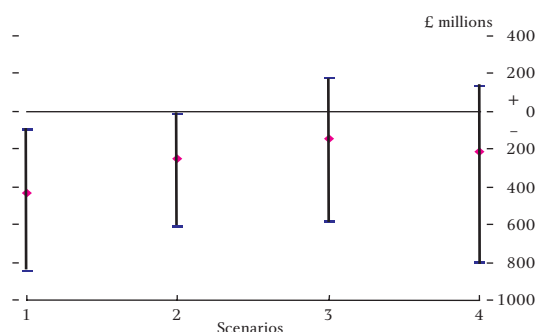


Source: Major UK-owned banks.

**Chart 2:**
**Impact as a percentage of average annual profits (over previous three years)[b]**
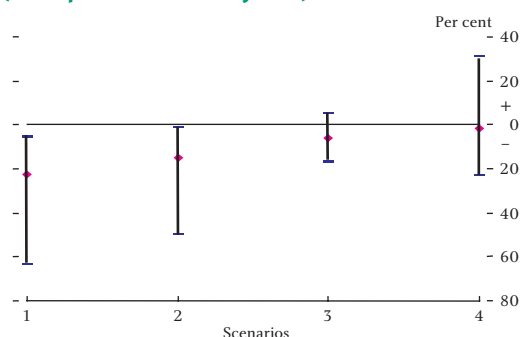


Source: Major UK-owned banks.

**Chart 3:**
**Impact as a percentage of total assets[b]**
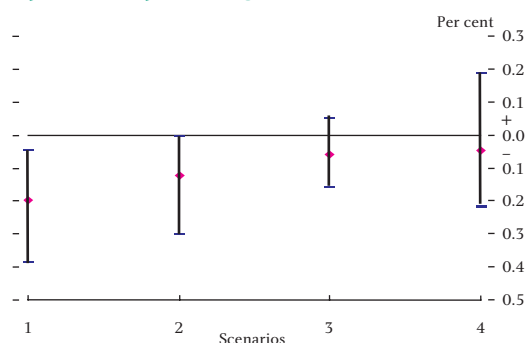


Source: Major UK-owned banks.

**Chart 4:**
**Impact as a percentage of risk-weighted assets[b]**
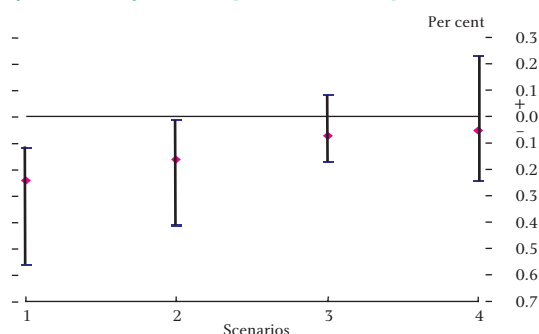


Source: Major UK-owned banks.

(a) For any given scenario the rank ordering of banks varies across the four measures shown above.

(b) The blue line represents the range across individual banks, the pink diamond shows the mean.

with LTVs over 90% has fallen since the mid-1990s, from almost 50% to below 30%[11]. Consequently, it would probably take a marked decline in house prices to cause a significant increase in losses on housing loans. UK banks' corporate loan portfolios also appear to be of a relatively high quality. Estimates indicate that almost half of major UK banks' corporate exposures have internal ratings equivalent to A or above (see Box 3).

Second, the impact of the scenarios was estimated only over a one-year horizon. In practice, it takes longer than one year for the full impact of the shock to work through. All but one bank valued loans on a historic cost rather than a marked-to-market basis (thus taking account of defaults but not other credit

deteriorations). Some of the defaults caused by an overall credit deterioration will not occur until later years. The one bank that also gave estimates as if the banking book were marked-to-market gave higher estimates of credit losses owing to the nature of their business, but still only representing 0.2% of their end-2001 risk-weighted assets. On the other hand, a longer time horizon would also enable the banks to adjust their new lending and potentially reduce or limit their ongoing losses. One bank sought to extend the simulations beyond the one-year horizon, assuming that the forecasts for the key macroeconomic variables remained flat at their values in 2003 Q1. This analysis suggested that their provisions for retail credit losses could be on average six times higher in the second year than the first

11: See Part III of *The financial stability conjuncture and outlook*, December 2002 *Financial Stability Review*.

## Box 2: Stress scenarios using a VAR model

Independently, as part of the FSAP exercise the IMF staff produced estimates of banks' losses under different macroeconomic scenarios using a top down approach based on VAR models for each of the household and (non-financial) corporate sectors. The models included measures of sectoral loan default rates and leverage, a policy variable – banks' lending rates – and some macroeconomic variables[1]. The VARs were estimated over the 1987–2001 period on quarterly data and used the estimated coefficients to simulate conditional future household and corporate default rates, and thus bank losses, in the event of selected shocks. The size of shocks were measured as the largest movement in the variables over the

estimation period and the impact on banks was estimated over a one-year horizon.

As in the macroeconomic model approach discussed in the main text, banks' losses on all scenarios were quite modest[2]. A marked (40%) fall in equity prices and 11% decline in property prices result in potential credit losses of only 0.5% and 1.2% of banks' total capital respectively. More extreme scenarios also appear to yield quite modest results over the one-year horizon. A 5.3 percentage point rise in interest rates results in credit losses of 1.2% of capital and even a 40% decline in property prices only results in estimated credit losses of 1.6% of total capital.

1: For the corporate VAR the macroeconomic variables were GDP growth, house prices and the sterling/DM exchange rate while the personal sector VAR used employment, house and equity prices.

2: The results are not strictly comparable since the IMF estimates are of actual credit losses on each scenario rather than the increase in losses compared with the (unconditional) base case.

(assuming no behavioural response by the bank). And, as a rough ready-reckoner, another bank suggested that the peak effect on retail loan-loss provisions was around three times the first-year effect and was likely to occur three years after the initial shock.

Also, the policy reaction tempers the impact of the shocks. Monetary policy is assumed to adjust partly to offset declines in output as well as rises in inflation (given the Taylor reaction function). So, for example, the decline in house prices is followed by a reduction in interest rates that moderates the impact on output, and thus on corporate liquidations and housing arrears. The large losses that UK banks incurred following asset price deflation in the early 1990s were accompanied by a sharp increase in nominal interest rates, and hence income gearing. In consequence, output fell substantially and liquidations and arrears rose sharply.

It might also be the case that in order to maintain a high credit rating and to have access to interbank funding the large UK banks hold capital in case of more extreme events than are considered here (see Jackson, Perraudin and Saporta (2002)).

**Top-down approach**

As a complement to the stress test results provided by the large banks, the Bank of England also estimated the effects on the provisions made against credit losses by the major UK-owned commercial banks in aggregate, using a single-equation econometric model. These top-down simulations compared the model-based predictions for banks' new provisions charged against profits under each scenario relative to a base case[12].

12: In the same spirit, the FSA undertook some top-down analysis for the aggregate UK building society sector.

The econometric model for banks' provisions is a reduced form showing the relationship between key macroeconomic (and bank-specific) variables and new provisions (see Pain (2003) for a further explanation). An advantage of this top-down approach is that the impact of the scenarios can be estimated beyond the one-year horizon[13].

One of the preferred equations estimated using a small panel dataset on the UK banks is:

$$\ln(prF_{it}/(1-prF_{it})) = -6.3 - 0.07\Delta gdp_t - 0.08\Delta wgdp_t$$
$$+0.09\Delta RR_{t-1} + 0.04\Delta M4L_{it-3} + 0.04\,propsh_{it-1} + 3.3\,herf_{it-1} \quad \text{(a)}$$
$$\overline{R}^2 = 0.75$$

where prF is the new provisions charge against profits relative to loans and advances

$\Delta gdp$ is annual growth in real GDP

$\Delta wgdp$ is annual growth in world real GDP

$\Delta RR$ is a measure of *ex post* real interest rates based on base rates and the GDP deflator

$\Delta M4L$ is the annual growth in M4 lending
propsh is the share of total (sterling) lending to domestic commercial property companies

herf is the herfindahl measure of concentration of the domestic (sterling) loan portfolio

$\Delta gdp$ significant at the 5% level, all other variables significant at the 1% level.

Using the equation, the impact of a shock was calculated as the difference between the 'shocked' value and a base case.

Table 2 summarises the average impact on provisions for the top-down simulations for those UK-owned commercial banks that also provided individual bottom-up estimates for the effects on provisions.

**Table 2:**

**Potential impact of stress test scenarios on UK commercial banks' provisions charge against profit[a]**

**First year**

|  | Scenario 1 | Scenario 2 | Scenario 3 | Scenario 4 |
|---|---|---|---|---|
| Mean | -172 (-5.7) | -47 (-1.6) | -4 (-0.1) | -31 (1.0) |
| Median | -181 (-6.1) | -50 (-1.7) | -4 (-0.1) | -32 (1.1) |
| Standard deviation | 39 (0.8) | 11 (0.2) | 1 (0.0) | 7 (0.1) |

**After three years[b]**

|  | Scenario 1 | Scenario 2 | Scenario 3 | Scenario 4 |
|---|---|---|---|---|
| Mean | -130 (-4.3) | -4 (-0.1) | -53 (-1.8) | -110 (-3.7) |
| Median | -138 (-4.6) | -4 (-0.1) | -56 (-1.9) | -116 (-3.9) |
| Standard deviation | 29 (0.6) | 1 (0.0) | 12 (0.2) | 25 (0.5) |

Source: Bank calculations.

(a) Negative sign means a decrease in profits, a positive sign an increase in profits. Percentage of past three years annual profits is in brackets.

(b) Cumulative impact. Assumes that the key macroeconomic variables return to base in 2004.

As in the case of the bottom-up approach, the largest effect on UK banks' provisions occurs in scenario 1: the 35% fall in world equity prices. Under this scenario, reductions in two of the key macroeconomic variables in equation (a) – UK and world GDP growth – increase the new provisions charge, more than offsetting the impact of lower real interest rates.

Overall, the top-down simulations also suggest that the likely increases in credit losses arising under all scenarios are quite small – all scenarios would result in an increase in banks' new provisions charges, both in the first year and cumulatively after three years, of less than £200 million on average (less than 10% of annual profits).

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13: However, a potential disadvantage of this approach is that it is based on the average historical relationships rather than on the impact on banks' *current* loan portfolios.

# Box 3: A complementary approach – re-running the early 1990s[1]

This box outlines an alternative stress testing exercise to complement those described in the main text. The shock scenario discussed here aims to replicate a specific, historical set of circumstances – the early 1990s recession. This was the last time that the UK banking system experienced significant losses (see Hoggarth and Pain (2002)).

Expected loss (EL) is the metric used to quantify the impact of this shock. EL is a broader measure than the accounting-based ones used in the FSAP stress tests, as EL captures deteriorations in credit quality as well as outright defaults.

Modelling EL is key to this stress test. EL is calculated as the product of the probability of default (PD), loss given default (LGD) and, for commitments that have not yet been drawn down, exposure at default (EAD). Therefore, taking as given how PDs and LGDs change during a recession year, the impact of early 1990s-type recession conditions can be modelled as the difference between the EL on the whole portfolio in a normal year and the EL in a year of recession conditions.

The data required for the stress test need to describe the current credit quality of banks' assets and how credit quality changed during the early 1990s recession. Individual UK-owned banks provided estimates of their *quality distribution by portfolio*[2]. These data comprise five portfolios (Chart A), each disaggregated into probability of default (PD) bands. The PDs represent banks' estimates of the likelihood that each exposure will default in the next year, where these estimates are based on long-run experience. For retail portfolios, the data also show banks' estimates of the loss given default (LGD). From these estimates – and with some assumptions about LGDs in the non-retail portfolios – it is possible to estimate expected loss (EL) for each portfolio and thus for banks' overall books. This provides the baseline against which the losses in a recession year can be compared.

**Chart A:**
**Composition of exposures**
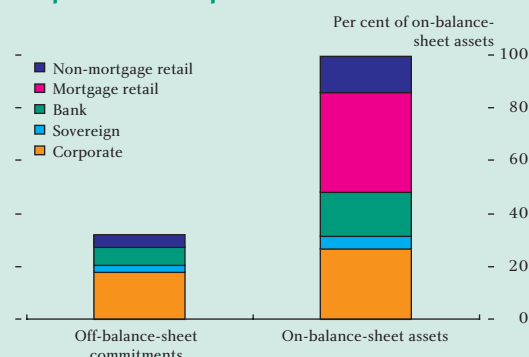


Source: UK banks.

The expected losses in a recession are derived differently for the retail and non-retail portfolios. For the **non-retail portfolios** (corporate, sovereign and bank), the expected decline in credit quality is estimated using a ratings transition matrix. This matrix records the incidence of one-year Moody's rating changes calculated from actual ratings changes that occurred between 1990–91 and 1991–92[3]. However, one important caveat is that US firms dominate the population of Moody's rated entities. The transition matrix is therefore at best a proxy for the impact of the UK recession. To use this matrix in conjunction with the banks' quality distribution data, the PD composition of each portfolio is mapped into the equivalent Moody's rating. The ratings transition matrix is then used to model how banks' exposures would change during a recession year. Unsurprisingly, the average quality of UK banks' aggregate non-retail portfolios would deteriorate.

One issue in calculating the expected losses in the recession year is what LGD rate to use. Credit models usually assume that only PDs change in a recession; LGDs are often assumed to be constant or to vary independently. But recent research suggests that LGDs can increase considerably in a recession[4]. Given this uncertainty about the behaviour of LGDs, two scenarios are considered in this analysis; one

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1: Written by Elizabeth Kent, David Lodge and Marco Stringa.

2: Data were provided by a number of UK-owned banks that collectively account for 40% of the assets of all UK-owned banks and with a portfolio composition that is representative of the UK banking system.

3: Taken from Nickell, Perraudin and Varotto (2001).

4: See, for example, Altman, Resti and Sironi (2002).

where LGDs do not change and another where they increase sharply, by 20 percentage points.

For the **retail portfolios** (mortgage and non-mortgage retail), it is not possible to use the ratings transition matrix as retail exposures are not rated. Instead the *percentage increase* in expected retail losses in a recession year is estimated directly from data on banks' loss experiences during the early 1990s recession[5]. The calibration of this increase in the EL is difficult, and depends on some imperfect proxies of banks' loss experiences. Therefore, a range of data sources is used, and the average percentage increase is used to scale up expected losses from the baseline scenario[6].

Having modelled the impact of a recession year on each portfolio, the expected losses can be aggregated to assess the overall effect of recession on the banks. The baseline estimate of EL expressed as a percentage of total on-balance-sheet assets is 0.5%, which appears plausible – it's in line with average provisioning levels over a full economic cycle[7]. This level of losses is equivalent to one-third of profits (before taxes and provisions) in recent years[8].

When the effect of the recession is taken into account, expected losses increase markedly (Chart B). ELs increase to the equivalent of around 60% and 80% of average profits before taxes and provisions for the fixed LGD and variable LGD scenarios respectively. For the non-retail portfolios, two-thirds of these expected losses are attributable to defaulted

loans in the recession year and one-third represent an increase in PDs on the remaining performing loans[9]. In both scenarios, the banks' profits are more than adequate to absorb the impact of the shock. Capital – banks' second shock-absorbing buffer – is untouched.

**Chart B:**
**Composition of expected losses**
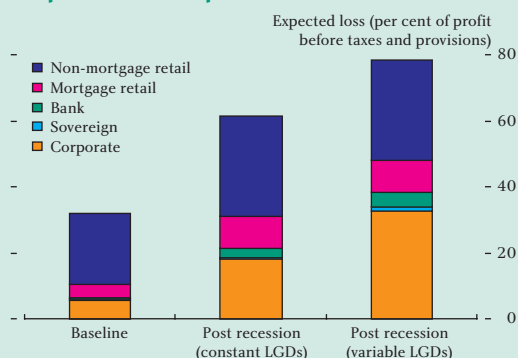


Sources: UK banks, Moody's Investors Service and Bank calculations.

The broad conclusion from this stress test is that the current levels of large UK banks' profits would seem to be sufficient to cover a decline in credit quality and increase in loss experience associated with a year of recession conditions; banks' capital buffers would remain untouched. The estimated scale of the losses is partly determined by the quality of data and some of the assumptions used in the stress test. Nonetheless, the level of losses are sufficiently low (well below 100% of profits before provisions) to suggest that the central conclusion would be robust to more conservative assumptions.

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5: Note that, in modelling EL directly (rather than the separate PD and LGD components), the issue of fixed or cyclical LGDs does not need to be addressed for the retail portfolios.

6: These data include write-off ratios reported to the Bank of England and data on mortgage repossessions and arrears from the Council of Mortgage Lenders.

7: Average provisioning levels relative to total assets for the ten major UK banks from 1986 to 2001.

8: From 1999 to 2001.

9: As it is not appropriate to use transition matrices for the retail portfolios, these calculations refer to the non-retail portfolios only.

## Conclusion

A range of stress tests using a number of approaches were carried out for the UK banking system as part of the FSAP. The estimated potential losses in no case exceeded annual profits or represented a large fraction of banks' capital. However, some caution needs to be attached to these results. Since banks would have found it difficult to translate longer-term scenarios into consequences for losses, most of the results only estimate the impact in the first year. Over a longer period, losses might accumulate, although banks would also have more opportunity to take action in response. The particular practice of reporting credit losses only after they have materialised, rather than on an expectations basis, also biases down the potential losses in the near term.

The results are also sensitive to the nature and specification of the macroeconomic stress tests. The size of the shocks is based largely on historical experience averaged over normal times and periods of stress, rather than taken from stress periods alone. The latter, by definition, occur infrequently and may be conditioned by the precise circumstances at the time. There may be sharp discontinuities in economic behaviour and relationships in crisis periods. The analysis also ignores how banks and their creditors, including other banks, would react faced with a weakened bank. Although individual bank actions might be designed to reduce potential losses, the collective results might intensify economic stress – through a credit crunch, for example – and weaken banks' positions further. It might also be the case that the proportional impact on capital is modest because banks hold capital as an insurance against more extreme events than have been considered here.

An important factor explaining the relatively modest impact of the scenarios on UK banks' profits is the assumed monetary policy reaction in response to a change in the outlook for inflation. Although the particular numerical results may depend on the precise specification of the interest rate reaction rule, to the extent that inflation targeting serves to stabilise some of the macroeconomic responses to unanticipated shocks, it will have beneficial implications for the stability of the UK financial system.

Overall, this exercise suggests that the stability of UK banks is unlikely to be threatened by a range of plausible adverse shocks, especially given that most UK banks are currently very profitable by international standards and have capital ratios well in excess of the regulatory minimum. Nonetheless, this exercise emphasises the importance for the authorities, and for banks themselves, of continuing to develop quantitative techniques that can be used to assess the resilience of individual banks and the financial system as a whole to potential shocks.

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## Annex: Measuring the initial shock in macroeconomic stress tests

In carrying out macroeconomic stress tests it is often very difficult to define the original shocks since macroeconomic models do not typically identify truly exogenous factors. Therefore, in the FSAP exercise the approach was to identify the measurable effect closest to the source of the shock. For example, in one of the scenarios, sterling depreciation was used to proxy a perceived increase in the relative riskiness of UK assets, since the latter could not be observed directly. If instead sterling depreciation had reflected an unexpected reduction in domestic interest rates (relative to foreign rates), the impact on the macro economy would have been expected to be quite different. This would not matter if this were simply a sensitivity test where the focus of interest was on the marginal effect of a change in one variable (the exchange rate in this example). But scenario analysis seeks to describe a coherent and consistent set of macroeconomic responses that arise from a specific initial event. Most of the stress tests discussed in the main text concentrate on macroeconomic scenarios (although these were supplemented with some sensitivity tests).

