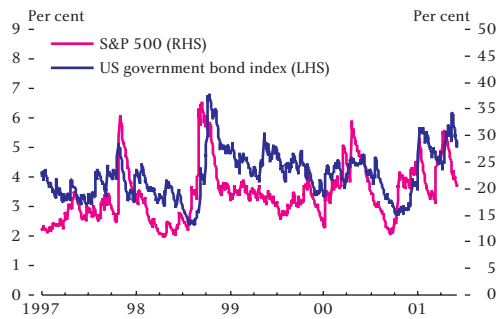


VI The international financial system

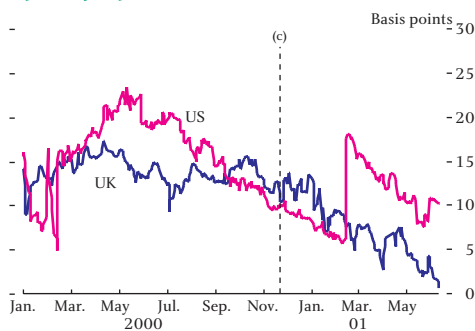
Chart 101:
Historical volatility of US equities and US government bonds^(a)



Sources: Thomson Financial Datastream and Bank calculations.

(a) Volatility calculated as annualised 252-day rolling square-root of exponentially weighted moving average of squared daily log returns.

Chart 102:
Liquidity spreads in the UK and US^{(a)(b)}



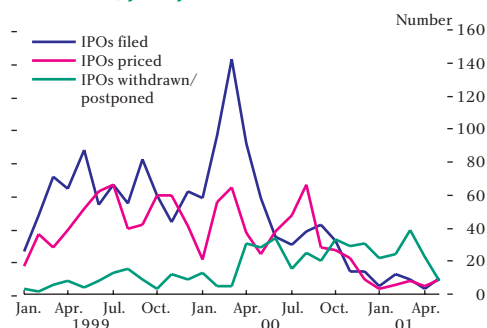
Sources: Bloomberg, Merrill Lynch, Reuters and Bank of England.

(a) UK: gap between the spread on the 8.5 per cent Treasury 2007 and the lower envelope of spreads on benchmark gilts. US: off-the-run minus on-the-run 30-year Treasury bond yields.

(b) Break in US series in February 2001 caused by new 30-year on-the-run bond.

(c) December 2000 Review.

Chart 103:
Number of US IPOs filed, priced and withdrawn/postponed



Source: ipo.com.

This Section addresses the question of how robust the international financial system is in the face of the developments and risks described in Sections I – V. This is especially important for the United Kingdom, given London's role as a global financial centre and the involvement of foreign-owned firms in domestic UK financial intermediation. Some important developments in infrastructure, regulation and other public policies relevant to the functioning of international financial markets are reported in Section IX.

Recent resilience of the system

As Section II discussed, there has been considerable volatility and uncertainty in markets since last autumn (Chart 101). High volatility entails greater market risk for investors and intermediaries taking direct exposures to the level of markets; and, furthermore, impedes risk management if returns across assets of different types and geographical location are positively correlated, reducing the scope for diversification. Correlations between returns on TMT and non-TMT equities have, in fact, increased since the December Review, as have correlations between regional equity markets (see Chart 28 in Section II). Increased cross-regional correlations, if they were to persist, would reduce the scope for mitigating risk by the geographical allocation of portfolios.

Notwithstanding potentially difficult conditions, most financial markets have continued to function smoothly. There have been no serious problems with market infrastructure. Most secondary markets appear to have remained liquid. For example, spreads between on- and off-the-run yields in the US and UK government bond markets have remained low (Chart 102). New issuance and liquidity in bond markets have generally been strong. This is helpful, as the capacity for capital markets to remain open and liquid in such conditions affects the ease and extent to which risk can be transferred to and from the banking system¹⁸. An exception was the drying up of liquidity in the US dollar and euro high-yield bond markets in late-2000, although conditions have since improved somewhat (see Section II).

Less helpful has been the weakness of the IPO market (Chart 103), which, amongst other things, has made it more difficult for some companies to reduce debt through asset sales and restricted the main exit through which venture capital investors realise value. While the biggest venture capital investors are pension funds and other long-term investment institutions, some banks also have significant venture capital exposures.

¹⁸ See, for example, remarks by Chairman Greenspan at the 36th Annual Conference on Bank Structure and Competition of the Federal Reserve Bank of Chicago, May 4 2000. Available at www.federalreserve.gov/boarddocs/speeches/2000/20000504.htm.