There are various methods of calibrating the shock, all based on explicit statistical criteria. One approach would be to consider the largest past movement (or change from peak to trough) in the variable of concern. An alternative would be to use a measure of historical variance. The latter enables a statistical probability to be attached to the risk of a shock occurring (assuming a normal distribution with that variance)[14]. On the other hand, large historical changes might be more relevant if it is judged that normal distributions understate the likelihood of extreme events[15].

Measures of historical variance will be sensitive to the time period and frequency of data used. They also provide no information on the original source of the shock, or of other macroeconomic factors that might have been affected, either directly or as a result of interactions between different components of the economy. This method is most suited to analysing the effects of a shock that is exogenous to the UK, such as

changes in world oil prices or demographic trends. Otherwise, the observed historical variances may include the effects of influences that arise from sources other than the shock itself and so may not be structurally stable. For example, historical variations in house prices may have been influenced in the past by a combination of factors, including personal incomes, interest rates and expectations of future capital gains. That would make it difficult to use the historical changes to calibrate the effects of a shift in expectations of future capital gains, for example, and so may generate biased estimates of the implications of such a shift for the macro economy and for the profitability of UK banks. Moreover, the direction and size of the bias would not be known.

One way around this problem is to rely more on some underlying economic model to provide an estimate of how far the variable considered is out of line with its long-run equilibrium. The underlying model need not be complex. Equilibrium house prices might be modelled by assuming that in the long run house prices grow in line with average earnings, so that over time the actual house price earnings ratio should converge on its long run average. In the earnings stress test, a measure of the deviation of real earnings growth from trend might also give some idea of sustainability that has some theoretical underpinnings (ie that real wages grow in line with trend productivity). In the case of the equity price test, the dividend discount model may be a useful stylised way of measuring deviations in equity prices from its long run[16]. How useful this approach is depends critically on the measure of underlying equilibrium.

In contrast, approaches that use a measure of *conditional variance* have both economic and statistical underpinnings. The error variance of an underlying estimated economic model can be used to identify an original independent shock. For a particular variable, its variance is measured conditional on holding constant all the explicit explanatory factors in the equation in which it is determined. The impact of the shock is then traced through to the other economic variables in the system. This method of identifying the shock requires a suitable well-specified set of

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14: For example, multiplying the standard deviation of the variable by 2.8 would imply a 5 in a 1,000 occurrence (ie 99.5% confidence level) – suggesting an extreme but still plausible event.

15: Applying a normal distribution will understate the likelihood of extreme events if the tails of the distribution are fat.

16: See the Box on 'equity market valuations' in the *Financial Stability Review*, June 2001, pages 36–37.

equations or model where the errors can be treated as independent[17]. Since the equations are estimated on actual data this approach also has some historical basis, and can be applied consistently in different conjunctural conditions and for different types of shock. The standard errors from the particular equation of interest can also be used to assign a statistical probability to the shock. Alternatively, the shock could be proxied by taking the largest residuals from the equation (although typically some smoothing may be necessary to take out the 'noise' in the data). Of course, any scenario derived from such an approach will depend on the structure and parameters of the particular model used[18].

17: These conditions are less likely to be satisfied for variables that are highly forward looking and that can jump in relation to news (for example, equity prices).

18: Vector auto regression (VAR) models are often used to distinguish between the incidences of certain classes of shocks, such as changes in supply and demand. But VAR models tend to be small and may not identify the relevant specific shock.

# Predicting default among UK companies:

## a Merton approach

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One of the key risks to financial stability is widespread default by UK companies. This article discusses an approach to quantifying the risk of default in individual companies using up-to-date market-based information. It finds that this Merton approach provides a reliable, ordinal, ranking of companies on the basis of their likelihood of going into liquidation. This is likely to prove to be a useful tool in regular surveillance.

**THE BANK MONITORS** the likelihood of corporate default because of its impact on lenders and possibly therefore on systemic stability. Although some loan losses are to be expected, and so should be allowed for in loan pricing, unexpected default can erode capital to a potentially dangerous degree.

Recent research at the Bank has been aimed at quantifying the risk of default by *individual* companies[1]. There are a number of separate ways in which this can be assessed. First, by informal judgement based on company visits and accounting information. Second, by formal quantitative analysis of accounting information and other disclosures. Third, by formal quantitative analysis of market-based indicators. All three of these methods can be combined to provide an overall assessment.

This article focuses on the third of these methods. It uses an approach to the quantitative modelling of credit risk initiated by Merton (1974) to show how the probability of default of an individual company can be inferred from its market valuation.

In principle, an important advantage of estimates based on the market value of individual companies is that they incorporate all information that the market judges to be relevant. Moreover, the estimates are available in a very timely way and could be updated continuously if that was desired. By contrast, estimates based on company accounts are available at most quarterly and often only once a year and then with a lag.

The usefulness of any indicator clearly depends on its reliability. The article assesses the reliability of the Merton approach using a range of different techniques and by comparing the accuracy of its predictions with those generated by models based on company accounts.

The article begins by discussing the underlying rationale of the Merton model. It then shows how the model can be used to generate estimates of the probability of default for individual companies. The reliability of the estimates is then assessed, first in comparison with other approaches and then using summary measures of the goodness of fit of the model. Finally, the article outlines how the model can be used to assess risks in the economy as a whole as well as in individual sectors.

### The Merton model

The quantitative modelling of credit risk initiated by Merton (1974) shows how the probability of company default can be inferred from the market valuation of companies under specific assumptions on how assets and liabilities evolve. The original Merton model is based on some simplifying assumptions about the structure of the typical company's finances and the circumstances under which default occurs. In particular, a company is considered to be in default when the value of its assets falls below the book value of its liabilities (the default point). In the original Merton model it is assumed that the event of default can take place only at the maturity of the debt when

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1: See Vlieghe (2001) for an account of previous work by the Bank on aggregate corporate liquidations.

the repayment is due. The model assumes that the proportionate change in the value of the firm's assets is subject to random influences over time. There may be a general tendency for the value to rise (or fall). But if there is also great variation in the change in the value over time, the range of possible values for the firm looking into the future may become very wide and include the possibility of default.

The broad working of the Merton model is illustrated in Diagram 1. This shows the initial market value of the company (at time 0) to be $V_0$. This is greater than the default point (DP) so that the company is not in default. As time progresses the value of the assets and liabilities of the company will change in a way that depends on the nature of the business and the shocks it faces. In the example shown in the diagram, the default point of the company does not change over time, but the value of the assets varies, reflecting the underlying shocks. The orange line shows one possible path over time of the value of the firm's assets. The range of possible outcomes at date T and their likelihood is represented by the pink probability distribution function. If when the debt comes to be repaid at date T the value of the firm is lower than the face value of the debt, then the firm is in default. The probability of default, as perceived at time 0, is shown by the shaded area in the chart. If the value of the debt is fixed and the value of the firm tends to rise then that in itself would make default less likely. But if the variation in the change in the value of the firm is very great that will tend to make the probability of default grow with time and more of the probability distribution will be below the debt line. This can be represented by the standardised 'distance to default', given by the difference between the expected value of the assets and the face value of debt at that date, divided by the standard deviation of the value of the firm's assets.

**Diagram 1:**
**Probability of Default**
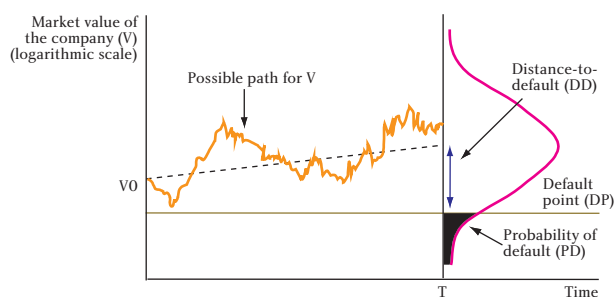


It would appear from this that the probability of default can be evaluated from knowledge of a company's market value, the book value of its liabilities and the process driving the value of assets forward. A difficulty in applying this model in practice is that the initial value and volatility of a company's assets cannot be observed. Nor can they be identified directly from the value and volatility of the company's equity and the book value of its liabilities. This arises from the fact that the value of equity can never be negative because shareholders have limited liability.

Merton's key insight was to point out that this puts the shareholders in the same position as if they had purchased a call option on the value of the company, with strike price given by the amount of debt outstanding. This is illustrated in Diagram 2 where the black line shows the payoff to shareholders for different values of the firm's assets at the date of maturity of its debt. If the value of the firm is greater than the face value of its debt, then the creditors could be paid in full and the shareholders take any value in excess of the debt. If the value of the firm is less than the face value of the debt then the creditors get whatever value there is and the shareholders get nothing. These payoffs are analogous to those of the owner of a call option. Option pricing theory would suggest that the relationship between the value of the firm's equity and its assets in advance of the date of maturity of the debt is represented by the orange line in the diagram. Even when the value of assets is below the default point, equity has some positive value so long as there is a chance that the firm might have enough good luck in the future to be able to pay its debts when they become due. Thus, as the value of a company's assets falls relative to the default point, so the value of its equity falls by less, reflecting the fact that the value of equity cannot fall below zero. Merton showed how option pricing techniques can be used to determine the underlying value of a company's assets from the value and volatility of its equity and the book value of its liabilities. So by observing the market value of equity ($V_e$ in Diagram 2) it is possible to calculate the value of assets ($V_a$). This approach can then be used to derive the probability of default.

There are a number of ways of implementing the Merton model in practice. Perhaps the best known is the proprietary credit risk measure of Moody's-KMV (M-KMV), known as the Expected Default Frequency

(EDF)[2]. This is summarised by Crosbie and Bohn (2002). It is a modified version of the basic Merton model in allowing default to occur at any time and not just at the maturity of the debt and taking account of multiple classes of liabilities. There are essentially three steps in the determination of the EDF. The first step is to estimate the asset value and volatility from the market value and volatility of equity and the book value of liabilities using their Merton approach. Second, the distance-to-default is calculated using the asset value and asset volatility. And finally, a default database of over 250,000 company-year data and over 4,700 incidents of default is used to derive an empirical distribution relating the distance-to-default to a default probability.

### Diagram 2:
### The relationship between the value of a firm's equity and its assets
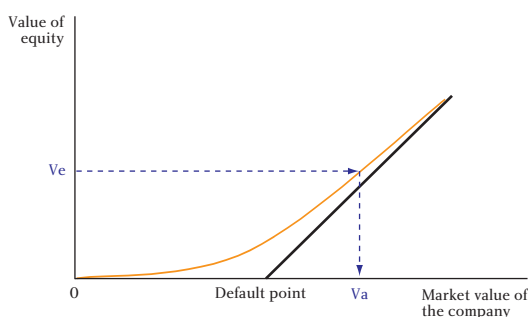


Our own approach to implementing the Merton model is different in that we use only publicly available information on market prices and time series estimates of model parameters to measure the probability of default. The model parameters estimated are the expected value and standard deviation of the process driving the value of each firm's assets. However, as with M-KMV, our approach allows default to occur at any time, rather than merely at the maturity of the debt. This involves the use of barrier option pricing methodology, where a barrier option is one on which the pay-off depends on the price of the underlying asset reaching a pre-specified level during a given period of time. Further details are available in Tudela and Young (2003). The probability of default is then evaluated from the standard normal distribution for estimated values of the distance of default. We make

no attempt to adjust these estimates to match the average rate of default observed in the company sector.

### Estimating the probability of default

In our initial work, we constructed weekly estimates from 1990 to 2001 of the probability of default (PD) over different time horizons for a large sample of quoted UK non-financial companies. We then use this sample to investigate the ability of the Merton approach to predict which companies enter receivership. Receivership is a narrow definition of default in that it excludes companies who default but avoid receivership, either because they go into administration, are taken over, restructure their debt or are rescued in some other way. We are unable to investigate a wider definition of default because of the lack of comprehensive information on defaults. The main features of the sample are shown in Table 1. Over the twelve years considered, 65 companies entered receivership out of 7,459 annual company observations[3].

As an initial test of the accuracy of the Merton approach, we first compare the PDs of failing and surviving companies. For failing companies, we calculate the 1-year ahead PD in each month of the twelve months prior to their entering receivership and take the simple average of these PDs as a measure of the default probability. For surviving companies, we take a simple average of the 1-year ahead PDs in each month of the preceding calendar year. We investigate the sensitivity of our results to these definitions below.

### Table 1:
### Distribution of receiverships over time

| Year | Surviving firms | Receiverships |
|------|-----------------|---------------|
| 1990 | 410 | 9 |
| 1991 | 443 | 10 |
| 1992 | 471 | 13 |
| 1993 | 482 | 7 |
| 1994 | 495 | 3 |
| 1995 | 508 | 6 |
| 1996 | 552 | 3 |
| 1997 | 595 | 5 |
| 1998 | 664 | 3 |
| 1999 | 907 | – |
| 2000 | 816 | 2 |
| 2001 | 1,051 | 4 |
| **Total** | 7,394 | 65 |

Sources: Thomson Financial Datastream and Bank calculations.

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2: M-KMV was formed in April 2002 with the acquisition of KMV by Moody's Corporation and merger with its Moody's Risk Management Services subsidiary.

3: The sample of failed companies was constructed by collecting news from FT.com about companies that went into receivership. The sample constructed in this manner was checked against the 'deaduk' dataset in Thompson Financial Datastream and the Companies House website. The date of receivership was selected as being the last day in which an equity price movement was observed.

It is clear from the raw data shown in Table 1 that failures were relatively more common in the recessionary period of 1990–92 than in the other years of our sample. To illustrate the properties of the PDs, Chart 1 shows average one-year PDs for the 13 companies that failed in 1992. The dotted vertical line cuts the time axis exactly one year before the failure date. All the PD curves show rising profiles before the companies defaulted, and in most cases the PDs are very high in the months before the failure. That is, we observe increasing levels of risk as the date of failure draws closer. From twelve to six months before failure the average one-year PD is always greater than 50.8%, whereas from 24 to twelve months before failure the average PD is 29.1%. This suggests that our implementation of the Merton model is able to pick up changes in the probability of failure of companies that actually fail.

An important question is the extent to which the method is able to discriminate between the prospects of failure of different companies and whether it does this reliably.

We perform a test for the equality of the average one-year PDs for the defaulters group and the non-defaulters group. The average one-year PD for the defaulters group is 47.33%, compared with 5.44% for the non-defaulters group. We are able to reject the null hypothesis that these means are the same at the 1% level of significance[4].

This suggests that on average there is a significantly higher PD for companies that fail, but how useful is the method in classifying individual companies as potential defaulters? By choosing a failure threshold for the PDs, it is possible to sort companies into those that the model predicts will default (for which the PD is greater than the set threshold) and those that the model predicts will survive (for which the PD is less than the threshold). The usefulness of the method in classifying companies in this way can then be assessed by examining how often the classification is wrong. There are two possible errors: unexpected failures, ie companies classified as survivors that failed (so-called Type I errors) and unexpected survivors, companies classified as failures that

survived (so-called Type II errors). Type I and II errors for different failure thresholds are shown in Table 2; Type I errors are shown as a proportion of failures while Type II errors as a proportion of survivors. The size of the respective errors is determined by the failure threshold. The lower the failure threshold, the smaller the Type I error, but at the expense of a greater Type II error.

**Table 2:**

**Type I and II errors: Proportion (per cent) of unexpected corporate failures and unexpected survivors[a]**

| Sample | Type error | Threshold (per cent) | | | | |
|---|---|---|---|---|---|---|
| | | 5 | 10 | 15 | 20 | 30 |
| Whole sample | I | 4.6 | 9.2 | 13.9 | 20.0 | 36.9 |
| | II | 20.0 | 15.0 | 11.8 | 9.4 | 6.3 |
| 1990 | I | 0.0 | 22.2 | 22.2 | 33.3 | 33.3 |
| | II | 20.2 | 14.2 | 10.7 | 8.1 | 5.4 |
| 1991 | I | 0.0 | 0.0 | 10.0 | 20.0 | 30.0 |
| | II | 31.8 | 26.9 | 22.1 | 18.5 | 13.5 |
| 1992 | I | 0.0 | 0.0 | 0.0 | 7.7 | 23.1 |
| | II | 25.9 | 19.1 | 15.3 | 12.3 | 8.1 |
| 1993 | I | 0.0 | 0.0 | 0.0 | 0.0 | 14.3 |
| | II | 30.5 | 23.4 | 19.5 | 16.2 | 11.8 |
| 1994 | I | 0.0 | 0.0 | 0.0 | 0.0 | 100.0 |
| | II | 17.2 | 11.9 | 9.1 | 6.9 | 4.4 |
| 1995 | I | 16.7 | 16.7 | 33.3 | 33.3 | 50.0 |
| | II | 14.0 | 10.0 | 7.1 | 5.1 | 3.5 |
| 1996 | I | 0.0 | 0.0 | 0.0 | 33.3 | 33.3 |
| | II | 14.1 | 10.5 | 9.1 | 7.3 | 5.8 |
| 1997 | I | 20.0 | 20.0 | 20.0 | 20.0 | 60.0 |
| | II | 14.5 | 11.4 | 8.6 | 6.6 | 3.7 |
| 1998 | I | 33.3 | 66.7 | 66.7 | 66.7 | 100.0 |
| | II | 15.2 | 10.5 | 8.0 | 6.3 | 4.1 |
| 1999 | I | – | – | – | – | – |
| | II | 19.1 | 14.6 | 11.5 | 9.3 | 6.1 |
| 2000 | I | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| | II | 19.7 | 15.2 | 11.9 | 9.3 | 5.6 |
| 2001 | I | 0.0 | 0.0 | 25.0 | 25.0 | 25.0 |
| | II | 21.6 | 15.7 | 12.2 | 10.0 | 6.5 |

Sources: Thomson Financial Datastream and Bank calculations.

(a) Threshold percentages relate to mean one-year PDs estimated by the Merton model.

As shown in Table 2, only three (4.6%) of the 65 companies that were liquidated in the entire sample were not classified as failures using a failure threshold of 5%. At this level, the Type I error is zero for eight of the years considered. But the corresponding Type II error is very high. In 1992, for example, a 5% threshold would have led to 135 companies being classified as failures, of whom only 13 actually failed, a Type II error of 122 companies (25.9% of non-defaulters). The

## Chart 1: One-year ahead probabilities of default

**Novalal**

Per cent

Sources: Thomson Financial Datastream and Bank calculations.

**International resort holdings**

Per cent

Sources: Thomson Financial Datastream and Bank calculations.

**Plastiseal**

Per cent

Sources: Thomson Financial Datastream and Bank calculations.

**Chequers group**

Per cent

Sources: Thomson Financial Datastream and Bank calculations.

**Burns Anderson group**

Per cent

Sources: Thomson Financial Datastream and Bank calculations.

**Sintrom**

Per cent

Sources: Thomson Financial Datastream and Bank calculations.

## Chart 1: One-year ahead probabilities of default (continued)
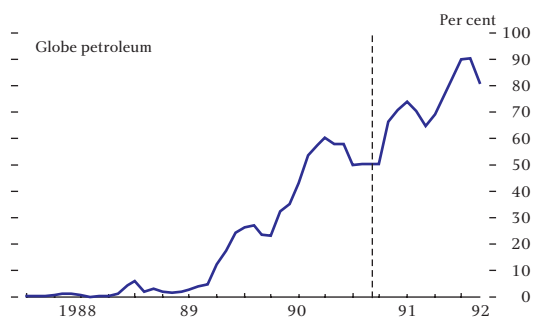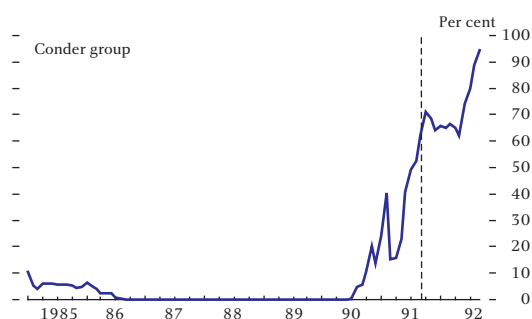


Globe petroleum

Per cent

Sources: Thomson Financial Datastream and Bank calculations.



Conder group

Per cent

Sources: Thomson Financial Datastream and Bank calculations.



Hey and Croft

Per cent

Sources: Thomson Financial Datastream and Bank calculations.



ATP communications

Per cent

Sources: Thomson Financial Datastream and Bank calculations.



Villaire

Per cent

Sources: Thomson Financial Datastream and Bank calculations.



Miskin group

Per cent

Sources: Thomson Financial Datastream and Bank calculations.



Colorgraphics

Per cent
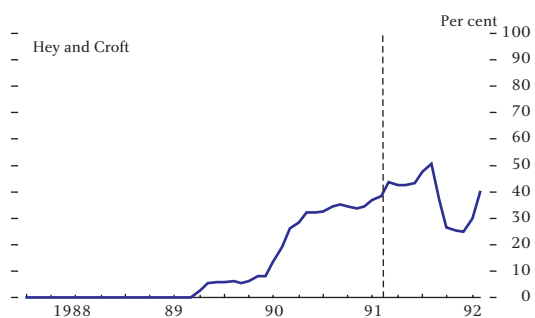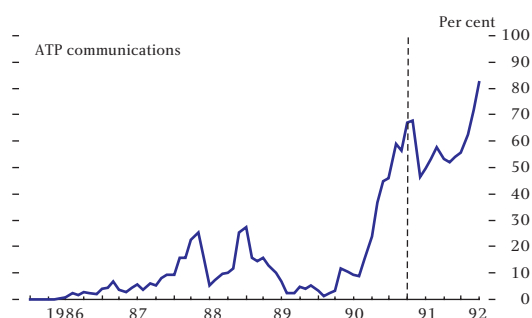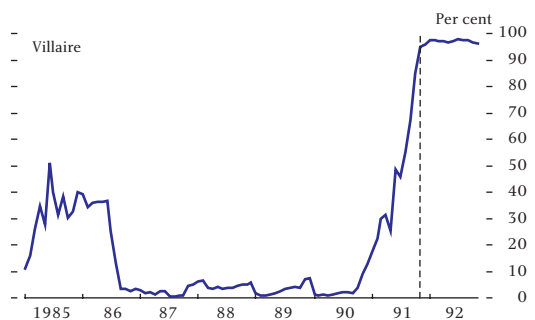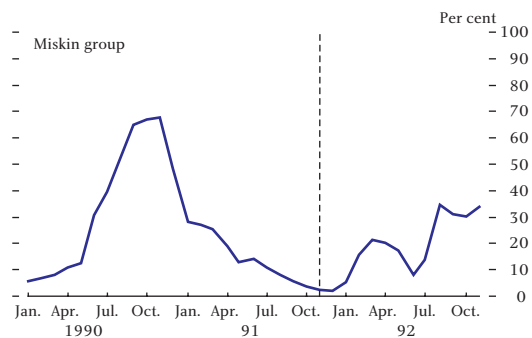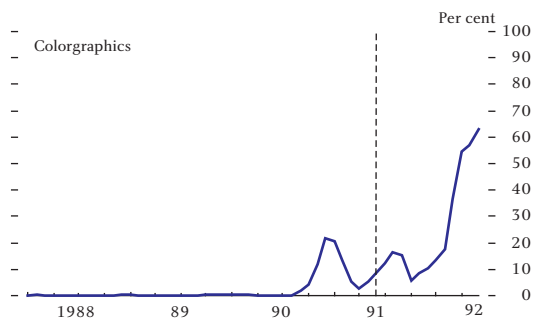
Sources: Thomson Financial Datastream and Bank calculations.

Type II error at this threshold for the whole sample is 19.9% of non-defaulting companies. If we increase the failure threshold to 10%, then the Type I error rises to 9.2% of failures while the Type II error falls to 15% of survivors.

The size of the appropriate threshold depends on what matters to the user. If the user is an investor or banker wishing at all costs to avoid investing in or financing high-risk companies, then the threshold would be set at a low level, to avoid Type I errors. Conversely if the user is more prepared to invest in or finance riskier companies, in order to earn higher returns, the threshold would be set high, to avoid Type II errors and narrowing the list of viable companies too far.

Overall, this implementation of the Merton model appears to be a useful tool for identifying companies at risk of receivership. But it is also important to assess how it compares to other methods of predicting company failure.

## The reliability of the Merton model relative to other approaches

There are several, alternative, well-established methods of predicting failure at the company-level. These include the Z-score approach of Altman (1968), where the likelihood of failure is assessed by giving marks to different aspects of a company's performance and combining them in a single score, and the company accounts based econometric approach of, for example, Geroski and Gregg (1997). We have compared the performance of our Merton approach with the information content of company accounts data by formal econometric methods, which allows straightforward hypothesis testing to be carried out.

The estimation strategy followed is first to develop an empirical model of company failure that uses only company accounts and other publicly available information. Then, the power of PDs estimated by our Merton model in explaining company default is assessed by testing for the statistical significance of these variables when added to the basic model. If the coefficient of the PD variable is significantly different from zero, we can conclude that the Merton approach here implemented adds value to the company account variables. Because both models are based on publicly available information, the issue being assessed is whether the structural Merton approach uses this information efficiently.

The company accounts based model uses broadly the same variables as Geroski and Gregg (1997). In addition, given the concentration of failures in the recession period, we also include the level of GDP as an additional regressor. The important determinants of failure according to this model are negative profitability, high gearing, poor sales growth and a poor cyclical position. Firm size, measured by the number of employees, is also marginally significant, suggesting that larger firms are less likely to fail than equivalent smaller quoted companies. More details are available in Tudela and Young (2003).

When Merton-derived PDs are added to this model they are strongly statistically significant, suggesting that they do indeed add information to that contained in the company accounts variables. Moreover, both the company profitability and sales variables cease to be significant. This implies that the information in these variables is incorporated efficiently in the PDs. Nevertheless, the best model is a hybrid model containing PDs, measures of company gearing, an indicator of firm size and the level of GDP.

## Power curves and accuracy ratios

We now evaluate the ability of the different models to rank failures and survivors using power curves and accuracy ratios, following Kocagil, Escott, Glormann, Malzkom and Scott (2002). Both testing tools evaluate the accuracy of a model in ranking failures and survivors using the estimated probabilities of default.

To plot a power curve for a given model, we first rank the companies by risk score (PD) from the riskiest to the safest along the horizontal axis. Starting with the riskiest companies, we then plot on the vertical axis the cumulative proportion of failures picked up by the model. Thus, for a sample in which 1% of companies fail, a perfect model would include all the failures within the riskiest percentile. By contrast, in a random model the first percentile would tend to include only 1% of the failures and its power curve would be represented by a 45 degree line. The better the model at ranking companies the more bowed towards the upper-left corner its power curve will be. The power curve is sample-dependent in that its shape is dependent on the proportion of companies in the sample that default.

The accuracy ratio (AR) gives a single statistic that summarises the information content of the power

curve. It ranks models from 0% (random model) to 100% (perfect model) and it is defined as the ratio of the areas below the power curve and above the diagonal for the actual to the perfect model.

Chart 2 plots the power curve for some of the models estimated in this paper. The dark blue curve represents the hybrid model that includes both PDs and some company accounts information, while the green curve represents the pure company account model, ie it does not include any information from the PDs. The pink curve corresponds to the pure Merton model based on the 1-year PD. Observing the different curves we see that the hybrid model as here designed outperforms the other models at the lower percentiles. The pure Merton model based on the 1-year PD annual average is almost identical to our hybrid model for the highest risk companies. The model that uses only company account information is clearly inferior to the hybrid model or our implementation of the Merton approach.

**Chart 2:**
**Power curves**
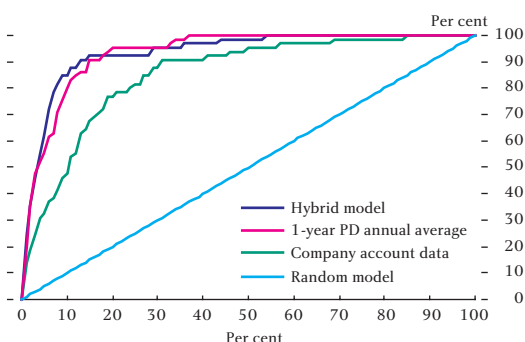


Sources: Thomson Financial Datastream and Bank calculations.

In Table 3 we report the accuracy ratios for the same models of Chart 2. Sobehart and Keenan (2001b) report the accuracy ratios for M-KMV's implementation of the Merton model (using 1-year probabilities of default) and for a hybrid model as described in Sobehart and Keenan (2001a). These ratios are 69.0% and 72.7%, respectively. We can use these figures as an approximate benchmark to evaluate the accuracy ratios reported in Table 3, although power curves and accuracy ratios constructed for different data sets are not strictly comparable because they are sample dependent. It can be seen that the pure Merton model based on the 1-year PD annual average, and the hybrid model, have comparable accuracy ratios, while the company accounts based model is clearly inferior.

**Table 3:**
**Accuracy ratios**

| Model | Accuracy ratio (per cent) |
| --- | --- |
| Hybrid model | 77.0 |
| 1-year PD annual average | 76.8 |
| Company account data | 54.5 |

Sources: Thomson Financial Datastream and Bank calculations.

**Aggregation and use in surveillance**

One of the uses to which the PDs estimated for individual companies might potentially be put is in assessing default risk in the economy as a whole. In principle, the simple average PD across companies should be a useful indicator of the overall default rate and its distribution should be a guide to the number of companies vulnerable to default and the riskiness of different sectors. Moreover, because the PD is based on market information, it should take account of the knock-on effect of one company's default on the financial position of others, since this should be factored into share prices.

Chart 3 plots the mean of the 1-year PDs against the aggregate corporate liquidations rate. The PD is led by one year so that it corresponds with the timing of the liquidations it is predicting. This updates to January 2003 the historical information used in developing the Merton model. Apart from the most recent observations (see below), the highest values of the mean 1-year PDs are concentrated in the early 1990s. This is consistent with the general deterioration in credit risk at that time illustrated by the rise in the aggregate corporate liquidations rate. The chart also shows that the level of the average 1-year PD is substantially higher than the aggregate liquidations rate, broadly consistent with the liquidation rate of companies in our sample. This suggests that the *level* of PDs derived from the Merton model tends to over-estimate the probability of an individual company going into liquidation.

The relatively high level of the average 1-year PD derives mainly from the estimated PD of the riskiest companies. Chart 4 shows the distribution of the 1-year PDs, plotting the probability of default at the 90th, 80th, 70th and 60th percentiles. Throughout the period the PD at the higher percentiles of the distribution has been appreciably greater than the actual frequency of failure amongst the relevant companies, reflected in the level of Type II errors discussed earlier. For example, in 1992 the riskiest decile of companies had a median PD of 73%, but

Per cent

3.5 –
3.0 –    Aggregate
         liquidation (LHS)
2.5 –
                                    Average one-year
2.0 –                               probability of default
                                    (RHS)
1.5 –
1.0 –
0.5 –
0.0 –

Per cent

– 16
– 14
– 12
– 10
– 8
– 6
– 4
– 2

1991 92   93   94   95   96   97   98   99 2000 01   02
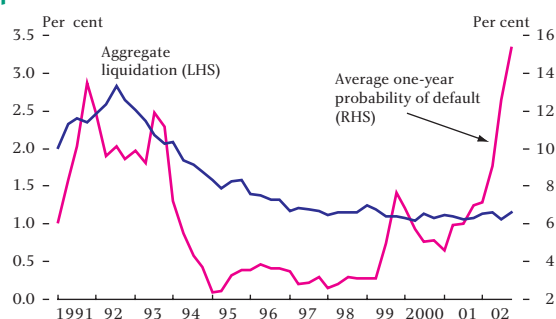
Sources: Thomson Financial Datastream, ONS and Bank calculations.
(a) The average 1-year PD is led one year so that it corresponds with the timing of aggregate liquidations.

only 14% of these companies went into liquidation. Companies in the next riskiest decile had a median PD of 26%, but only 6% of them went into liquidation. This discrepancy could reflect inaccuracies in the Merton approach; but it could also arise because the rate of liquidation is lower than the rate of default among these companies or because action is taken by companies with high PDs to prevent failure from actually occurring. Of course, this does not question the ability of the Merton model to provide an ordinal ranking of companies on the basis of their likelihood of going into liquidation. In 1992, no companies ranked outside the top two deciles were forced into liquidation.

**Chart 4:**
**Aggregate 1-year ahead probability of defaults distribution**

Per cent

— 60th percentile
— 70th percentile
— 80th percentile
— 90th percentile

– 100
– 90
– 80
– 70
– 60
– 50
– 40
– 30
– 20
– 10
– 0

1990 91   92   93   94   95   96   97   98   99 2000 01   02 03
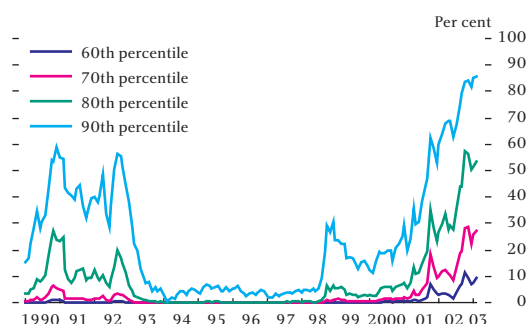
Sources: Thomson Financial Datastream and Bank calculations.

The mean PD has picked up sharply recently, reflecting the sustained period of stock market weakness since 1999, combined with high market volatility and the rise of corporate capital gearing to historically high levels. The average 1-year PD has actually risen above the levels prevailing during the

recession of the early 1990s. In contrast to the early 1990s, however, this increase has not been accompanied by a significant rise in receiverships among our sample of companies.

This disjunction does call into question the usefulness of the *average* PD as an aggregate indicator in that it is now providing a strong signal of distress in the corporate sector that is not matched by the liquidations rate which remains at historically low levels. One possible reason for this is that many of the companies identified as having a high PD are not failing on our receivership-based definition, but nevertheless fail to repay their debt in full. The list of highest risk companies according to the estimated PDs contains several well-known companies who have continued to survive despite having had to renegotiate their debt. Thus the rise in the average PD over the past two to three years could be consistent with the observed debt problems of over-leveraged companies which have nevertheless managed to avoid receivership by restructuring their debt. Some evidence for this is shown in Chart 5 which plots the annual value of public bond defaults by UK non financial companies since 1998. The sharp rise in defaults on public bond issues at a time when the aggregate liquidations rate has fallen confirms some of the signal provided by the average PD.

**Chart 5:**
**Annual value of public bond defaults by UK PNFCs**

£ billions

– 18
– 16
– 14
– 12
– 10
– 8
– 6
– 4
– 2
– 0

1998   99   2000   01   02
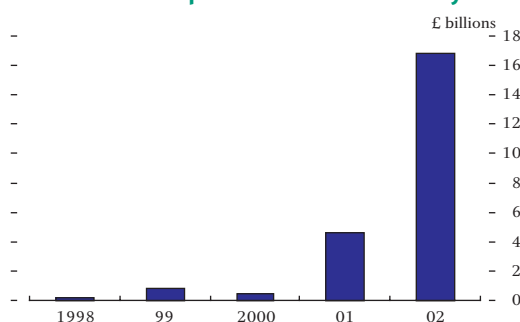
Sources: Moody's Investors' Service and Bank calculations.

The current low rate of corporate liquidations in the UK could also reflect the level of corporate income gearing. This does not enter the Merton model directly, since its effects should in theory be taken into account by equity markets. But, in contrast to the early 1990s, the current low level of income gearing may make it easier for companies to reach agreement to restructure their debt when under financial pressure, thereby avoiding outright default.

It is possible therefore that the distress signal provided by the PD is now being reflected more than usually by debt restructuring and re-negotiation rather than by outright liquidation of companies.

More generally, the low level of the PD for most companies, even in the early 1990s, shows that failure remains unlikely for the average company even when the economy as a whole is in recession. Thus the main advantage of the Merton approach is in discriminating between companies and highlighting those most at risk.

As well as discriminating between individual firms, it is also useful to examine the risks within particular sectors. Chart 6 plots the average 1-year PDs for the manufacturing, retail, leisure and transport and telecoms sectors. While all show an increase in the past two or three years, this has been largest for transport and telecoms.

**Chart 6:**

**One-year ahead probabilities of default by sectors (averages)**
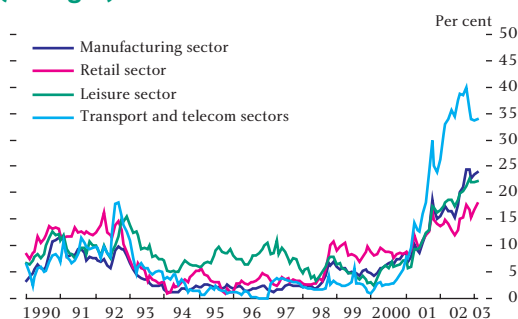
Sources: Thomson Financial Datastream and Bank calculations.

**Conclusions**

This article describes the derivation of default probabilities from an extended version of the Merton model and applies this to a number of UK non-financial quoted companies over the period from 1990 to the January 2003.

Our analysis suggests that the model appears to be most useful in ranking companies according to their riskiness rather than in identifying their probability of failure. In aggregate, the level of the PD is much higher than the aggregate liquidations rate. Moreover, the recent rise in the average PD has not been matched by an increase in the aggregate liquidations rate. While this may be due to a rise in corporate debt problems that are resolved without liquidation, it

does suggest that the aggregate implications of the model need to be interpreted with caution.

The main strength of the model is in ranking companies according to their riskiness. The mean value of the average 1-year PD for our entire sample is 47.3% for those companies that went into liquidation, and 5.4% for those that did not.

Calculation of Type I and II errors suggests that PDs are successful in discriminating between failing and non-failing firms. Using a threshold of 10%, that is, classifying defaults as those firms with a 1-year PD greater or equal to 10%, the Type I error is relatively modest at 9.2% (with a Type II error of 15.0%). Moreover, our implementation of the Merton approach clearly outperforms reduced form company accounts-based model of the type of Geroski and Gregg (1997). While a hybrid model, combining company account information and the PDs derived from a Merton model performs best, it is only marginally better than the pure Merton model. This all suggests that the model is a useful surveillance tool for assessing the riskiness of individual companies.