With markets generally remaining open, market participants, taken as a whole, appear to have coped well, notwithstanding volatile trading conditions. No very large trading losses have been announced, and there have been few obvious signs of distressed selling in order to raise liquidity or meet margin calls. One reason may be that firms have been able to adjust to greater price volatility over time rather than facing a sudden, unexpected market crash. Higher historical volatility will have increased measured value-at-risk (VaR) for the many market participants using these models to measure exposure to market risk. It is possible that they responded by reducing the size of positions during that period.

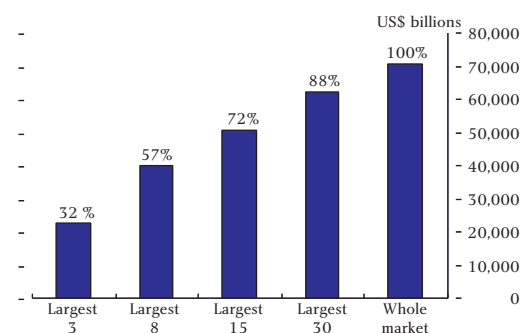
The June 2000 *Review* reported that the pattern of financial intermediaries' business with customers might have enabled them – perhaps in part as a defensive position against high equity market valuations – to benefit from high and rising price volatility: for example, by combining purchases of put options written by companies as part of share buy-back programmes with purchases of covered calls written by investment funds. Contacts suggest that such customer business declined as equity market prices fell and volatility rose. Although intermediaries probably remain 'long' equity market volatility, which might insulate them to some degree from sharp market disturbances, the size of these positions may typically be smaller now than a year ago.

Internationally active banks

While markets are one potential channel through which any major disturbances to the international financial system could spread, another is the links resulting from the scale and complexity of international banking activity. Cross-border banking is relatively concentrated amongst a number of large international banks, which often – but not always – have a significant share of banking activity in their home market. Overall, as measured by the BIS, interbank exposures account for just under one-half of total cross-border lending. Counterparty exposures relating to over the counter (OTC) derivatives are also relatively concentrated within a small number of large banks and securities firms (Chart 104).

The business of these internationally active firms, and the effectiveness of their risk management therefore has a material effect on the global pattern of exposures and risks. That is, of course, why the Basel Capital Accord, which is currently being updated, is designed to cover internationally active banks. It also provides the background to a recent survey¹⁹ undertaken by the G10 central banks' Committee on the Global Financial System on the use of stress tests and scenario analysis by internationally

Chart 104:
Interest rate swaps: Notional principal outstanding of 64 banks and securities firms^(a)

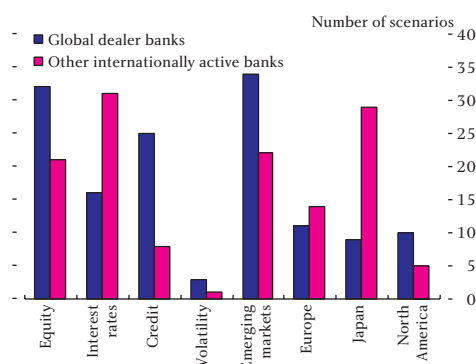


Source: Swaps Monitor.

(a) As at 31 December 2000 (data only available for some firms as at end-1999). Whole market refers to the sample of 64 banks and securities firms from the US, UK, France, Germany, Japan, Canada, Australia and the Netherlands.

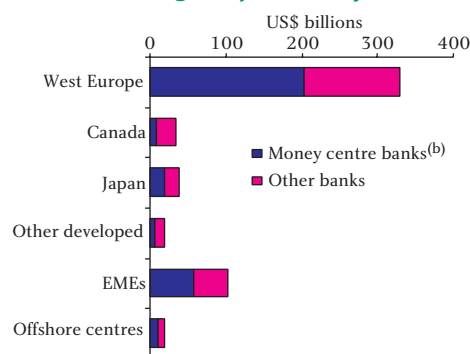
¹⁹: A survey of stress tests and current practice at major financial institutions. April 2001. Committee on the Global Financial System of the central banks of the G10 countries. Available at www.bis.org.

Chart 105:
Stress test scenarios: by peer group and theme



Source: BIS.

Chart 106:
US banks' foreign exposures by bank size^(a)

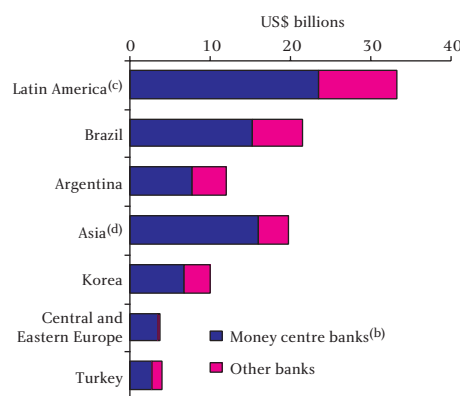


Source: Federal Financial Institutions Examination Council.

(a) As of 31 December 2000.

(b) 'Money centre banks' are Bank of America, Bank One, Citigroup, JP Morgan Chase & Co and Taunus Corporation.

Chart 107:
US banks' exposures to emerging markets^(a)



Source: Federal Financial Institutions Examination Council.

(a) As of 31 December 2000.

(b) 'Money centre banks' are Bank of America, Bank One, Citigroup, JP Morgan Chase & Co and Taunus Corporation.

(c) Excluding Argentina and Brazil.

(d) Excluding Korea.

active banks. The survey found that both global dealer banks²⁰ and other internationally active banks without the same global reach made extensive use of stress tests, but global dealer banks did more scenario analysis. Nearly 80 per cent of global dealer banks used stress tests to set limits and 42 per cent considered interactions between market and counterparty credit risk; the equivalent percentages for other internationally active banks were 45 per cent and 12 per cent respectively. Both groups of firms looked at a range of scenarios (Chart 105).

US banking system

A wide range of official data is published on the US banking system by a number of agencies, including the Federal Reserve, the FDIC, the OCC and their joint venture, the Federal Financial Institutions Examination Council (FFIEC).

According to FFIEC data, the five *commercial banks* – the money centre banks – with the largest international lending exposures accounted for over three-quarters of the industry total as at end-2000 (Chart 106). The bulk of these banks' exposure was to non-banks; about a quarter were interbank. They also had the larger share of exposures to EMEs, although these were low in relation to capital (Chart 107). The international exposures of smaller US banks were predominantly interbank, and concentrated in major OECD countries, particularly Europe and Canada.

US banking system exposure to Japan (including the replacement cost value of counterparty credit exposures on OTC derivatives) was the equivalent of 14 per cent of Tier 1 capital at end-2000. Cross border claims at end-2000 had fallen slightly since September (Chart 111).

The OCC publishes a measure of the US banking industry's counterparty credit exposures from international and domestic OTC derivatives business, which (as already noted) will largely relate to the activities of the largest banks. At replacement cost values, these exposures fell from a peak of around 300 per cent of regulatory capital in late 1998 to around 250 per cent at end 2000 (Chart 108).

Venture capital accounted for about 10 per cent of total income at several US banks in 2000. Although such investments are a negligible proportion of the total assets of the US banking system, a few of the large US banks have large portfolios. The fall in asset values in the TMT sector and the relative drying up of the IPO market might constrain earnings from this source for a while. It is difficult to assess the significance of this.

Overall, following a long period of high profitability, internationally active commercial banks in the US appear to be

²⁰: See footnote 10 of the CGFS paper for the definition of 'global dealer bank'.

in a stronger position to meet the demands of a downturn than before the early 1990s recession. According to FDIC data, the overall risk-based capital ratio for the largest US banks (those with assets greater than US\$10 billion) was over 11 per cent at end-2000 and the Tier 1 ratio over 8 per cent. Equity capital ratios averaged over 8 per cent, compared with less than 5 per cent in 1989. The ratio of impaired assets to total assets was 0.8 per cent at end-2000. While higher than the 1997 low, this is much less than the 4 per cent at end-1991.

The reported capital resources of the large US *investment banks* (securities firms and investment banking arms of banks) more than doubled in the second half of the 1990s, with earnings boosted by a sharp increase in fees from customer trading and underwriting revenues. Average value at risk (VaR) – the maximum amount which, on the basis of relatively recent price movements and within a specified level of confidence, an institution would expect to lose on its positions over a given trading period – generally declined for the trading books of major US securities firms between annual reporting dates in 1999 and 2000 (Chart 166 in Section VIII). Given that volatility of many markets in 2000 was relatively high, lower reported VaRs suggest that securities firms might have reduced the size of their market risk positions.