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# A statistical overview of

# CHAPS Sterling

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CHAPS Sterling handles sterling denominated inter-bank payments. This article provides a statistical overview of CHAPS Sterling, focusing in particular upon payment activity, liquidity provision, and 'concentration' risk (the extent to which the failure of a single bank could disrupt the payment system as a whole). The evidence suggests that a bank failure would not prevent the remaining healthy banks from making payments to each other. However, as payment activity is relatively concentrated, the failure of a key node bank could still disrupt the payment system.

**CHAPS (the Clearing House Automated Payment System)** Sterling handles Sterling denominated inter-bank payments. Although there are only 13 direct members, all UK banks have indirect access through (direct or indirect) correspondent relationships with member banks. CHAPS Sterling can therefore be thought of as the central clearing house for a network of private payment systems run by individual banks. The importance of CHAPS Sterling to the UK economy is illustrated by the fact that payments through the system average about £175 billion (approximately 17.5% of the United Kingdom's annual GDP) *per day*. Even a temporary disruption could adversely affect UK economic activity.

The central processor for CHAPS Sterling is operated by the Bank of England, and the accounts across which inter-bank payments are made are held at the Bank. As CHAPS system operator and settlement agent, the Bank is involved in all CHAPS Sterling transactions and maintains data on these for research purposes. This article analyses this data to provide a statistical overview of CHAPS Sterling, focusing in particular upon: payment activity[1]; liquidity provision; and concentration risk, that is, the extent to which the failure of a single bank could disrupt the payment *system* as a whole[2].

## CHAPS Sterling

CHAPS Sterling is a Real-Time Gross Settlement (RTGS) payment system. A given bank X makes a payment of £Z to another bank Y by instructing the Bank of England to transfer £Z from its account to Y's account. The payment is made instantly if X's balance covers the payment in question, and each payment is final and irrevocable once made. Each payment instruction is processed in turn (ie payments from X to Y and from Y to X are not netted against one another)[3].

A bank may obtain the liquidity needed to make payments in two ways. First, it can obtain liquidity directly by posting collateral with the Bank[4]. Second, it can obtain liquidity by receiving a payment from another bank. So, the total amount of liquidity available to the system as a whole is determined by the amount of collateral the member banks post with the Bank. The subsequent pattern of payments by these banks determines the distribution of that liquidity across member banks.

Since a given bank can obtain the liquidity it needs to make its own payments by receiving a payment from another bank, it follows that a given amount of liquidity can support many times its value in payments over a given time interval. Furthermore, the speed of payment activity (as measured by the brevity

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1: APACS (the Association of Payment Clearing Services) presents less detailed summary statistics of CHAPS sterling payment activity on its website (www.apacs.org.uk).

2: The central bank of Sweden (the Sveriges Riksbank) presents a related analysis of concentration risk in the Swedish payment system in an article entitled 'Can a Bank Failure Threaten the Payment System?' in its *Financial Stability Report 2003/1*.

3: One may find a more detailed explanation of how a RTGS system functions in Fry et al (1999), and a review of the advantages and disadvantages of RTGS and net settlement systems in McAndrews and Trundle (2001).

4: A bank posts collateral by repoing eligible marketable securities to the Bank. The Bank protects itself against the possibility that market fluctuations reduce the value of the securities a bank provides to less than the amount the Bank credits the bank's account by applying a haircut to the value of the repoed securities.

of the wait a customer faces before his bank has the liquidity it needs to make his payment) increases with the amount of liquidity in the system[5].

## Concentration risk

A payment system is potentially vulnerable to concentration risk if the failure of a single bank would, in the absence of regulatory intervention, result in the cessation of a substantial proportion of total payment activity in the system. 'Failure' is taken here to mean an event that instantly and completely removes a bank – and any liquidity that it controls – from the system[6].

A bank failure can affect the payment system through two channels, which one may label the 'liquidity concentration' channel and the 'payment concentration' channel. First, if a given bank controls a substantial portion of total system liquidity at the time it fails (liquidity concentration), that failure may indirectly disrupt the payment system by depriving the healthy banks of the liquidity they need to make payments to each other. Second, if a bank participates in a sufficient proportion of total payments (payment concentration), then its failure may directly disrupt the payment system by preventing healthy banks from making payments to its customers and by preventing its customers from making payments to the healthy banks.

Of course, bank customers, member banks and regulators can take steps to reduce the impact of a bank failure upon the payment system. For example, healthy banks (using Bank facilities) can counteract a disruption flowing from the liquidity concentration channel by posting additional collateral, thereby alleviating a liquidity shortage. Or, a failed bank's customers can mitigate the disruption from the payment concentration channel if they can redirect their payments through a healthy bank. Assessing the cost and effectiveness of these countermeasures is beyond the scope of this article, which is limited to establishing whether and to what extent concentration risk exists.

## Payment activity

The research discussed here uses a sample period from 4 March 2002 to 28 March 2003 (270 business days)[7]. CHAPS Sterling consisted, during this sample period, of eleven active commercial banks and the Bank[8].

CHAPS Sterling transactions may be divided into liquidity transactions and CHAPS Sterling payments. A CHAPS Sterling payment is a payment between two member commercial banks' CHAPS Sterling accounts. Such a transaction moves liquidity around the system, but does not add or subtract liquidity from the system. A liquidity transaction is any other payment. So, for example, a commercial bank's initial deposit of liquidity into CHAPS Sterling counts as a liquidity transaction rather than a CHAPS Sterling payment. To take another slightly less obvious example, note that banks use CHAPS Sterling as a gateway to other payment and settlement systems such as CREST (the securities settlement system). It makes more sense to think of a payment from a given bank's CHAPS Sterling account to its CREST account as moving liquidity out of CHAPS Sterling into CREST, rather than as a CHAPS Sterling payment[9].

Since the Bank is not a standard commercial bank, it participates in the system in a different way from the commercial banks. For example, a significant proportion of the Bank's activity stems from its money market operations. In the analysis below, transactions between the Bank and the commercial banks are classified as liquidity transactions rather than as CHAPS Sterling payments.

Summary statistics on the value and volume of payment activity are presented in Table 1. CHAPS

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5: The speed of payment activity in an actual payment system depends upon the recondite details of that system's design, and much of payment system research is devoted towards improving the speed/liquidity relationship. See, for example, McAndrews and Trundle (2001) for an overview of the payment system design debate, and Leinonen and Soramaki (1999) for an example of research on payment speed and liquidity. All else equal, a payment system that can achieve a given speed while requiring less liquidity is to be preferred. However, if the cost of supplying liquidity to the payment system is not very high (as the evidence discussed below suggests), then it is not clear that increasing the speed/liquidity trade-off (as opposed to, say, reducing concentration risk) should be the primary goal of payment system design.

6: Failure here need not mean legal failure. For example, an operational failure that disrupted a bank's IT systems might temporarily prevent if from participating in the payment system, but would not prevent the bank from return to full operation at a later date.

7: A small number of days were lost owing to mechanical data capture problems.

8: These banks are ABN Amro, Barclays, the Bank of Scotland, Citibank, Clydesdale, the Cooperative, Deutsche, Lloyds TSB, HSBC, Natwest/RBS and Standard Chartered. Though RBS and NatWest have yet to formally merge their CHAPS sterling accounts, they are combined here for analytical purposes.

9: This classification matters when one is calculating the total value of payments made during a day, etc.

**Table 1:**

**CHAPS Sterling payments summary statistics**

|  | Total payments £ millions per day | Number of payments per day | Daily average payment size £ millions | Daily median payment size £ millions |
|---|---|---|---|---|
| **Average** | 176,934.5 | 94,590.0 | 1.9 | 0.017 |
| **Standard deviation** | 25,985.2 | 21,922.8 | 0.3 | 0.004 |

Source: Bank calculations.

Sterling payments averaged a total of £177 billion per day over the sample period, with the daily value of payments ranging from £100 billion to just under £300 billion (Chart 1). The daily number of transactions averaged slightly under 100,000. Payment activity is particularly high at the end of each quarter, and is particularly low on US holidays (owing primarily to a reduction in foreign exchange transactions).

**Chart 1:**

**Total payments in CHAPS Sterling**
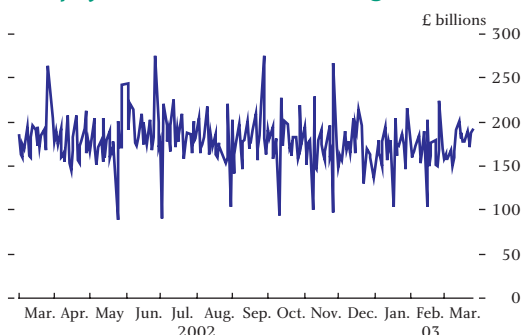


Source: Bank calculations.

Table 1 also shows that the payment size distribution is highly skewed, with the size of the average payment (£1.9 million) being over one hundred times greater than that of the median payment (£0.017 million). Examining the payment size distribution in more detail (Chart 2), about 45% of transactions are for less than £10,000, while 0.5% of transactions exceed £100 million.

Turning now to the intraday pattern of payment activity, Chart 3 illustrates that payment activity proceeds at a reasonably constant rate between 0700 and 1620 (the cut-off time for CHAPS Sterling payments). On the basis of this pattern, define the 'CHAPS day' to be this period.

To get an idea of how concentrated payment activity is across CHAPS Sterling banks, consider the daily

**Chart 2:**

**Distribution of payments in CHAPS Sterling by size**
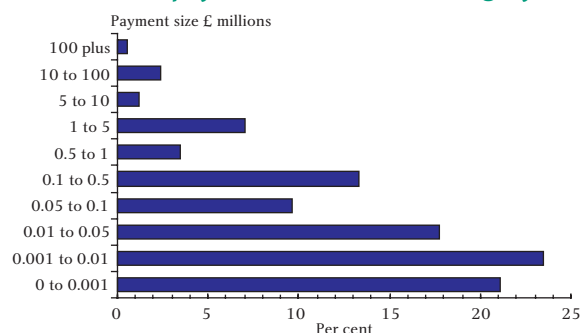


Source: Bank calculations.

**Chart 3:**

**Intraday pattern of payment activity in CHAPS Sterling**
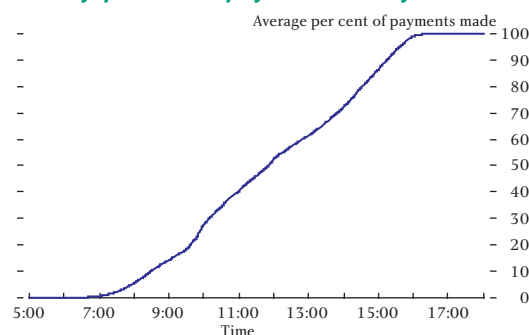


Source: Bank calculations.

Herfindahl index of payment concentration (plotted in Chart 4). This Herfindahl index ($HI_{Payments}$) equals

$$HI_{Payments} = \sum_{Banks} \left( \frac{\text{Bank i Payments}}{\text{Total Payments}} \right)^2$$

It is a characteristic of the Herfindahl index that if the parameter in question is equally divided between N participants, then the Herfindahl measure of concentration equals $1/N$. So, it follows that HI here will lie somewhere between 0.09, the case in which payment activity is equally divided between the eleven active commercial banks in CHAPS Sterling, and 0.5, the case in which all payments occur between two of these banks.

Chart 4 shows that the HI of payment activity is consistently slightly under 0.2, the number one would observe if payment activity were equally divided between five to six banks. So, while payment activity is not evenly divided between member banks, it is not all that concentrated either.

**Chart 4:**
**Concentration in payment activity and liquidity provision in CHAPS Sterling**
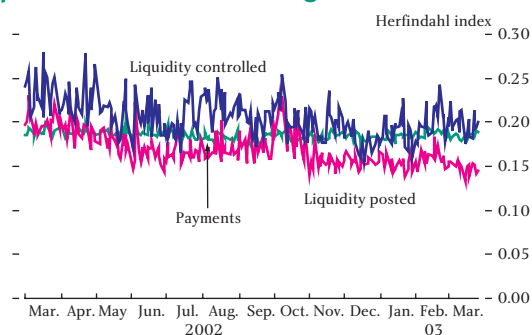


Source: Bank calculations.

## Liquidity provision

The intraday pattern of liquidity posted is illustrated in Chart 5. One can see that banks put liquidity into CHAPS Sterling shortly after 05:00, and then quickly take 10% to 20% of that liquidity out (by sending it to CREST to support their securities settlement activities). During the CHAPS day, the amount of liquidity posted is fairly constant. After the CHAPS day, banks collect their liquidity from the various payment and settlement systems to which they belong and withdraw it (repurchasing the securities they sold to the Bank to acquire the liquidity in the first place). Thus, about 80% of the maximum total liquidity posted to CHAPS Sterling is available to support CHAPS Sterling payments during normal operating hours.

**Chart 5:**
**Intraday pattern of posted liquidity in CHAPS Sterling**
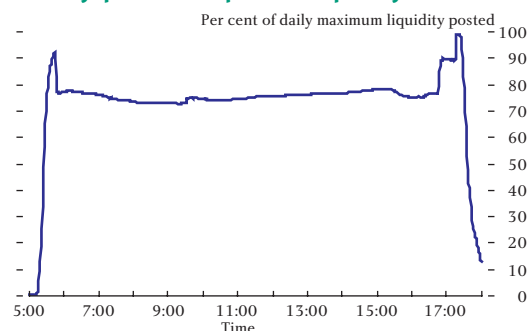


Source: Bank calculations.

Keeping this intraday pattern in mind, it seems reasonable to measure total liquidity available on a given day as the time-weighted average of liquidity posted over the CHAPS day[10]. The daily total liquidity available in CHAPS Sterling averaged slightly under £20 billion prior to September 2002, and averaged slightly more than £20 billion after September 2002 (Chart 6)[11].

**Chart 6:**
**Liquidity used in CHAPS Sterling**
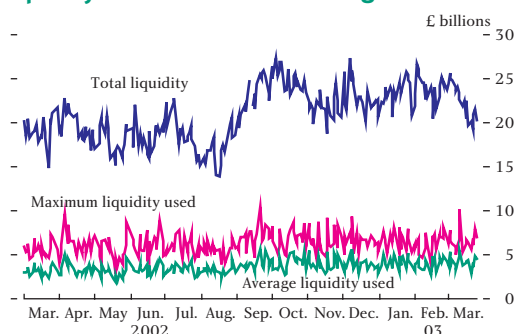


Source: Bank calculations.

To examine the concentration of liquidity provision, consider a Herfindahl index for average liquidity posted (calculated as above, substituting in each bank's time-weighted average liquidity posted for total payments). Chart 4 indicates that liquidity posted is slightly less concentrated than payment activity, but the index still averages around 0.2.

As banks make payments over the course of the day, they will be either absorbing liquidity from or supplying liquidity to the system as a whole. The net flow of liquidity from bank X from the opening of CHAPS Sterling to time t equals

$$\text{Net Flow}_{X,t} = \sum_0^t \text{Payments Made} - \sum_0^t \text{Payments Received}$$

If net flow at t is positive, then X is supplying liquidity to the system. If net flow is negative, then X is absorbing liquidity from the system. The amount of liquidity X controls at t then equals

$$\text{Liquidity Controlled}_{X,t} = \text{Liquidity Posted}_{X,t} - \text{Net Flow}_{X,t}$$

---

10: CHAPS Sterling operates on a time period of 1/100 of a second (ie the Bank of England processes payment transactions each 1/100 of a second). To calculate a time-weighted average, then, one must take into account liquidity posted at the end of each 1/100 of a second period.

11: This change in liquidity posting behaviour around September 2002 may be because of the introduction of CLS Bank (a settlement system for foreign exchange transactions), but this pattern is not investigated further here. Box 3 of *Strengthening financial infrastructure* in this *Review* examines evidence on the effects of CLS on CHAPS Sterling.

The Herfindahl index of liquidity controlled is also shown in Chart 4. The chart reveals that liquidity is slightly but consistently held in a more concentrated manner than it is posted.

The amount of liquidity a bank X supplies to the system at time t equals

$$\text{Liquidity Supplied}_{X,t} = \text{Maximum}\,[\text{Net Flow}_{X,t},\, 0]$$

Recall that if net flow is less than zero, then the bank is absorbing rather than supplying liquidity. A bank must supply liquidity in the course of making payments when the value of payments it wishes to make exceeds the value of the payments it receives. A bank can supply this liquidity only by posting it.

It follows that the amount of liquidity that CHAPS Sterling banks as a group must post in order to support the observed level of payment activity equals[12]

$$\text{Liquidity Required} = \sum_{\text{CHAPS Banks}} \text{Liquidity Supplied}$$

The maximum liquidity required at any point during each day, as well as the time-weighted average amount of liquidity required over the CHAPS day, is plotted in Chart 6. The maximum amount of liquidity required is generally in the region of £6 billion to £7 billion, while the average amount required is in the region of £4 billion to £5 billion[15]. Chart 6 reveals that the amount of liquidity banks post far exceeds the amount they actually use. The most likely explanation for this finding is that the opportunity cost of posting liquidity is not very high. The large UK banks that form the heart of the CHAPS Sterling payment system face a low marginal cost for posting liquidity because: 1) the types of securities that the Bank will repo in exchange for providing liquidity also form the core of the marketable assets that these banks must hold to meet their regulatory stock liquidity requirement; and 2) regulations currently allow banks to repo assets held to meet stock liquidity requirements to the Bank to obtain liquidity. Thus, since the banks must hold these assets anyway, the marginal cost of using them in CHAPS Sterling for the day is close to zero.

### Concentration risk

Concentration risk arises through two channels: the liquidity concentration channel and the payment concentration channel. Consider each in turn.

**The liquidity concentration channel**

The failure of a given bank will affect the payment system as a whole through the liquidity concentration channel if that failure reduces the amount of liquidity available in the payment system such that it is then insufficient to support the payment activity of the remaining healthy banks. One can gauge this vulnerability by plotting the total liquidity in the system, the amount of liquidity that would remain in the system after the failure by the bank controlling the most liquidity (post-failure liquidity[14]), and the maximum liquidity required to support that day's payment activity for each day in the sample period (Chart 7).

**Chart 7:**
**Liquidity channel concentration risk**
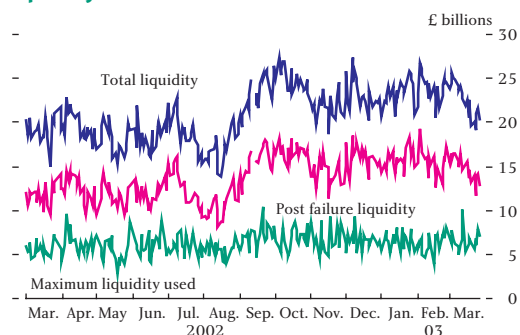


Source: Bank calculations.

The chart demonstrates that the level of post-failure liquidity considerably exceeds the maximum liquidity required for every sample day. This analysis therefore suggests that the member banks in CHAPS Sterling are well protected against liquidity concentration risk. Even if the bank controlling the most liquidity at any given time were to fail, there would still be plenty of liquidity to support normal payment flows.

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12: This calculation assumes that banks can redistribute system liquidity to where it is needed through the inter-bank loan market.

13: In the presence of a liquidity shortage, it would almost certainly be possible for banks to alter the timing of payments so as to reduce the liquidity required to support their payment activity. It follows that the average liquidity required may provide a more accurate indication than the peak liquidity demanded of the (obtainable) minimum amount of liquidity the system would need to support its payment activity.