Securities firms' sources of earnings were diverse in the 1990s (Chart 109). 2001 Q1 profits increased slightly on the previous quarter, reflecting an increase in foreign earnings (US earnings were flat). Strong bond underwriting income contrasted with weak earnings from IPOs and M&A: a pattern that has continued in the initial results for 2001 Q2. Recent market volatility seems not to have led to significant problems with margin credit exposures.

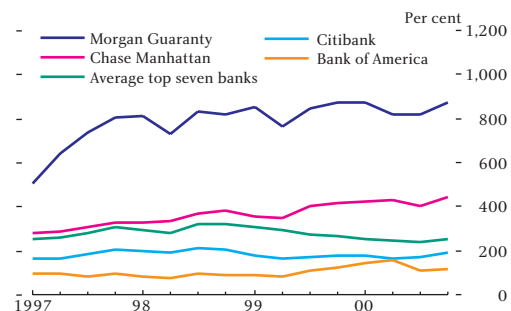
European banking systems

Rather less data are available on a consistent basis for European banking systems. As in the United States, published data show that aggregate bank capital ratios have increased since 1997. The average risk-based capital ratio for large banks in Europe was over 12 per cent by end-2000. The ratio of average loan loss provisions to gross loans increased following the 1997-98 crises, but has fallen significantly since.

On-balance-sheet *cross-border* exposures²¹ of European banks to the United States vary widely by creditor country, with Dutch, Belgian and Swiss banks having the largest exposures in relation to capital (Chart 110). However, these data exclude exposures of US offices and, for some European banks, these are likely to be substantial.

²¹: This excludes local currency exposures of local offices, for which aggregate data is not available.

Chart 108:
Major US banks with derivatives – ratio of derivatives credit exposure^(a) to risk-based capital^(b)

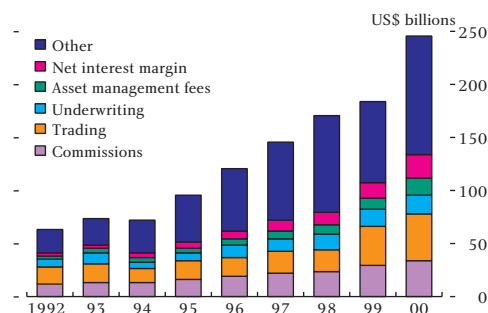


Source: Office of the Comptroller of the Currency.

(a) Credit exposure defined as bilaterally netted exposure (gross positive marked to market value of all contracts after bilateral netting) plus future exposure add-ons.

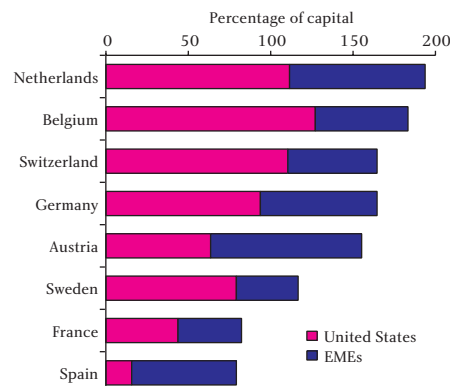
(b) Capital is Tier I plus Tier II capital.

Chart 109:
Composition of US securities industry earnings



Source: Security Industries Association.

Chart 110:
European banks' exposures to US and emerging markets^{(a)(b)}

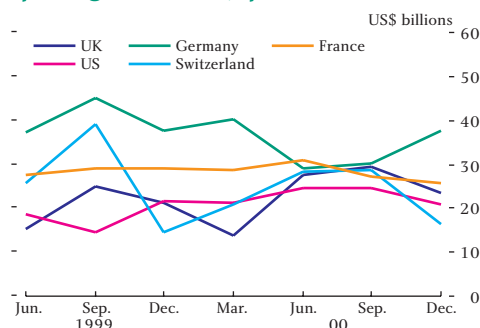


Sources: BIS, IMF and OECD.

(a) Consolidated data on balance sheet only. Excludes exposures of local subsidiaries.

(b) Switzerland is based on December 1999 and Sweden is based on September 2000 data; the rest are December 2000 data.

Chart 111:
Consolidated international claims of reporting banks on Japan



Source: BIS.

German and French banks have larger claims²² on Japan than US, UK and Swiss banks. They have fallen since 1999, although German banks' claims increased in 2000 H2 (Chart 111).

On-balance-sheet cross-border exposures to EMEs similarly vary significantly. Austrian banking system exposure – around 90 per cent of capital – largely results from its business with neighbouring and nearby central and eastern European countries. German, Dutch and Spanish banks also have large EME businesses. Cultural and historical ties to EMEs might aid risk management. For example, despite Argentina's prolonged recession, Spanish banks' profits from that source have been high and increasing in recent years. Box 4 examines the exposure of Spanish banks to the Latin American region.

Since 1999, large European banks have made increasing use of collateralised loan obligations (CLOs) to transfer credit risk on their corporate loanbook. For example, 29 of the 51 CLO transactions rated by Moody's globally in 2000 were by European banks, transferring the risk on portfolios totalling more than US\$40 billion²³. Most of these transactions were designed to transfer the credit risk on loans to German, French, Spanish or Italian companies. Large European banks appear to have made greater use of CLOs than US banks in 2000, perhaps because they have larger corporate loanbooks. The main investors in European CLO tranches are said to have been European insurance companies²⁴.

Sectoral exposures – telecoms

The most significant credit exposure of the international banking system to a single industry sector probably remains telecoms. Consistent public data on the relative exposures of US and European banks do not exist. But, according to Capital Data's Loanware database, outstanding syndicated loan commitments (drawn and undrawn) of all international banks to European telecom operators and equipment manufacturers at the end of April 2001 totalled US\$179 billion (April 2000: US\$91 billion), of which US\$130 billion (US\$61 billion) was to the large operators. Nearly US\$83 billion of these facilities mature in the second half of 2001.

Ratings of some of the large European operators have continued to fall since the December Review (Table 13). Further downgrades could begin to limit access to commercial paper markets and would lead to higher interest costs on those recent bond issues that include step-up clauses. There have, however, been a number of positive developments this year. In particular, the large

Table 13:
Ratings of European telecom operators

	December Review	12 June 2001
British Telecom	A-/A2	A-/Baa1
France Telecom	A-/A1	A-/A3
Deutsche Telekom	A-/A2	A-/A2
Vodafone	A-/A2	A-/A2
KPN	A-/A3	BBB+/Baa2
Telefonica	A+/A2	A+/A2

²²: Again, local currency exposures of local offices are excluded.

²³: Moody's Investor Services 2000 *Review of CDOs and outlook for 2001: The European market matures*, January 25 2001.

²⁴: See the article by David Rule in this *Review*.

Box 4: Spanish banks' exposures to Latin America

The consolidated claims of Spanish banks on Latin America have grown significantly to US\$51.5 billion in 2000 Q4 from US\$44.1 billion in Q2 and US\$39.7 billion at end-1999, putting Spanish exposure just below that of the United States and about twice that of the United Kingdom¹. Spanish banks' claims represent 18 per cent of all BIS banks' consolidated claims on the region and 31 per cent of all Spanish-owned banks' international claims. This constitutes a far greater regional concentration than that recorded by banks in most other countries.

These BIS data cover a wide range of assets (loans, securities and equities) and include foreign currency-denominated lending by local subsidiaries as well as those of the parent group. This is important in the case of Spain, as Spain's two largest banks (BSCH and BBVA) have significant subsidiary operations in Latin America, some of whose businesses will be in foreign currencies such as the US dollar. But the BIS data understate total group exposures to credit risk as they do not include local currency loans by foreign subsidiaries. So, for example, if BBVA's Mexican subsidiary lends peso to a Mexican firm, the loan will not be included in the BIS data. The data are collected in this way on the basis that subsidiaries funded locally are treated on a stand-alone basis by the parent bank and its exposure is limited to its capital investment.

An alternative way of measuring exposure is to look at all the assets of the consolidated group. As Table A shows, the total on-balance sheet assets of Spanish-owned subsidiaries in Latin America are far higher than external claims. Calculations scaled to reflect partial or total ownership suggest that, as at end-2000, subsidiaries of BSCH and BBVA had Latin American assets of US\$95 billion and US\$51 billion, respectively.

While large exposure to parts of Latin America clearly represents a risk in the current conjuncture, BSCH's and BBVA's earnings in the region have been strong. This might reflect a number of factors, including a 'first-in' advantage as well as historical and linguistic ties with the region.

Links to the international financial system

The exposure of BIS-area banks to banks located in Spain was US\$70.7 billion at end 2000. Given the predominance of Spanish-owned banks in the Spanish banking sector, it is likely that much of this exposure was to Spanish-owned banks. Spain accounted for only 2 per cent of UK-owned banks' on balance sheet consolidated cross-border claims (US\$9.8 billion), of which about half were to the banking sector. In addition, offices of UK-owned banks located in Spain had local currency claims on local residents of US\$7.3 billion. As for their activity in London, at end-2000 Spanish banks represented only 0.6 per cent of the aggregate balance sheet of UK-resident banks and accounted for only 0.3 per cent of the inter-bank business.