14: The maximum amount of liquidity controlled figure for a given sample day equals the time-weighted average of the maximum liquidity controlled during the CHAPS day.

Given that the total volume of payments considerably exceeds the total amount of liquidity and the fact that each bank's payments are stochastic and lumpy, it would seem likely that chance alone would at times produce a distribution of system liquidity that gave rise to concentration risk. The fact that such situations do not in practice occur suggests that banks tend to manage their payments to limit liquidity concentrations and its associated systemic risks. For example, banks can agree a system rule to ensure that no bank can absorb too much liquidity (a receiver limit) or they can limit their own exposure by operating bilateral position limits. These actions will limit the amount of liquidity that a bank failure can drain from the system. Furthermore, imposing a bilateral position limit may not interfere significantly with payment flows as payment transactions between pairs of banks will be roughly balanced over time. So, in the event that a bank X hits the net payment limit that bank Y imposes, it is likely that X will soon send payments to Y.

Thus by imposing bilateral position limits and by posting a little more liquidity than it otherwise would, a bank can protect its ability to make payments in the event of a failure by another bank. If the cost of posting liquidity is low (as the evidence suggests it is for the major UK banks in CHAPS Sterling), and if the cost to the bank of being seen to be unreliable is high (as it no doubt is), then individual banks will have a strong incentive to post that additional liquidity. One would therefore expect to find that concentration risk will not arise from the liquidity concentration channel.

**The payment concentration channel**
The analysis above showed that payment activity (measured in terms of each bank's payment share) is not all that concentrated. This suggests that the payment concentration channel may not pose significant system-wide risks either. Payment share, however, is not the correct way to measure these risks. Each payment involves both a sending and a receiving bank, and a given payment will not be made if either of the banks involved fail[15]. Consequently, the appropriate payment concentration channel risk index for a given bank X equals

$$\text{Node Risk}_X = \frac{\text{Payments Made}_X + \text{Payments Received}_X}{\text{Total Payments Made}}$$

The risk index values for the three most active banks and the average risk index value for the remaining banks are shown in Chart 8. The risk index for each of the two most active banks equal approximately 50%, and the index for the third most active bank averages about 35%. The average risk index value for the remaining banks is much smaller. These results imply that half of payment activity would stop if either of the two most active banks were to fail. Such an event would clearly be highly disruptive to the payment *system* as a whole.

**Chart 8:**
**Percentage of payment activities involving individual banks**
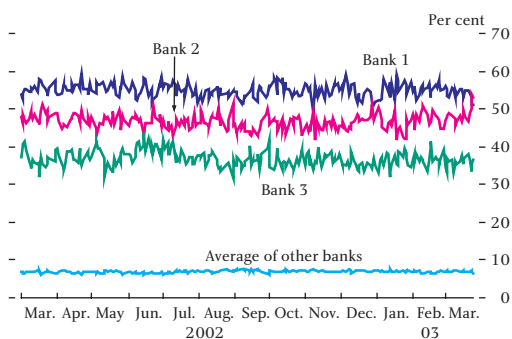


Source: Bank calculations.

The payment concentration channel gives rise to system-wide risks in part because individual banks are in a much poorer position to protect themselves. To see why, consider a highly stylised payment system market consisting of a public payment system (such as CHAPS Sterling) containing just two major banks, X and Y. Each of these two major banks runs a private payment system for a large number of extremely small banks. Every payment in the public system is either from X to Y or from Y to X. So, if either bank fails, payment activity in the system stops[16]. It is reasonable to assume that a payment system disruption of this magnitude will have adverse consequences for the smooth functioning of the economy more generally (and so adversely affecting payment flows in the surviving private network)[17].

15: Of course, the payer and payee could, potentially, re-route their payments through another bank. But it is unlikely that they could do this quickly or without incurring large costs.

16: Of course, payments between customers and/or the small banks that are clients of the healthy bank would continue; we would not see a cessation of all payment activity.

17: The length of this disruption will be a function of the ease and speed with which the smaller banks and the failing bank's customers can re-route their payment activity.

Moreover, there is nothing that either bank can do to protect itself and, more importantly, its customers against the risk of a counterparty failure. Holding additional liquidity and/or imposing a bilateral position limit have no effect upon this risk. A major bank could reduce the node risk it imposes upon the system by turning customers away, but it has little incentive do so.

Alternatively, a smaller bank could leave a major bank's private payment system and join the public payment system directly. The incentives to do so are, however, likely to be limited. First, a smaller bank presumably joined a major bank's private payment system because it was beneficial to do so, perhaps in terms of operating costs or additional services. Second, the fact that a single small bank joins the public system directly will do little to reduce node risk from the perspective of the payment system as a whole. Instead of 100% of payments within the system stopping in the event of a failure by a major bank, 95% of payments, say, within the system would stop. Third, entering the payment system directly will do little to protect the small bank's ability to make payments. Consider a bank XX (a small bank in X's network). If XX enters the public payment system directly and Y fails, it is no better off than it would have been if it had remained in X's network. If X fails, then XX can still make payments to Y directly. However, since it had chosen to be in X's network originally, it is likely that most of its payment activity involved other members of X's network. So it is hard for a small bank to deal with payment concentration risk. And, more generally, one would not expect payment systems themselves to develop a good defence against payment concentration risk[18].

## Conclusions

CHAPS Sterling is clearly a core component of the UK financial system's infrastructure. Financial system participants and regulators thus have a strong interest in ensuring that CHAPS Sterling is robust. One of the risks to which CHAPS Sterling may be vulnerable is concentration risk, that is, the risk that a failure by a single member bank will disrupt the payment system as a whole.

Concentration risk may affect the payment system through a liquidity concentration channel and through a payment concentration channel. A member bank can protect itself (and so the system) against concentration risk flowing from the liquidity concentration channel by posting additional liquidity, by imposing limits on bilateral positions, and by monitoring receiving bank behaviour. The evidence suggests that CHAPS Sterling member banks do manage their liquidity in a way that protects them and the system from this channel.

Individual member banks, however, can do little to protect themselves against concentration risk flowing from the payment concentration channel. The degree of payment concentration in CHAPS Sterling is relatively high. So, an event that causes a key node bank to withdraw from the payment system could potentially seriously disrupt the system's ability to function.

Clearly, this risk can best be combated by ensuring that key banks are financially strong institutions that operate under strong systems and controls. And, of course, every bank has strong incentives to ensure that such is the case. But the risk controls of a key node bank are relevant not only to the bank's own customers, but also to the users of the system as a whole.

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18: System designers affect a bank's decision to join the public payment system, and so that system's node risk, through their decisions regarding design and cost recovery. System designers may therefore wish to take the impact of their decisions on node risk into account when making them.

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# Moral hazard:
## how does IMF lending affect debtor and creditor incentives?

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When the IMF lends to countries in crisis does this distort materially the risk-taking incentives of debtors and creditors – so-called 'moral hazard'? The existing literature is undecided. In this article, we take a critical look at the existing evidence and present some new evidence of our own. Taken together, it suggests that debtor and creditor moral hazard has been, and remains, a concern.

**SINCE THE MID-1990s**, financial crises have become more frequent in emerging market economies. In response, the International Monetary Fund (IMF), and other international financial institutions, have often contributed financing to help cushion the side-effects. These financial cushions have been large. Indeed, they have often been substantially larger than at any time in the IMF's history. As Chart 1 illustrates, the average annual purchase by member countries drawing on the IMF's General Resources Account (GRA) has risen from around US$150 million during the 1980s to over US$2 billion entering the 21st century[1].

### Chart 1:
### Average GRA purchases[a]
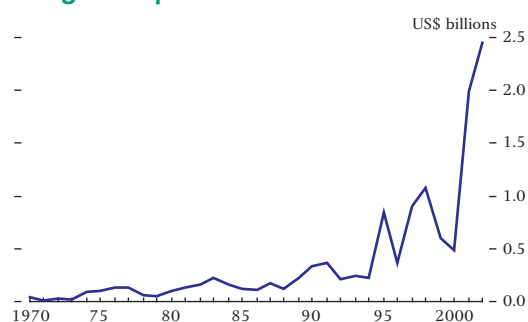


Sources: Gai and Taylor (2003) and IMF.

(a) Average annual purchase from GRA (excluding reserve tranche purchases) of those IMF member countries making a purchase in given year.

These developments raise some difficult public policy questions. In particular, is this rise in official sector financing a natural response to an increased incidence of financial crisis from the 1990s onwards?

Or might it actually have sowed the seeds of future crises by blunting the incentives of debtors and creditors to undertake effective credit risk-management? And what analysis can be brought to bear to address these questions?

Although the analogy is not exact, IMF facilities can usefully be considered as a kind of insurance policy. Short-term liquidity support from the IMF offers some insurance against the short-term liquidity problems facing countries. Liquidity crises represent a *real hazard* that such insurance can help mitigate. In this role, IMF insurance is clearly welfare-enhancing.

As with any insurance policy, however, the benefit comes at a cost. Mitigating the real hazard of crisis might at the same time aggravate the *moral hazard* of distorted incentives. Risk-mitigants may lead the insured parties to become less attentive to these risks: in an international context, this might lead debtors to undertake riskier and/or larger-scale borrowing and creditors to undertake riskier and/or larger-scale lending.

All insurance policies, IMF or otherwise, entail some degree of moral hazard. That is in their nature. An optimal insurance contract will seek, however, to balance these moral hazard costs against the real hazard benefits that insurance confers. Assessing the appropriate scale of IMF lending involves the same trade-off, both in individual country cases and in aggregate. But to strike that balance we need

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1: On the basis of data since 1970, IMF loans are currently at their highest ever average level in relation to gross domestic product (GDP) (Chart 3).

*quantitative* evidence on the importance of these two types of hazard.

Below, we consider some of the existing empirical evidence on the moral hazard induced by IMF financing and critically evaluate the conclusions which have been reached. We then summarise some new evidence which aims to identify more precisely moral hazard affecting debtor countries and private creditors. The empirical evidence is only illustrative; it is doubtful whether empirical evidence in this area could ever be definitive. But taken together it paints a consistent picture: large-scale IMF lending may lead to a significant distortion of incentives.

### What the papers say

**Emerging market capital flows**

It is striking – indeed, surprising – that there have been relatively few formal empirical studies of whether large-scale IMF loans have led to a significant distortion of (debtor and creditor) incentives. There has, of course, been no shortage of informal studies and punditry. For example, a number of commentators have pointed to the decline in capital flows to emerging markets, relative to say the mid-1990s, as evidence against pervasive moral hazard (Chart 2). Low capital flows are not consistent with excessive risk-taking, so this argument goes.

**Chart 2:**

**Capital flows to emerging markets**
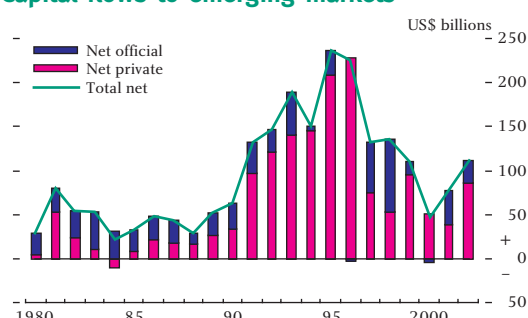


Source: IMF World Economic Outlook.

This approach is, however, asking the wrong question. The issue is not capital flows now versus those in the past. That difference depends on a wide range of factors – for example, changing risk-aversion among creditors and macro-fundamentals among debtors, as well as IMF lending policies. In principle, a more useful comparison is between current capital flows and their counterfactual level in the absence of the

IMF. But the latter is unobservable, so this approach is impossible to apply in practice.

More generally, it is a matter of debate just how 'depressed' current levels of capital flows to emerging markets really are. True, they are well below their high-water mark in 1996, with net private flows less than half that level. But with hindsight, the mid-1990s were probably an overshoot. Recent flows may have seen a return to normality. Moreover, the composition of capital flows over recent years – much more equity and less debt – may also be more in line with a sustainable position, given that some emerging markets had by the late 1990s encumbered themselves with excessively high debt-equity ratios.

### Assessing financial redistributions

It is useful to divide formal empirical studies of moral hazard into two broad strands, the first looking at the effects of IMF intervention on financial redistributions among the parties to crisis, the second at the effects of such intervention on borrowing costs for debtors.

IMF financing provided to recent crisis countries has unquestionably been large, both in money amounts and in relation to GDP. As Table 1 illustrates, funds committed under large-scale IMF programmes since the mid-1990s have averaged around 6% of crisis countries' GDP and have in some cases reached over 10% of GDP.

**Table 1:**

**Selected IMF arrangements**

| | Programme[a] | Funds available[b]: as per cent of quota | as per cent of GDP[c] |
|---|---|---|---|
| **Brazil 2002** | SBA with SRF | 752 | 6.9 |
| **Turkey 2002** | SBA | 1,330 | 9.5 |
| **Brazil 2001** | SBA with SRF | 400 | 3.0 |
| **Argentina 2000** | SBA with SRF[d] | 800 | 7.8 |
| **Turkey 1999** | SBA with SRF[e] | 1,560 | 10.5 |
| **Brazil 1998** | SBA with SRF | 600 | 2.3 |
| **Korea 1997** | SBA with SRF | 1,938 | 4.4 |
| **Indonesia 1997** | SBA | 557 | 5.2 |
| **Thailand 1997** | SBA | 505 | 2.6 |
| **Mexico 1995** | SBA | 688 | 6.3 |

Sources: Gai and Taylor (2003), IMF and IMF World Economic Outlook.
(a) SBA – Stand-By Arrangements; SRF – Supplemental Reserve Facility (introduced from Dec. 1997).
(b) Funds available include augmentations to initial amount announced.
(c) Relative to GDP in year of initial programme announcement.
(d) SRF approved Jan. 2001.
(e) SRF approved Dec. 2000.

But there is an important respect in which the analogy between IMF loans and insurance contracts breaks down. Insurance contracts involve a permanent transfer of funds from the insurer to the insuree on realisation of the risk. By contrast, IMF loans involve only a temporary transfer. They are loans, not gifts. Certainly, the headline IMF loan amounts in Table 1 are likely to give a misleading impression of the size of any net long-term transfers.

The IMF can of course bring about a net financial redistribution through the cost (rather than the quantum) of its loans. As many IMF loans are made at an essentially risk-free rate of interest – based on the rate on Special Drawing Rights (SDRs) – this risk might, at first blush, appear significant. In practice, however, there are two mitigating factors.

First, IMF loans have in practice ranked ahead of both private sector and bilateral official loans in terms of seniority. Second, partly as a result, arrears to the IMF have historically been very rare[2]. If IMF loans are essentially risk-free, then charging a risk-free rate would be appropriate. The subsidy component of IMF loans would be trifling and the resulting distortion to incentives associated with IMF lending correspondingly limited[3].

This point is underscored if we set these (small or zero) average transfers to debtors and creditors from the IMF alongside the *negative* costs each faces as a result of crisis. For debtors, there are widely varying estimates of the costs of recent crises. But they all share the common characteristic that they are large. In terms of output forgone, these costs have ranged anywhere from 5% to over 25% of pre-crisis GDP[4]. For creditors, some estimates would put the value loss on their emerging market portfolio associated with recent crises as high as US$240 billion[5].

In the light of this analysis, *net* transfers to debtors and creditors resulting from recent crises appear likely to have been strongly negative. So if risk-taking behaviour by debtors and creditors is based on these net transfers, neither party's incentives to take crisis risks are likely to have been much affected by recent IMF interventions, whether large or small.

**Assessing financing costs**

A second approach has aimed to detect moral hazard indirectly by examining the borrowing costs facing debtor countries. The theory here is that IMF loans help protect both debtors and creditors from the risk choices they face; they mitigate the downside risks of default. So IMF intervention should result in a fall in the equilibrium cost of borrowing between debtors and creditors. That, in turn, may provide incentives for lending and borrowing beyond prudent levels. In other words, observed borrowing costs may serve as a diagnostic on (excessive) risk-taking incentives.

A number of studies have looked at this phenomenon around the time of IMF intervention events, when 'news' is revealed to the markets about the IMF's future lending intentions. Taken together, these studies suggest there is some evidence of (dwindling) moral hazard towards the end of the 1990s, but that this may have largely disappeared moving into the 21st century. For example, Zhang (1999) examines borrowing spreads either side of the Mexican IMF package in 1995, but fails to detect any significant effect. Dell'Ariccia, Schnabel and Zettelmeyer (2002) and McBrady and Seasholes (2000) consider two 'reverse' moral hazard events in the late 1990s: the first, the Russian default on domestic debt in 1998; the second, the decision by Pakistan to restructure its international bonds in 1999. There is evidence from these studies of spreads having risen in response and the distribution of spreads having widened. Both are consistent with some moral hazard having been squeezed from the system by these events. Finally, Kamin (2002) compares spreads over recent years with those prior to the Mexican crisis (the 'no moral hazard' counterfactual) and finds few differences between the two periods. This is taken as evidence against moral hazard having been present over recent years[6].

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2: Jeanne and Zettelmeyer (2001a).

3: See Mussa (2002), Jeanne and Zettelmeyer (2001b).

4: See, for example, Hoggarth, Reis and Saporta (2001).

5: From Cline (2002).

6: All of these studies are careful to control for the effect of macroeconomic fundamentals on borrowing costs when assessing the impact of IMF loans. The study by Lane and Phillips (2000) looks at a wider range of IMF events (22 of them between 1994 and 1999), but does not control for movements in fundamentals given the short window considered.

## Box 1: Property insurance

A new insurance fund is introduced for helping deal with theft – a real hazard. The new policy fines all captured thieves an amount equal to the average amount stolen in any theft, in addition to returning the stolen goods. The proceeds of these fines are pooled in the insurance fund and are used to compensate the victims of theft. Assume also, for simplicity, that the probability of the average thief being caught is one half. Now, this new policy is, *ex ante*, revenue-neutral. The proceeds of the fines will be sufficient exactly to compensate the victims of theft. On average, there is no net transfer from thief to victim.

But the incentives such a policy creates are less than benign. Thieves who are good at their job (who have a lower than average probability of being caught and/or who steal an above-average amount) will find that the

marginal benefits of theft outweigh the marginal costs. The opposite is true of below-average quality thieves. The risk-taking incentives of the high-quality thieves will be sharpened; those of the low-quality blunted. The upshot will be a rise in theft. Repeat offenders will come to dominate the market. With the passage of time, the new policy will no longer be revenue-neutral.

A similar set of incentives also affect the victims of crime. Those with an above-average probability of being a victim – they have failed to install a security alarm system – will take even fewer precautions; there are no marginal benefits from doing so, irrespective of the amount at risk. Those with good alarm systems will not bother having them maintained for the same reason. In time, the average safety of houses will fall and the probability of a successful theft will rise.

All of these studies face a basic identification problem. A fall in borrowing costs is consistent with IMF loans inducing moral hazard. It is also consistent, however, with IMF loans mitigating the real hazard of crisis. The former is welfare-depleting, the latter welfare-enhancing. So even concrete evidence of a lowering of spreads around IMF intervention events needs to be interpreted cautiously as signifying a moral hazard problem; it may as likely signal a real hazard solution.

Taken together, this evidence paints a rather benign picture. It suggests that moral hazard may have been a temporary problem of the past, but is not a particular feature of the present. There are several good reasons for questioning that consensus.