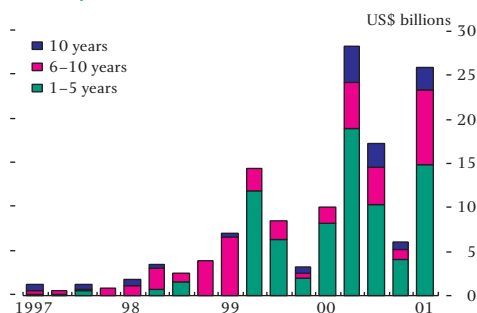
Table A:
Assets of Spanish subsidiaries in Latin America
(US\$ billion)

	BSCH	BBVA	All Spanish consolidated claims
Argentina	9.8	7.0	19.0
Brazil	32.2	5.2	5.7
Mexico	25.6	22.3	13.0
Total LA	94.9	50.5	51.5
<i>Memo:</i>			
<i>Parents' equity</i>	29.2	21.9	
<i>Group assets</i>	376.6	321.7	

Source: Bureau van dijck Bankscope.

¹: Data not adjusted for risk transfers.

Chart 112:
European telecom bond issuance by maturity



Source: Capital Data.

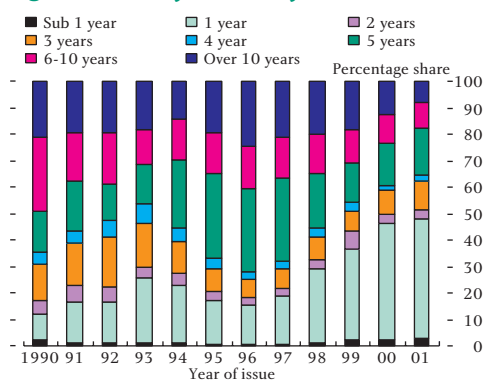
European operators have been able to refinance some short-term debt in the bond markets (Chart 112), probably thereby reducing the risk to banks that commercial paper back-up lines will be drawn and lessening the number of maturing undrawn facilities that will need to be replaced later this year. To some extent, debt has also been reduced through asset sales and equity issues, although equity market weakness has constrained debt reduction plans. Credit exposures to the large European operators are plausibly – but not certainly – reasonably well distributed through the international banking system.

As discussed in Section II, risks in lending to alternative telecom operators in the US and Europe remain high, particularly for those needing additional finance to implement business plans. Although bondholders and equipment suppliers have provided a large share of the debt for many of these companies, bank exposures might increase if distressed companies were to draw down committed lines.

Market developments with potential effects on system resilience

While the system has proved resilient in recent choppy market conditions and the international banking system in aggregate has built up capital resources over recent years, there are, nevertheless, a variety of issues to which risk managers, regulators and the monetary authorities generally need to be alert. Sections I-V covered some risks related to the macroeconomic conjuncture and specific country or sectoral vulnerabilities. The remainder of this Section identifies developments, possibly creating potential risks, sourced in recent patterns of business within the financial industry itself.

Chart 113:
New syndicated loan arrangements by original maturity of facility



Source: Capital Data.

Shortening maturity of syndicated bank facilities

Whereas most syndicated lending until the late-1990s was through five-year or longer maturity facilities, since 2000 nearly half has been for one year or less (Chart 113). This has been accompanied by a trend towards financing through securities markets. The reduced participation of Japanese banks, industry consolidation and a greater focus on risk-adjusted returns by banks probably all contributed to a steepening of the supply curve for bank lending. Bank borrowing is now typically used either when corporates need funds quickly and flexibly – for example, when acquiring another company – or as liquidity insurance in case they are unable to issue securities. The shorter maturity of bank facilities should mean that banks have more flexibility in reviewing whether and on what terms to lend – for example, to increase prices if credit quality deteriorates. But it increases refinancing risk for borrowers.

Commercial paper back-up lines

Issuance of US\$ commercial paper (CP) has increased rapidly in recent years, particularly paper backed by corporate assets such

as trade receivables (Chart 114). Money market mutual funds are amongst the largest buyers. Under their investment guidelines, however, many are not allowed to invest in paper below a certain rating threshold. For this reason, the ability to issue commercial paper can fall sharply if it is downgraded. In early 2001 the supply of A2-rated commercial paper in the United States increased following rating downgrades of some large issuers. Inelastic demand may have been one reason why the spread of A2/P2-rated over A1/P1-rated commercial paper remained high in early 2001 following the increase at the end of 2000, which may have been an end-of-year effect (Chart 115).