### Questioning the consensus
**Average transfers and marginal incentives**

Moral hazard is about incentives to take risk. These incentives hinge on a comparison of the marginal benefits of risk-taking and its marginal costs. The key word here is *marginal*. Average costs and benefits may have a bearing on risk-taking decisions, but they are not the key arbiter. For example, the introduction of a policy that offers zero net benefits on average will not necessarily leave incentives unaffected. A revenue-neutral tax measure is not necessarily incentive-neutral. It may tilt the marginal

incentives of some agents in ways that affect aggregate behaviour in the economy. Box 1 provides a stylised example.

*Ex ante*, IMF loans may well have left the average creditor and debtor no better off. But they will potentially have affected the marginal incentives of certain kinds of creditors and debtors, in ways that are potentially damaging to the international monetary system.

On the creditor side, the investors who are likely to extract the largest marginal benefits from IMF loans are those that are fastest on their feet – short-term creditors who can take the IMF money and run. It is precisely this set of investors who are most likely to prompt liquidity crises in the first place. On the debtor side, the borrowers who are likely to extract the largest marginal benefits are those whose macroeconomic policies make them most susceptible to crisis. So we would see evidence of repeated victims of crisis.

How would we detect if such incentive effects were building up? The evolving composition of the IMF's loan book potentially offers some clues. Two stylised facts are striking here. First, the degree of concentration in the IMF's loan book has reached levels last seen in the 1970s. The top five borrowers

account for 70% of credit outstanding; and the top three borrowers – Argentina, Brazil and Turkey – account for around 60%. More generally, it is striking that at the same time as the average size of IMF loans has gone up, the actual number of countries borrowing from the IMF has shrunk (Chart 3). Certain types of (large and rising) borrower are coming to dominate the IMF lending pool.

**Chart 3:**
**Number and size of GRA purchases[a]**
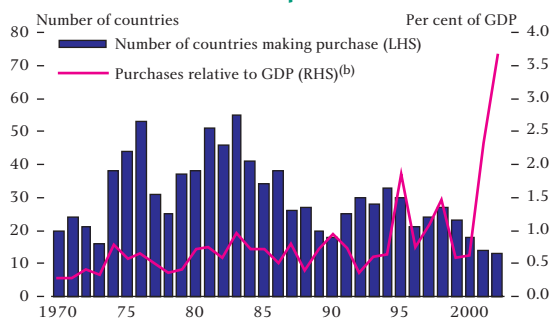


Sources: Gai and Taylor (2003), IMF and MF World Economic Outlook.
(a) Purchase from GRA (excluding reserve tranche purchases). Sample is those member countries for which purchase and GDP data available.
(b) Sum of purchases of IMF member countries making a purchase in given year relative to their total GDP.

Second, there is evidence of both prolonged and repeated use of IMF resources by these borrowers. A recent study by the IMF's Independent Evaluation Office (IMF IEO (2002)) is illuminating here. It takes one definition of prolonged users to be countries which have been under IMF-supported programmes for seven or more years in a ten-year period. On this definition, prolonged use has increased sharply since the 1970s in terms of numbers of countries, their share of IMF membership and their share of IMF exposures. In 2001, prolonged users accounted for around half of the IMF's outstanding obligations. Moreover, there is evidence of persistence in prolonged use. Each of the IMF's three largest creditors are repeat users of funds. Clearly, if these patterns were to be extrapolated into the future, they suggest a problem. Evergreening of official loans is tantamount to a gift. Small transfers from the IMF in the past may give way to larger transfers in the future.

These stylised facts suggest a rising and increasingly concentrated set of credit risks on the IMF's books, related to a persistent core of crisis-prone countries.

They are not conclusive proof of moral hazard. They do suggest, however, that zero net transfers from the official sector in the past may not be a necessary (much less a sufficient) condition for the absence of moral hazard; and that the IMF's loan book itself may already bear some of the scars of those distorted incentives.

**Indirect moral hazard**
Moral hazard need not manifest itself as a direct and permanent transfer of funds from the IMF to debtors or creditors. Even if the transfer is temporary, it can distort risk-taking behaviour. This could be the case, for example, if the IMF supports bad policies. There is an *indirect* moral hazard[7]. The way in which such indirect moral hazard ultimately manifests itself is as a financial redistribution from domestic taxpayers (rather than the official sector) to private creditors. When bad policies are supported, it is domestic taxpayers that at the end of the day foot the bill.

Bad policies can take a variety of forms. At the relatively benign end of the spectrum, some countries have extended a blanket official deposit guarantee to their banking systems, with the support of the IMF. This action may have adverse side-effects in both the short and medium term. In the short term, if deposits are withdrawn, there will be a direct net transfer of funds from domestic taxpayers to private creditors. Over the medium term, blanket deposit insurance could be expected to dampen depositor incentives to monitor risks.

A second, less benign, form of indirect moral hazard arises if IMF loans facilitate policies of 'gambling for resurrection'. The electoral life-cycle of a government is considerably shorter than the economic life-cycle of its citizens. So faced with a default which could precipitate its demise, a government may be tempted to pursue high-risk policy strategies. If these work, the government reaps the rewards. But in the likelier event that they fail, its citizens bear the costs of an even-deeper crisis. So the short-term incentives of an incumbent government may differ from the medium-term incentives of its citizens. To the extent that the IMF supports governments pursuing high-risk strategies, they help effect a transfer from domestic taxpayers to private creditors which is damaging to welfare. In other words, there is an indirect moral hazard.

7: Jeanne and Zettelmeyer (2001b) and Mussa (2002).

A third manifestation of indirect moral hazard occurs when official sector loans are extended for geopolitical rather than economic reasons. In these cases, there may be fewer (or no) safeguards against misuse. Indeed, in extreme situations, geopolitical loans may become geopolitical gifts from the official sector, at which point geopolitical lending may lead to a direct moral hazard, rather than an indirect one. Barro and Lee (2002) find that IMF lending has in the past been sensitive to a country's political and economic proximity to some of its major shareholding countries. Mussa (2002) believes geopolitical moral hazard to have been important in a few high-profile recent IMF cases.

### Tackling the identification problem

These observations cast some doubt on the conclusions to be drawn from the moral hazard literature. Historically small transfers from international taxpayers to debtor countries or their creditors may give a misleadingly reassuring impression of the distortionary effects of IMF intervention. Moreover, they also fail to reflect indirect moral hazard, since that is about transfers from domestic taxpayers, not international taxpayers, to private creditors.

So is it possible to devise empirical tests that address these identification difficulties and provide a clearer quantitative picture of moral hazard? Below we consider two separate pieces of evidence that may help. All studies of moral hazard face some intrinsic trade-offs when it comes to identification. There are three such basic identification issues.

First, do you measure risk-taking behaviour directly by looking at observed actions of debtors and creditors? Or do you infer such behaviour indirectly, for example by looking at movements in asset prices? Most of the existing literature has pursued the second course. The pieces of evidence presented below consider both approaches.

Second, are we able to disentangle empirically the effects of IMF policies on real hazard (crisis) from their effects on moral hazard (incentives)? Some, but not all, of the existing studies of moral hazard have attempted to do so, by conditioning responses on the behaviour of fundamentals. Both of the pieces of evidence we consider here attempt to weigh carefully the potentially beneficial effects of IMF loans in mitigating real hazard.

Third, are the IMF interventions we consider truly exogenous, in the sense that they signal a clear shift in the official sector's intention to supply funds, rather than being a response to the increased incidence of crisis? Most of the existing literature has focused on particular IMF programme events to get round this problem. Below, the first study also uses this methodology, while the second considers more systematic shifts in the lending policies and practices of the IMF, which created additional international liquidity.

Our approach is to look first at the effect of IMF loans on the marginal incentives of *creditors*. This is done by considering the effect of IMF interventions on private creditors' net worth. Importantly, both the direct and the indirect moral hazard channels envisage net transfers to private creditors (albeit from different sources), and so a boost to their net worth.

Second, we look at the effect of IMF loans on the marginal incentives of *debtors*. This is done by considering the probability of different types of debtor entering an IMF programme and how this has been affected by recent international policy adaptations. Because we are examining the increased risk of future crisis resulting from the debtor pursuing sub-optimal policies, this evidence ought also to capture both moral hazard channels.

### Some new evidence on creditor moral hazard

To assess creditor moral hazard, we consider the effect of IMF loans on the market capitalisation of banks that are creditors of the debtor country that is the subject of IMF intervention[8]. This is clearly an indirect test of the moral hazard hypothesis as a change in the market valuation of creditor banks is not, by itself, proof of a change in future risk-taking behaviour by these banks. Such a valuation response will, however, capture the change in price incentives for creditors to engage in future risky lending to countries that are expected to be the subject of IMF intervention. If the value of a bank rises by lending to a certain set of countries, there are likely to be incentives to undertake further such lending in the future.

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8: The methodological details of the test are discussed in much greater detail in Haldane and Scheibe (2003).

The creditors we focus on are seven UK banks with significant exposures to emerging markets[9]. For these banks, we have (confidential) Bank of England data on their individual loan exposures to emerging markets. Unfortunately, we do not have similar institution-specific balance sheet data for non-UK banks, which would allow us to test for similar effects across a wider cross-section of creditor banks.

We consider 26 IMF intervention events, beginning with the IMF loan package for Mexico in January 1995 and ending with the IMF programme for Brazil in August 2002[10]. This gives us a richer array of events than earlier studies, encompassing all of the large-scale systemic crises of the past few years. The analysis, then, uses information looking across a time series of IMF events, and across a cross-section of creditor banks, to examine the valuation responses of these creditor banks to IMF interventions.

Chart 4 plots the (cumulative) response of the borrowing spreads of the individual debtor country which is the subject of the IMF loan, and of emerging markets generally, to each of the 26 IMF loan events[11]. The behaviour of borrowing spreads offers useful framing for the subsequent analysis. As Chart 4 shows, many (but not all) of the IMF events were associated with some lowering of borrowing spreads. On average, across the events, there was a 4.6% fall in borrowing costs for the intervened country and a 2.6% fall in borrowing costs for emerging markets generally[12].

To try to pinpoint the creditor dimension, we look at the market valuation responses for creditor banks. Are these positive? Are they large? Are they bigger for banks with large balance sheet exposures to the intervened country or to emerging markets generally? And are these responses still evident once we control for the positive effect of IMF loans in mitigating the real hazard of crisis?

**Chart 4:**

**Changes in Emerging Market Bond Index (EMBI) spreads around IMF events[a]**
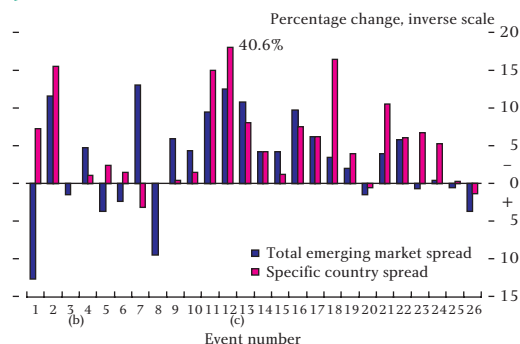


Sources: JP Morgan Chase & Co. and Haldane and Scheibe (2003).

(a) EMBI Global spread used where EMBI spread not available.

(b) Specific country spread not available.

(c) Event number 12 is the Russian 'non-intervention' event on 17 Aug. 1998, therefore these bars are reversed in value ie spreads increased by 40.6%.

Chart 5 plots the cumulative market valuation response of UK banks across the IMF intervention events[13]. For each event, we identify the mean (averaging across UK banks) and the high-low range for UK banks. In calculating these responses we abstract from general movements in the UK equity market, so giving a measure of 'excess' or abnormal returns to each individual bank[14]. For most (but not all) events, responses from UK banks are positive; the mean is around 0.45%. This may sound small. But it needs to be placed in the context of UK banks' net worth. At end-2001, the market capitalisation of UK banks was around US$370 billion. So even a 1/2% excess return represents a jump in the market value of UK banks of perhaps US$2 billion.

There is quite considerable variation in these responses, both across events and across banks. Table 2 lists the 'top five' events by average size of the valuation response. These events share a number of common features. First, they all involve average responses in excess of 2%. Translated into dollar terms, this represents a large increase in banks' net worth. Second, all of them (perhaps not surprisingly) involved large headline IMF packages (also shown in

9: These are HSBC, Standard Chartered, Barclays, Lloyds TSB, National Westminster, the Royal Bank of Scotland (which acquired National Westminster in 2000) and Abbey National.

10: These are listed in the Annex.

11: We consider a window of two days either side of the IMF intervention date.

12: These figures exclude the Russian 'non-intervention' event number 12 (see Annex for details).

13: Again, using a five-day window to measure responses.

14: This is done by estimating market betas for each bank. The valuation response window is again five days, centred on the IMF event. In Haldane and Scheibe (2003), we also consider unconditional returns.

**UK bank excess returns for selected IMF events**
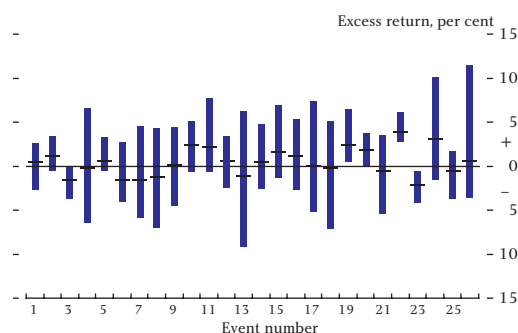


Sources: Datastream and Haldane and Scheibe (2003).

Table 2). Third, with the exception of the Korea package, all of them were augmentations of existing IMF packages, rather than entirely new loans. This is consistent with the 'repeated victims' hypothesis. Fourth, a number of them are associated with recent IMF programmes – for example, in Argentina, Brazil and Turkey. This is inconsistent with the notion that moral hazard may have been a problem in the past but has not been a problem of late. If anything, the results indicate that moral hazard may have been rising recently.

**Table 2:**

**'Top Five' valuation responses for UK banks**

| Rank | IMF intervention[a] | Mean excess return | Headline IMF package (US$ billions)[b] | Event number |
|---|---|---|---|---|
| 1 | Brazil, Aug. 2001 | 3.84% | 15.0 | 22 |
| 2 | Turkey, Nov. 2001 | 3.01% | 16.0[c] | 24 |
| 3 | Korea, Dec. 1997 | 2.41% | 21.0 | 10 |
| 4 | Argentina, Dec. 2000 | 2.32% | 13.7 | 19 |
| 5 | Russia, Jul. 1998 | 2.21% | 12.5 | 11 |

Sources: IMF and Haldane and Scheibe (2003).

(a) See Annex for details.

(b) Total IMF financing package (including augmentations).

(c) Figure for related IMF financing package announced Feb. 2002 (Event 25) as no figure announced at Nov. 2001.

One implication of the creditor moral hazard hypothesis is that the creditors which stand to benefit most from an IMF intervention are those with the largest exposures either to the intervened country or to other emerging markets that might be the subject of future intervention. Using bank-specific data on loan exposures allows us to assess that hypothesis.

Formal regression analysis confirmed that UK banks' valuation responses to an IMF loan were largest for those banks with the largest emerging market portfolio overall[15]. There is little if any evidence, however, of a larger valuation response from banks with large direct exposures to the country immediately involved. Why is this? One explanation may lie in the availability of information. Market participants do not have the data on bank-by-bank loan exposures to emerging markets. So their reaction to IMF interventions may be to reward banks based on their overall emerging market portfolio.

A different, though related, explanation is that IMF loans serve as a more general signal of shifts in IMF lending practices. Anticipating future outlays to countries facing crisis, the valuations of creditor banks with large emerging market books will be boosted. It is this market signal that might then tempt these banks to place further risky bets with emerging markets. In short, a classic creditor moral hazard would arise. The observed empirical response of the share prices of UK banks with large emerging market books is fully consistent with that moral hazard hypothesis.

An alternative hypothesis, also consistent with the evidence, is that IMF loans are mitigating the real hazard of crisis for emerging market countries, which is welfare-enhancing both for the bank and for the country. To attempt to control for this effect, we included within our formal regression analysis an instrument proxying the fall in real hazard associated with IMF lending – specifically, the movement in yield spreads. We know from Chart 4 that in many cases yield spreads have fallen around IMF events, consistent with a decline in real hazard.

In formal regression analysis, yield spreads do indeed help explain the positive market valuation response from UK banks following IMF events. Interestingly, however, even allowing for this effect does not remove the important role of banks' emerging market loan books as an explanatory factor[16]. In other words, even controlling for a fall in real hazard resulting from IMF programmes, creditor banks have still exhibited excess returns, which are bigger the larger their emerging market portfolio. This empirical stylised fact is consistent with a degree of creditor moral hazard.

15: The technical details and regression results are given in Haldane and Scheibe (2003).

16: See Tables 4 and 5 in Haldane and Scheibe (2003).

A fall in spreads is also of course consistent with increased moral hazard. So by interpreting all of the fall in spreads as a welfare-enhancing fall in real hazard – rather than a rise in moral hazard – in the regression analysis, we are probably loading the dice against finding any remaining moral hazard. That we do nonetheless find such effects strengthens our conclusions.

Of course, these empirical results are only partial. They measure the *change* in price incentives for banks over a relatively short window. So they do not tell us about the *level* of risk-taking by these banks; nor about any incentive effects of IMF interventions that are anticipated well in advance; nor about whether any market valuation response to such interventions is sustained. Capturing such effects would call for a different identification scheme.

## Some new evidence on debtor moral hazard

The empirical literature on health and labour economics provides guidance on alternative identification strategies to test for moral hazard. It suggests that incentive effects are easiest to detect when there are exogenous changes in the incentive structure – for example, through a change in government policy – and where we can compare the responses of a 'test' group which is affected by the policy change with a 'control' group which is not. The estimated effect of the policy change on incentives is then inferred from the difference in the outcomes between these two groups, controlling for other factors.

So rather than use observed asset prices as an indirect proxy, an alternative approach to assessing moral hazard is to examine directly an observable action, such as a country's use of IMF resources[17]. From this we can try to infer directly changes in debtor behaviour induced by changes in IMF lending practices. In particular, we focus on changes in debtor behaviour associated with the introduction of the SRF and the New Arrangements to Borrow (NAB)[18].

The application of this approach is not straightforward. The policy changes we consider are not entirely exogenous, but rather a response to the Mexican crisis and Asian crises. It is also harder to distinguish between a test and control group of countries since all IMF members, at least in principle, have access to all IMF facilities. To address these difficulties, a suitable instrumental variable must be constructed that captures a country's capacity to access IMF facilities and how this may have changed as the 'rules of the game' have changed.

The introduction of the SRF and the NAB were both designed to contain the systemic impact of capital account crises. This suggests a measure of systemic importance might be used to index the potential for enhanced access[19]. Such an index, albeit necessarily subjective, can be constructed from a weighted sum of indicators of potential crisis spillover – for example, the importance of a country in international capital markets, in international banking markets and in international trade[20].

Given their objectives, we would expect the introduction of the NAB and SRF to have had a greater effect on resource use the more 'systemic' the country. This hypothesis was examined for a sample of 19 middle-to-lower income emerging markets over the period 1995 to 2001. The sample was drawn from the major emerging market asset price indices (the Morgan Stanley equity index and the JP Morgan EMBIG bond index) and so covers most countries with access to private external finance. The sample is limited owing to restrictions on data availability but accounts, on average, for more than half of all IMF credit outstanding during the sample period. Table 3 ranks the 19 countries according to the constructed index of systemic importance.

The estimation methodology involves three main steps (see Gai and Taylor (2003)). The first is to specify our directly observable action, namely a debtor's decision whether to use IMF resources. We

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17: See Gai and Taylor (2003) for technical details and regression results.

18: The NAB aimed to supplement existing IMF resources, while the SRF provides large-scale short-term financing in the event of a capital account crisis. The SRF has similar features to a domestic lender of last resort, including interest rate surcharges (ranging from 300 to 500 basis points). While the surcharges are designed to limit moral hazard, they do not appear penal compared with secondary market spreads at the time of crisis.

19: The SRF was "to be utilized in cases where the magnitude of the outflows may create a risk of contagion that could pose a potential threat to the international monetary system" (IMF (2002)), whilst participants in the NAB agreed "to make loans to the IMF when supplementary resources are needed to forestall or cope with an impairment of the international monetary system, or to deal with an exceptional situation that poses a threat to the stability of the system." (IMF Press Release 97/5, 'IMF Adopts a Decision on New Arrangements to Borrow', 27 January 1997).

20: See Gai and Taylor (2003) for details.

## Table 3:
## Sample countries

| Average systemic index rank[a] | Country |
|---|---|
| 1 | Mexico |
| 2 | Korea |
| 3 | Brazil |
| 4 | China |
| 5 | Argentina |
| 6 | Thailand |
| 7 | Malaysia |
| 8 | Indonesia |
| 9 | Turkey |
| 10 | India |
| 11 | Hungary |
| 12 | Philippines |
| 13 | South Africa |
| 14 | Chile |
| 15 | Venezuela |
| 16 | Czech Republic |
| 17 | Colombia |
| 18 | Pakistan |
| 19 | Uruguay |

Source: Gai and Taylor (2003).

(a) Mean systemic index for 1995 Q1 to 2001 Q4.

construct a binary dependent variable which takes the value one if a country is in an IMF programme and makes a drawing on IMF resources and is zero otherwise. We restrict the programme definition to the main IMF facilities designed to address balance of payments difficulties (Stand-By Arrangements (SBA) and the Extended Fund Facility (EFF) which may be accompanied by SRF funds). Table 4 provides summary statistics on programme use for the periods before and after the introduction of the SRF in December 1997. These data suggest, on average, a rise in the frequency of programme participation after the SRF was introduced, and the more so the more systemically important the country.

## Table 4:
## Programme participation, 1995 Q1 to 2001 Q4[a]

| | Number of quarterly programme participations[b] | Programme participations per quarter (sample average)[c] |
|---|---|---|
| **Full sample** | | |
| Pre-SRF | 55 | 0.263 (0.441) |
| Post-SRF | 121 | 0.375 (0.485) |
| **Countries with average systemic index above median** | | |
| Pre-SRF | 26 | 0.263 (0.442) |
| Post-SRF | 79 | 0.516 (0.501) |
| **Countries with average systemic index equal or below median** | | |
| Pre-SRF | 29 | 0.264 (0.443) |
| Post-SRF | 42 | 0.247 (0.433) |

Sources: IMF and Gai and Taylor (2003).

(a) Pre-SRF period is 1995 Q1 to 1997 Q3; post-SRF period is 1997 Q4 to 2001 Q4.

(b) Defined as a quarter in which a country is in an SBA or EFF programme (with or without SRF) and makes a drawing under that programme at some point before the end of the programme.

(c) Standard deviation in brackets.

A change in a country's unconditional probability of going to the IMF could merely reflect a change in its vulnerability to crisis, rather than a change in its propensity to draw on IMF resources for a given set of economic fundamentals. The second stage is thus to specify a set of factors which influence the decision on whether or not to undertake a programme. Following previous empirical studies, such as Knight and Santaella (1997), IMF (2001) and Barro and Lee (2002), we consider a range of such factors.

The most significant factors in explaining the programme participation decision were found to be: the foreign exchange reserve coverage of short-term debt; the level of the real effective exchange rate; and the residual of sovereign ratings when regressed on the other fundamentals (which could be taken to be a proxy for other information on creditworthiness). Previous studies suggest that these variables largely reflect demand-side considerations.

The third stage is to examine whether there is a change in debtors' incentives to participate in a programme, conditional on fundamentals, following the introduction of policies such as the SRF or NAB. Has there been any weakening in the relationship between fundamentals and programme participation across these policy changes? And, if so, is this weakening greater, the greater the systemic importance of a country?

The empirical results suggested that the introduction of the SRF and NAB did indeed appear to result in a greater probability of IMF loan use, for given fundamental determinants of crisis. Moreover, this increased propensity to borrow was greater among the more systemically important countries. These are necessary conditions for debtor moral hazard.

Clearly, these results need to be interpreted cautiously. For example, the dataset is a relatively narrow one and the choice of instrumental variable for systemic importance is open to debate. It is also impossible to disentangle perfectly supply-side incentives (for the IMF to provide new or larger loans) from demand-side incentives (for potential borrowers to agree on such programmes). Only the latter could be strictly interpreted as debtor moral hazard. Ideally, a structural model of demand and supply could distinguish the two, but this is not empirically tractable. Nonetheless, the results suggest that demand-side factors do help to account for

programme participation. And they do suggest that this increased use of IMF funds was particularly pronounced among countries which could be regarded as systemically important.

The last of these pieces of evidence corroborates the pattern evident from the IMF's loan book: large and increasing concentration of the IMF's portfolio among a small number of systemically important borrowers. The formal econometric evidence presented here suggests that this can be explained, at least in part, by weakened incentives among debtors. In other words, it could be interpreted as offering some support for an increase in the degree of debtor-side moral hazard during the late 1990s.

## Where does this leave us?

Effective management of international financial crises involves balancing a real hazard (crisis) on the one hand and a moral hazard (incentives) on the other. The former hazard is readily observable: it is on the front pages of the financial press when a country is hit by crisis. The latter is inherently more difficult to detect. Distorted incentives do not make for headlines; they are often hidden and slow to accumulate. Moreover, even when identified, quantitative evidence on moral hazard will not be black and white, but rather shades of grey. The consensus from the existing moral hazard literature lies in that grey and fuzzy zone. Against that backdrop, it is not surprising that this literature has failed to have much impact on policymakers.

In this article we have tried to penetrate some of that fog. We have looked at some new data, and used some new restrictions, to shed light on risk-taking behaviour by creditors and debtors arising from changes in IMF lending policy. The evidence is far from conclusive. For example, it only tells us about changes in risk-taking induced by IMF lending practices; it does not tell us how large the stock of moral hazard may be in relation to the costs of crisis. It does, however, suggest concrete evidence of, or incentives for, such increased risk-taking in ways which apparently cannot be explained fully by changes in the real hazard of crisis. Concerns about moral hazard should continue to play a prominent role in policymakers' thinking both ahead of, but especially during, crises.

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## Creditor moral hazard events

| Number | Event date | Event description |
|---|---|---|
| 1 | 26 Jan. 1995 | IMF Managing Director Camdessus indicates support for Mexican letter of intent requesting US$7.8 billion stand-by credit (300% of quota). |
| 2 | 1 Feb. 1995 | IMF Board approves US$17.8 billion stand-by credit for Mexico (688% of quota), of which US$7.8 billion available immediately. |
| 3 | 26 Mar. 1996 | IMF Board approves extended fund facility credit of US$10.1 billion (160% of quota) for Russia. |
| 4 | 5 Aug. 1997 | Camdessus welcomes Thai policy package and suggests IMF programme will soon be ready to be forwarded to the IMF Board for endorsement. |
| 5 | 20 Aug. 1997 | IMF Board approves stand-by credit of US$3.9 billion (505% of quota) for Thailand, of which US$1.6 billion available immediately. |
| 6 | 8 Oct. 1997 | Camdessus announces support for Indonesia's economic programme. |
| 7 | 31 Oct. 1997 | Camdessus indicates intention to recommend IMF Board approval of US$10 billion (490% of quota) stand-by credit to Indonesia. |
| 8 | 6 Nov. 1997 | Camdessus announces that IMF financial support for Korea would be available if needed. |
| 9 | 21 Nov. 1997 | Camdessus welcomes Korean request for IMF assistance and says he has assured Korean authorities of the IMF's full support. |
| 10 | 4 Dec. 1997 | IMF Board approves US$21 billion (1,939% of quota) stand-by credit for Korea, of which US$5.6 billion available immediately. |
| 11 | 13 Jul. 1998 | Camdessus announces that he is to recommend to the IMF Board support for Russia's strengthened reform programme and additional financing of US$11.2 billion (180% of quota), to bring total financing to US$12.5 billion. |
| 12 | 17 Aug. 1998 | Camdessus comments on Russian government announcement of debt restructuring and other policy measures. |
| 13 | 23 Sep. 1998 | Camdessus states that the IMF will be prepared to lend to Brazil if required. |
| 14 | 18 Oct. 1998 | US Congress ratifies increase in US IMF quota. |
| 15 | 13 Nov. 1998 | Camdessus announces successful conclusion of talks with Brazil and says he will recommend IMF Board approval for financial support, including SRF funds, of US$18 billion (600% of quota). |
| 16 | 15 Jun. 1999 | Camdessus announces that an IMF Board meeting is to be scheduled to consider Mexico's request for stand-by credit of US$4.1 billion. |
| 17 | 9 Dec. 1999 | IMF management approves letter of intent from Turkey requesting a US$4 billion (320% of quota) stand-by arrangement. |
| 18 | 6 Dec. 2000 | IMF Managing Director Köhler proposes an extra US$7.5 billion (600% of quota) of funds under the SRF for Turkey in addition to US$2.9 billion remaining under existing stand-by arrangement. |
| 19 | 18 Dec. 2000 | Köhler announces agreement on strengthened Argentine programme and recommends to the IMF Board additional financing, including SRF funds, of US$6.7 billion to bring total financing to US$13.7 billion (500% of quota). |
| 20 | 21 Dec. 2000 | IMF Board approves third and fourth reviews of Turkey's programme and the US$7.5 billion (600% of quota) extra funds Köhler proposed on 6 Dec. 2000. |
| 21 | 27 Apr. 2001 | Köhler announces that a recent IMF Board meeting supported Turkey's economic programme and that additional financing from the IMF and World Bank would be in the order of US$10 billion. |
| 22 | 3 Aug. 2001 | Köhler recommends approval of US$15 billion (400% of quota) stand-by credit for Brazil, including SRF funds. |
| 23 | 21 Aug. 2001 | Köhler indicates he is prepared to recommend an addition of US$8 billion (290% of quota) to Argentina's stand-by credit. |
| 24 | 15 Nov. 2001 | Köhler indicates intention to recommend a new stand-by arrangement for Turkey to support reforms and close the financing gap (no amount mentioned). |
| 25 | 4 Feb. 2002 | IMF Board approves US$16 billion stand-by credit for Turkey involving additional funds of US$12 billion (960% of quota) with US$4 billion undisbursed funds rolled over from the previous arrangement. |
| 26 | 7 Aug. 2002 | IMF management agrees new stand-by arrangement for Brazil which, upon Board approval, would provide additional funds of US$30 billion (750% of quota), 80% of which would be disbursed in 2003. |

Sources: IMF and Haldane and Scheibe (2003).

# Market discipline and financial stability:
## some empirical evidence

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Market discipline may play an important role in maintaining the overall stability of the financial system. A number of recent policy initiatives recognise this. But various distortions may mean that the impact of market discipline is limited in practice. Based on a large cross-country dataset comprising banks from 32 countries, this article investigates empirically the disciplining force of financial markets in determining the amount of bank capital buffers.

**ONE MANIFESTATION OF MARKET DISCIPLINE** is the way in which holders of bank liabilities, such as subordinated debt or uninsured deposits, 'punish' banks which take greater risks by demanding higher yields. Banks collect deposits and invest these funds in risky assets (loans). To safeguard against insolvency, banks hold capital buffers against loan impairment or default. For a number of reasons, however, a bank may be prepared to accept a higher risk of default than would be desirable from an overall welfare point of view. First, banks may not fully take into account the interests of depositors when choosing their risk profile. Second, banks may not take into account the likely 'collateral damage' caused by a bank failure to other banks and potentially, through systemic linkages, to the economy as a whole. Nevertheless, if investors and depositors demand a higher rate of return the riskier a bank is perceived to be, market discipline may potentially curb the incentive to take excessive risk by making risk-taking more costly for banks.

Market discipline is therefore an important element in safeguarding the soundness of the banking system and in maintaining overall financial stability. But various factors may mean that the force of market discipline is limited in practice. For instance, if depositors are insured, this will reduce the incentive to monitor the soundness of banks. In addition, if banks are supervised by specialist government agencies, investors and specifically depositors may

have an incentive to 'free ride' on the efforts of the supervisor. As a result, they may not press banks for a full and comprehensive disclosure of their risk profile. This again implies a weakening of market discipline.

A number of recent policy initiatives recognise the importance of market discipline in safeguarding financial stability. These include Basel II[1], initiatives to create internationally accepted accounting standards (IAS) and proposals to make it mandatory for banks to issue subordinated debt (Evanoff and Wall (2000)). In particular, the Basel Committee on Banking Supervision (BCBS) has taken the view that market discipline is increasingly important in a world where banking activities are becoming more and more complex. This view is reflected in Pillar 3 of the proposed new Accord, which encourages greater bank disclosure to strengthen market discipline. In view of these policy initiatives, it is important to ascertain whether market discipline can be effective, and under what conditions it might not be.

Previous literature has concentrated primarily on whether the market prices of bank liabilities react adversely to information about risk (Flannery (1998) contains a survey of the US literature and Sironi (2003) is a study using European data). As been emphasised by Berger (1991), Bliss and Flannery (2002) and Hamalainen et al (2001), these studies do not reveal the degree to which market discipline is effective, ie how far such price signals

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[1]: See Basel Committee on Banking Supervision (2003). More detail on Basel II is provided in the article *Strengthening financial infrastructure* in this *Review*.

actually influence bank behaviour[2]. This article seeks to fill this gap and assembles evidence on the effect of market discipline on bank risk-taking[3].

## Conceptual background

For market discipline to be effective three conditions need to be satisfied. First, investors in bank liabilities need to consider themselves at risk of loss if the bank defaults. Second, market responses to changes in the bank's risk profile need to have cost implications for the bank and its managers. Third, the market must have adequate information to gauge the riskiness of the bank.

Blum (2002) and Cordella and Yeyati (1998) show that if bank deposits are uninsured and the bank's risk choice is observable by depositors, the bank's risk choice will be efficient[4]. This is so because banks take account of the impact of their risk choice on depositors since these will demand higher compensation should the bank incur higher risk. However, if deposits are insured or the bank's risk choice is not observable by depositors, the bank will increase risk at the expense of depositors[5].

These studies suggest that the conditions needed for market discipline to be effective involve three key factors. First, the effectiveness of market discipline will depend on the extent of the government safety net. Both explicit and implicit government guarantees may limit the responsiveness of the yield on bank liabilities to changes in the bank's risk of default hence limiting the incentive effects of market discipline. Second, effectiveness will depend on the degree to which the bank is financed by uninsured liabilities. A larger proportion of uninsured liabilities will make it more costly for the bank to increase its risk of default. And third, the outcome will depend on the extent of observability of the bank's risk choices.

Banks that disclose more information will be subject to more market discipline and have a greater incentive to limit their risk of default.

## Market discipline – empirical measures

In order to measure factors that are likely to affect the strength of market discipline in practice, a large cross-country panel dataset was constructed, consisting of observations on individual listed banks from 32 different countries for the 1993 to 2000 period. The dataset contains information on a number of variables that are likely to affect the strength of market discipline – the strength of the safety net (insurance), the banks' funding structure (funding) and the transparency of the banks' risks (disclosure).

### Insurance

To test the role of the safety net an index of the existence and strength of depositor protection across countries was constructed. This index was derived from data on deposit protection schemes provided by Demirgüç-Kunt and Sobaci (2000)[6]. Larger values on the index reflect more generous protection and should therefore be associated with weaker market discipline. The features that were taken into account included whether the scheme was legally binding, whether the scheme provided for an element of co-insurance and whether coverage was unlimited.

In addition to this measure of explicit insurance a measure of implicit government guarantees was constructed. Since the social cost of bank failure can be large, governments may decide to bail out, rather than close, a failed bank. But governments worry about the moral hazard this type of implicit insurance creates. They will therefore typically limit any official action to systemically important situations and, as suggested by Freixas (1999), by maintaining a measure of 'constructive ambiguity' with respect to

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2: A small proportion of literature examines the extent to which banks respond to changes in the yield of their subordinated debt. Bliss and Flannery (2002) fail to find strong evidence that following a change in yield spreads managers respond with changes in balance-sheet allocations. As pointed out by Evanoff and Wall (2000a), this study attempts to capture one aspect of discipline imposed by the debt market – *ex post* discipline. That is, do managers change their behaviour following a change in yield spreads? Another form of discipline, and that most typically associated with sub debt proposals, refers to how banks may change their behaviour in an attempt to avoid having the market impose costs through increased spreads. In contrast to the paper by Bliss and Flannery (2002), this article attempts to examine the effectiveness of this *ex ante* discipline.

3: A more detailed account of the analysis presented in this article can be found in the Bank of England Working Paper 'Market Discipline, Disclosure and Moral Hazard in Banking', which is forthcoming by the same authors.

4: These studies assume that managers act in the interest of shareholders. In addition, these studies analyse a single bank and thus abstract from the knock-on effects on other banks when a bank defaults.

5: In the Cordella and Yeyati model disclosure enables banks to commit to low risk. There are two cases: (1) Under full disclosure the bank's risk choice is observable. Depositors demand a high interest rate if the bank chooses high risk. In equilibrium the bank chooses low risk and the interest rate is low. (2) Under no disclosure, depositors do not observe the bank's risk choice. Lower risk is not rewarded with a lower interest rate. In equilibrium, the bank chooses maximum risk and depositors, anticipating this choice, choose an interest rate commensurate with this anticipation.

6: Using this dataset, Demirgüç-Kunt and Detragiache (2002) provide evidence that explicit deposit insurance tends to increase the likelihood of banking crises in a sample of 61 countries in the years 1980–97.

their bail-out policy. From the point of view of the market, therefore, a government bail-out in the event of failure is uncertain and its probability may depend both on the bank in question and on the government concerned. The Fitch rating agency assigns a support rating that reflects its assessment of the probability of support from the government. The support rating ranges from 1 (near certain bail-out) to 5 (bail-out very unlikely). This support rating was used to construct a variable that reflects whether or not public support was expected[7].

## Funding

The effect of market discipline ought to be stronger the more a bank relies on uninsured liabilities. The amount of uninsured funding was proxied by the proportion of deposits received from other banks[8]. Interbank deposits are typically not covered by explicit deposit insurance schemes[9]. In addition, banks are likely to be informed investors in the interbank market. A lending bank may be subject to the same kinds of shocks to risk and profitability as the borrowing bank. As a result, interbank deposits are likely to be sensitive to the risk the borrowing bank is taking. Consistent with this conjecture, Ellis and Flannery (1992) find that interbank rates paid by large money centre banks include significant default risk premia.

## Disclosure

In practice, quantifying the amount of information available to investors is difficult. For this reason three different measures of disclosure were constructed.