Reportedly some issuers found it cheaper to draw down back-up lines than continue issuance. There has been market comment to the effect that lines were not intended to be available to an issuer on demand but were there to provide insurance against market-wide events which made issuance impossible. It has also been suggested that clausuring on back-up lines, which could perhaps have protected banks against idiosyncratic company risk, has weakened in recent years, and that banks may sometimes be unwilling to enforce material adverse change clauses. Where clauses linked to ratings have existed, borrowers have in some instances pre-empted these by drawing down a facility shortly before a downgrade. Even if facilities have a maturity of less than one year, the issuer is often able to draw down a longer-term loan under so-called 'term-out' clauses.

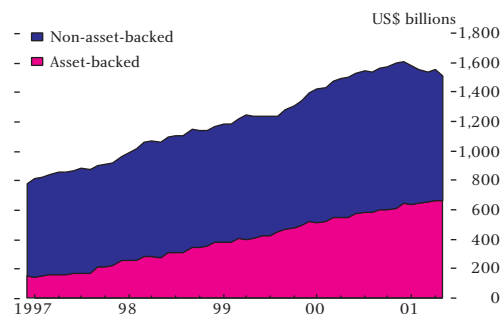
The latest Federal Reserve System Senior Loan Officer Opinion Survey showed that almost all banks in the US believed that back-up lines were under-priced, although most thought profits could be recouped from ancillary or capital markets business with an issuer (Table 14).

Convergence of investment and commercial banking

A broadly related development is the increasing use of bank loans as a 'bridge' to future bond or equity issues. The December *Review* reported that commercial banks had been using their capacity to lend in order to compete for IPO or bond business with investment banks, which had responded by providing bridge loans themselves. It is now said that investment banks are also under some pressure to provide general corporate credit, especially commercial paper back-up lines. To the extent that they choose to do this business, and of course some may not, systems will be needed to manage the associated credit and liquidity risks.

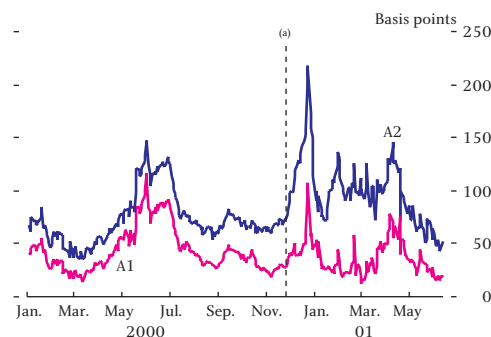
These developments may partly reflect cyclical influences, such as weakness of equity capital markets business and some increased corporate demand for liquidity insurance given current macro and market uncertainties. But it may also reflect structural factors such as consolidation in the commercial banking sector and a greater emphasis on return on capital. Large companies

Chart 114:
Outstanding commercial paper, including asset-backed



Source: Board of Governors of the Federal Reserve System.

Chart 115:
Commercial paper spreads to US treasury bills^(a)



Source: Bloomberg.

(a) December 2000 *Review*.

Table 14:
May 2001 Senior Loan Officer Opinion Survey responses on commercial paper back-up lines

Profitability	% of respondents ^(a)	%
Profitable on standalone basis	2.3	
Profitable overall ^(b)	77.3	
Unprofitable overall	20.5	
<i>Of which expecting a change in volume over the longer-term:</i>		
	Minor decline	33.3
	Moderate decline	44.4
	Fairly considerable decline	22.2

Source: Board of Governors Federal Reserve System

(a) Based on the 44 firms in the Senior Loan Officer Opinion Survey on Bank Lending Practices providing commercial paper back-up lines.

(b) After taking into account associated business opportunities.

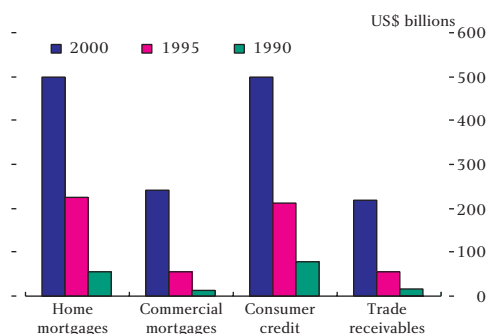
also seem to be reducing the amount they want to borrow from banks while expecting banks and investment banks both to arrange their capital markets financing and to be willing to provide back-up liquidity when needed. While it is too early to tell, investment banking and commercial banking may therefore be converging further, with potential implications for regulators and central banks. In Europe, universal banking has a longer tradition, so this development may be more significant for the large US securities firms and commercial banks.