The first was based on whether the bank had a listing on a primary US exchange[10]. Firms registered outside the US and listed on a primary US exchange may provide their US shareholders with financial statements prepared under their domestic (non-US) generally accepted accounting principles (GAAP). But the Securities and Exchange Commission (SEC) requires such firms to reconcile their reported earnings and shareholders' equity to US GAAP as part of a Form 20 filing. In addition, the Form 20 filing requires disclosure of information that may not be required under the bank's national accounting regulations. A US listing may therefore increase the quantity of information available to investors. Moreover, a number of empirical studies suggest that the quality of statements prepared in accordance with US GAAP may be superior to some alternative disclosure regimes[11]. Amir et al (1993) find that the reconciliation of earnings and shareholders' equity in Form 20 filings increases the association between accounting earnings and security returns. Leutz and Verrecchia (2000) show that German firms which have voluntarily adopted US GAAP for their reporting show lower measures of information asymmetry and higher stock liquidity compared with a control group of firms employing the German reporting regime.

Second, investors should have more information about a bank if it is rated by a major rating agency. Rating agencies act as intermediaries in the disclosure process. They gain access to information that is not publicly available to investors and feed this information into the rating. Indeed, Kliger and Sarig (2000) suggest that this is the very reason why firms usually pay for the rating. It allows firms to incorporate inside information into the assigned ratings without disclosing specific details to the public at large. A number of studies provide evidence that ratings do indeed contain information over and above other publicly known information. Therefore investors may have more information on an individual bank if it is rated[12].

7: The indicator variable takes the value 1 if the public support rating indicates that a bail-out is very likely (support rating equal to 1 or 2) and 0 if the public support rating indicates a low probability of a bail-out (rating is 3, 4, or 5). An alternative is to use the support rating as assigned on the scale from 1 to 5. The results are not materially affected by this choice.

8: Uninsured liabilities may also include subordinated debt and large corporate deposits. But many banks in our sample did not have any subordinated debt in issue. Also, banks often did not disclose what fraction of their deposits was accounted for by corporates.

9: Liabilities held by other banks might, however, be subject to implicit government guarantees. Any expectation of a bail-out of creditor banks would tend to limit the disciplining force of bank deposits and would thus reduce their effect in our regression analysis. Further discussion in Baumann and Nier (2003).

10: This variable takes the value 1 if the bank is listed on the NYSE, the NASDAQ or the AMEX and 0 otherwise. It was also assigned to US banks, on the grounds that US banks listed on a primary US exchange would be subject to the same disclosure regime as foreign banks listed on a US exchange. Our regression results are not sensitive to this choice.

11: A number of recent accounting frauds may cast doubt on this conjecture. On the other hand, typically in these cases, the published accounts did not meet the US accounting standards. These cases may therefore not necessarily change the belief that accounts that do comply with US GAAP may be more informative than accounts that comply with alternative standards.

12: An indicator variable (rating) takes the value 1 if the bank is rated by any of the major rating agencies (Standard and Poor's, Moody's or Fitch), and 0 otherwise.

A third measure of disclosure was constructed from balance sheet information. This disclosure index records whether or not the bank provides information on 18 categories of core disclosure in its published accounts as represented in the BankScope database. All of the categories are related to one or more dimensions of the bank's risk profile (interest rate risk, credit risk, liquidity risk and market risk) or the capital/reserves it holds to back the risk. The variable was normalised to take values between 0 and 1 and is available for each bank in each year of our sample. Box 1 describes the disclosure index in more detail.

Both the US listing and the rating variables are indirect measures of the amount of information available to investors. When a bank obtains a US listing, this may have implications beyond improving the amount of disclosure provided to the market. A similar difficulty may apply to the rating variable. The advantage of the disclosure index is that it is a direct measure of the amount of disclosure provided to the market. Compared with the listing and rating measures, however, it also suffers from some important drawbacks. In particular, while the quantity and the quality of disclosure are likely to be positively correlated, the index may be an imperfect proxy of disclosure quality[13]. In addition, the extent of disclosure by simple banks is measured using the same yardstick as that of more complex banks[14].

## Econometric approach

The aim of the econometric approach is to analyse whether factors that increase the strength of market discipline are associated with a lower probability of bank default. A measure of a bank's probability of default is not readily available, but simple models of bank default (eg Merton, (1977)) suggest that a bank's risk of default depends on two key factors: its underlying asset risk and leverage. Leverage, in turn, is determined by the size of the capital buffer a bank holds as insurance against adverse shocks. These considerations suggest the following reduced form framework for analysing the effect of market discipline on capital buffers.

$$CAP_{it} = f\left(RISK_{it}, MKD_{it}, Z_{it}\right) + \upsilon_{it}, \qquad (1)$$
$$\qquad\qquad (+) \qquad (+)$$

where $i$ denotes bank $i$ and $t$ denotes the time period.

This regression is used to test whether market discipline factors (MKD) affect the size of individual banks' capital buffers (CAP) controlling for asset risk (RISK) and other factors explaining bank capital (Z).

When market discipline is perfect the bank's choice of capital buffer for a given underlying risk exposure is likely to be efficient[15]. However, when market discipline is weak, banks' capital buffers are likely to be inefficiently low for a given risk exposure. This leads to a number of testable hypotheses. First, banks that enjoy explicit or implicit government guarantees will tend to have lower capital buffers for given risk. Second, a bank for which market responses to decreases in capital are less costly because the bank is funded largely by insured deposits is likely to have lower capital buffers for given risk. And third, banks for which market discipline is weak as a result of low disclosure are likely to have a high risk of default and low capital buffers[16].

The capital buffer (CAP) is defined as the bank's equity capital as a proportion of its other liabilities – that is, it is the inverse of leverage in book value terms. Measures of the riskiness of a bank's assets (RISK) include both components of the standard deviation of weekly equity returns, beta and idiosyncratic risk, and the one-period-ahead ratio of loan loss provisions to total loans. The latter is taken to reflect current credit risk, as one may think of it as measuring expected loan loss provisions.

In addition to the risk factors, the model includes a number of other control variables (Z). Some of these

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13: For instance, it may not measure the extent to which accounting statements truthfully reflect economic reality.

14: This problem may be mitigated to some extent by the fact that our sample only comprises listed banks, ensuring some degree of homogeneity across banks. In addition, it is important to control for a number of bank characteristics, such as size, in the regression analysis.

15: Even if market discipline was perfect and a bank's funding costs fully reflected its risk of default, the bank's choice of capital buffer – while likely to be efficient from the point of view of the institution – might still be inadequate in view of systemic externalities. On the other hand, if managers are more cautious than shareholders would like them to be, bank capital buffers may be inefficiently high.

16: All banks disclose the amount of their equity capital, but the probability of default implied by the amount of capital may be difficult for investors to judge if this information is not put into context by additional information about the risk taken by the bank. Such additional information may commit the bank to choosing a capital buffer commensurate with its risk.

# Box 1: A composite disclosure index

As one of our market discipline variables, an index of disclosure was constructed that uses the BankScope database as a source of information. The purpose of this exercise was to arrive at bank-level information on disclosure. The basic idea of the index was to measure the level of detail which banks provide in their published accounts. To arrive at the disclosure index a number of dimensions of accounting information were defined which can be mapped into indicators of bank risk. A total of 18 subindices were created which reflect whether the bank's accounts (as presented in BankScope) provide any detail on each dimension. The subindices were then aggregated to form a composite disclosure index.

The composite index was defined as:

$$DISC = \frac{1}{20} \sum_{i=1}^{18} s_i$$

where each subindex, $s_i$, can be related to one or more sources of risk (interest rate risk, credit risk, liquidity risk, market risk). There are a total of 18 subindices. Rather than ordering the subindices with respect to the source of risk on which they inform, the definition and the ordering of the subindices follow the presentation in the BankScope database.

The following table lists the subindices used to construct the composite disclosure score. For all subindices, a 0 was assigned if there was no entry in any of the corresponding categories and a 1 otherwise, except for the capital subindex. For the last, a 0 was assigned if there was no entry in any of the categories, a 1 if there was one entry only, a 2 if there were two entries and a 3 if there were three or four entries. Whenever a bank provides information on three of these items, one can infer the fourth. The provision of three items was therefore viewed as informationally equivalent to the provision of four items. The maximum attainable score on the sum of the subindices is 20.

**Table A:**
**Subindices used to construct the composite disclosure index**

| | Subindex | Categories |
|---|---|---|
| **Assets:** | | |
| **Loans** | S1: Loans by maturity | Sub three months, three-six months, six months-one year, one-five years, five years + |
| | S2: Loans by type[a] | Loans to municipalities/government, mortgages, HP/lease, other loans |
| | S3: Loans by counterparty[a] | Loans to group companies, loans to other corporate, loans to banks |
| | S4: Problem loans | Total problem loans |
| | S5: Problem loans by type | Overdue/restructured/other non-performing |
| **Other earning assets** | S6: Securities by type (detailed breakdown) | Treasury bills, other bills, bonds, CDs, equity investments, other investments |
| | S7: Securities by type (coarse breakdown) | Government securities, other listed securities, non-listed securities |
| | S8: Securities by holding purpose | Investment securities, trading securities |
| **Liabilities:** | | |
| **Deposits** | S9: Deposits by maturity | Demand, savings, sub three months, three-six months, six months-one year, one year-five years, five years + |
| | S10: Deposit by type of customer | Bank deposits, municipal/government |
| **Other funding** | S11: Money market funding | Total money market funding |
| | S12: Long-term funding | Convertible bonds, mortgage bonds, other bonds, subordinated debt, hybrid capital |
| **Memo lines:** | | |
| | S13: Reserves | Loan loss reserves (memo) |
| | S14: Capital | Total capital ratio, tier 1 ratio, total capital, tier 1 capital |
| | S15: Contingent liabilities | Total contingent liabilities |
| | S16: Off-balance-sheet items | Off-balance-sheet items |
| **Income statement:** | | |
| | S17: Non-interest Income | Net commission income, net fee income, net trading income |
| | S18: Loan loss provisions | Loan loss provisions |

Source: As defined by the authors and based on categories of information presented in the BankScope database.

(a) The categories chosen reflect the presentation in the BankScope database.

variables capture factors that might be expected to drive actual bank capital ratios from their desired values, such as a bank's stock of non-performing loans, its return on equity and the position of the economic cycle, proxied by GDP growth[17]. In addition to these cyclical factors more structural control variables are included that may have an impact on the bank's desired capital ratio but which are distinct from market discipline factors. These include a bank's size, its market share, as well as the minimum capital requirement prevailing in the country of origin of the bank. Finally, a time trend is included to control for the possibility that capital may have trended up over the sample period for reasons other than an increase in market discipline.

One major difficulty in the analysis is that some of the market discipline variables are likely to be endogenous, ie themselves dependent on bank capital. In particular, banks that hold little capital may have to rely on attracting bank deposits in order to fund their assets. This would result in a negative relationship between capital and the bank deposit ratio. On the other hand, banks that hold little equity capital could be perceived as risky by investors. This could increase the banks' cost of interbank funding and reduce their reliance on such funds, resulting in a positive relationship between capital and bank deposits.

Similarly, bank disclosure may be determined jointly with the amount of capital a bank chooses to hold. Again, this may affect the results, in two ways. First, a bank that wishes to raise more equity in the capital market may need to increase its disclosure in order to lower its cost of equity capital. This reverse causality would result in a positive relationship between disclosure and capital. On the other hand, when

investors in bank debt are uncertain about the risk profile of the bank, they might require a higher return. The bank may therefore have an incentive to reduce the effect of this uncertainty premium on the cost of debt. It can do this in two ways. It may increase disclosure or, alternatively, it may increase capital in order to reassure investors. Depending on the marginal cost of holding equity capital relative to the cost of disclosing information, some banks may respond by disclosing more information while others decide to hold more capital. Across banks, this would result in a negative relationship between disclosure and capital that may obscure the potential positive relationship set out earlier[18].

Endogeneity problems were likely to affect the measured effect of the market discipline variables, such as disclosure and bank deposits, on bank capital. Potential endogeneity biases therefore needed to be addressed by a suitable choice of estimation method. In particular, an instrumental variables Two-Stage Least Squares (TSLS) procedure was employed[19].

### Regression results

Table 1 shows the regression results. Both deposit insurance and expected government support are found to have a negative effect on bank capital buffers, reflecting the adverse incentives arising from explicit or implicit government insurance. In addition, a larger proportion of interbank deposits is associated with larger capital ratios, consistent with a disciplining role of the interbank market. Both the US listing variable and the disclosure index show a statistically significant positive coefficient, suggesting that more disclosure is associated with banks holding higher capital buffers[20]. The effect of having a credit rating, while statistically significant, is smaller,

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17: Since non-performing loans are counter-cyclical and the return on equity is pro-cyclical, the impact of GDP on the capital ratio may already have been captured in the specification, but there could be further effects. For example, in upswings loan growth would tend to be higher, thus reducing the capital ratio, everything else being equal.

18: Even if disclosure was exogenous and not chosen by the firm, there might be reason to believe that banks with low disclosure have an incentive to aim for higher equity capital in order to reduce the cost of debt finance. However, equity capital is not cheap. For a negative relationship between disclosure and equity capital to hold with exogenous disclosure one would require that the relative cost of equity and debt depended on the amount of disclosure. In particular, it would have to be true that for low disclosure banks equity capital is cheap relative to the cost of debt. There is evidence that the cost of debt capital is higher for low disclosure firms, (Sengupta (1998)). Equally, there is evidence that the cost of equity capital is higher if disclosure is low, (Botosan (1997)). There appears to be no existing evidence to show how the relative costs of equity and debt might depend on disclosure.

19: This method is standard, (Wooldridge (2002)). In the first stage, the endogenous variable is regressed on a set of exogenous regressors. The first-stage regression is used to generate predicted values that take account only of the exogenous information. The predicted value of the first-stage regression, rather than the actual value, is then used in the second-stage regression. The TSLS approach was adopted for two endogenous variables: the ratio of interbank deposits and the disclosure index. The other two disclosure variables are likely to suffer from an endogeneity bias to a lesser extent, since these are fixed across all years. In addition, again because these variables are fixed across time, it is harder to satisfactorily predict their values from available exogenous variables. More detail on the estimation procedure is provided in the working paper by Baumann and Nier (2003).

20: A positive coefficient on disclosure is consistent with two alternative channels of market discipline. First, more disclosure may result in a lower cost of equity. Banks may therefore find it cheaper to hold more equity as a buffer against the risk of default. Second, more disclosure may result in a greater sensitivity of the bank's cost of debt to variations in its risk of default, resulting in an incentive to reduce the risk of default by increasing equity. Distinguishing between these two hypotheses is beyond the scope of this article.

perhaps suggesting that a rating may not be as useful a disciplining device as information available to the financial market at large. Importantly, the effect of the US listing variable turns out to be robust when the regression is run on a sub sample excluding all US banks.

**Table 1:**

**The effect of market discipline on bank capital**

| Dependent variable | (1) Cap. | (2) Cap. | (3) Cap. |
|---|---|---|---|
| Constant | -3.2609*** | -1.9414*** | -3.0638*** |
| Provisions (t+1) | 0.3657*** | -0.1016*** | -0.0320** |
| Beta | 0.0044*** | 0.0070*** | 0.0068*** |
| Idios. risk | -0.1715*** | -0.0537*** | -0.0427*** |
| Logsize | -0.0043*** | -0.0138*** | -0.0147*** |
| ROE | 0.0535*** | 0.0217*** | 0.0247*** |
| GDP growth | 0.0058 | -0.1154*** | -0.1244*** |
| Non-perf. loans | -0.0970*** | 0.0016 | 0.0075 |
| Market share | -0.0484*** | 0.0394*** | 0.0282*** |
| Cap. req. | 0.0148*** | 0.0115*** | 0.0122*** |
| Time trend | 0.0016*** | 0.0011*** | 0.0016*** |
| Dep. insurance | -0.0023*** | -0.0065*** | -0.0059*** |
| Support | -0.0117*** | – | – |
| Bank deposits | – | 0.0676*** | 0.0784*** |
| Rating | – | 0.0030*** | 0.0031*** |
| Listing | 0.0098*** | – | 0.0149*** |
| Disclosure | 0.0157*** | – | 0.0147*** |
| No. of obs. | 695 | 726 | 728 |
| No. of banks | 154 | 199 | 199 |
| Goodness of fit[a] | 0.50 | 0.46 | 0.46 |
| Log likelihood | 2,424 | 2,694 | 2,732 |

Source: Bank calculations.

(a) The goodness of fit is calculated as the square of the correlation coefficient between the actual and the fitted value of the capital ratio.

* Indicates significance at the 10% level.

** Indicates significance at the 5% level.

*** Indicates significance at the 1% level.

Cap. = equity/(assets – equity)

Provisions (t+1) = forward ratio of loan loss provisions to total loans.

Beta = bank's beta.

Idios. risk = idiosyncratic risk.

Logsize = natural logarithm of total assets.

ROE = return on equity.

GDP growth = real GDP growth.

Non-perf. loans = ratio of non-performing loans to total loans.

Cap. req. = regulatory capital requirement.

Time trend = time trend variable.

Dep. insurance = deposit insurance index.

Support = Fitch support rating.

Bank deposits = fitted value from a first-stage regression of the ratio of bank deposits to total deposits on instrumental variables.

Rating = 1 if a bank is rated, 0 otherwise.

Listing = 1 if a bank is listed on the NYSE, NASDAQ or AMEX, 0 otherwise.

Disclosure = fitted value from a first-stage regression of a constructed disclosure index on instrumental variables.

In addition to judging the statistical significance of the sign of the coefficients on the market discipline variables, it is useful to check the plausibility of the size of these coefficients. All the bank-level variables range between zero and unity. The coefficient for each of these variables can therefore be interpreted as the absolute change in the capital ratio resulting from a unit increase in the market discipline variable. The mean capital ratio is about 10.5%. The coefficient for the bank deposits' variable varies somewhat between specifications but is typically close to 7%. This means that a bank that is financed fully by uninsured deposits would have a capital ratio some seven percentage points higher than a bank that had no uninsured interbank deposits. Similarly, banks thought likely to receive government support have capital ratios about 1.2 percentage points lower than those not expected to receive government support. For the rating variable we find that the coefficient is quite small. Rated banks have capital ratios, on average, 0.3 percentage points higher than banks without a rating. The coefficients on listing and the disclosure index are more sizeable, implying an increase in the capital ratio of some 1.5 percentage points, respectively, as a result of an increase in disclosure from zero to unity.

In sum, the regression results are consistent with the notion that market discipline can enhance the incentives for banks to limit their risk of insolvency. They show that explicit and implicit government guarantees – measured by a deposit insurance index and the Fitch public support rating, respectively – result in lower capital buffers, everything else being equal. In addition there is evidence that interbank deposits have a disciplining effect. Finally, banks that disclose more information – measured by whether a bank has a US listing, whether it is rated or by the disclosure index – tend to have a higher capital buffer and thus more protection against unexpected losses than banks that disclose less.

## Conclusions and caveats

The results of this analysis are broadly supportive of recent policy initiatives. Enhancing market discipline through more disclosure and/or larger uninsured liabilities would appear to be beneficial for financial stability, since both mechanisms seem to provide incentives for firms to maintain adequate solvency standards. The results also indicate that the beneficial effect of these policy initiatives is likely to be stronger for banks that do not benefit from wide deposit protection schemes or other safety nets.

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