Transfer of credit risk from the banking system

As well as reducing the maturity of their lending, US and European banks are also transferring, often outside the banking sector, a greater proportion of the credit risk on facilities that are drawn down. Arrangers of syndicated facilities say that the amount they seek to retain on their own balance sheet has decreased over the past five years or so. Sales of loans in the secondary market are increasing, including to non-bank investors (see Chart 17 in Section I for developments in the US domestic market). Just under a third of unsecured consumer credit in the US has been securitised (Chart 116). Moody's rated 51 collateralised loan obligations (CLOs) in 2000 compared with 40 in 1999²⁵. Large banks have also been purchasing credit protection on individual corporate and sovereign exposures using single name credit default swaps.

Non-bank investors, such as insurance companies, mutual funds and pension funds, have always been exposed to credit risk in other ways, directly via corporate bond holdings and indirectly through investment in bank equities and other capital instruments. An interesting new development, so far apparently

Chart 116:
Stocks of securitised assets in US market^{(a)(b)(c)}



Source: Board of Governors of the Federal Reserve System.

(a) All values refer to the end of year shown.

(b) Commercial mortgages include multi-family residences.

(c) Proportion of all outstanding loans of this type at end-2000 (proportion of all non-public domestic credit market debt end-2000).

²⁵ Moody's Investors Services 2000 CDO Review/2001 Preview, 19 January 2001. See also the article by David Rule in this Review.

limited in scope, is the provision of contingent capital to banks by reinsurance companies²⁶. For example, a reinsurer might commit to subscribe for new preference shares at a pre-agreed price if bad debts on a bank's portfolio exceed a threshold figure.

The transfer of loan exposures or risk outside the banking system is welcome if it spreads credit risk more widely and the holders are able to manage it sensibly. However, if banks have mainly been able to transfer risk on the better quality credits, the average credit quality of assets remaining on their balance sheet may have deteriorated. Other developments may also have the same effect. First, some banks have moved into relatively risky lines of business, such as leveraged financing and sub-prime consumer lending. Secondly, if corporate borrowers pledge assets with more certain cashflows to back their commercial paper or securitisation programmes, the quality of assets for general creditors, including other banks, may have deteriorated. Moody's data indicate that recovery rates on loans and bonds have fallen since 1997 (Chart 117).

The combination of a shift from direct lending to provision of liquidity insurance and a probable increase in the transfer of credit risk outside the banking sector has probably increased the share of undrawn relative to drawn commitments. This might mean that, in relation to capital, reintermediation could have a greater effect on bank balance sheets if corporate credit quality deteriorated, the liquidity of primary capital markets reduced, or non-bank investors' demand for loans fell.

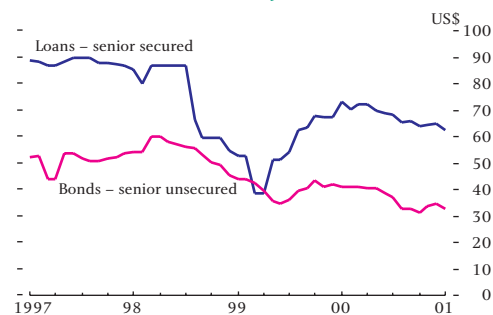
Leverage and hedge funds

As the events of 1998 demonstrated, combinations of credit and liquidity risk can sometimes be associated with a crystallisation of market risk. Asset price volatility is more likely to lead to disruptive spillovers if highly leveraged intermediaries become forced sellers. One of the main ways to obtain balance sheet leverage is through sale and repurchase (repo) of securities. Repo financing by US government securities dealers has been increasing over the past six months (Chart 118), and reverse repo lending to non-residents by UK banks has continued steadily – raising the question of what activities are being financed (Chart 119).

Lending to the non-bank private sector in the Cayman Islands, where many hedge funds are domiciled, has also been continuing to increase (Chart 119). Such flows were not certainly associated with hedge fund borrowing – they might, for example, have been purchases of securities issued by SPVs incorporated in the Cayman Islands – but there has recently been considerable growth in the hedge fund industry: according to TASS Research,

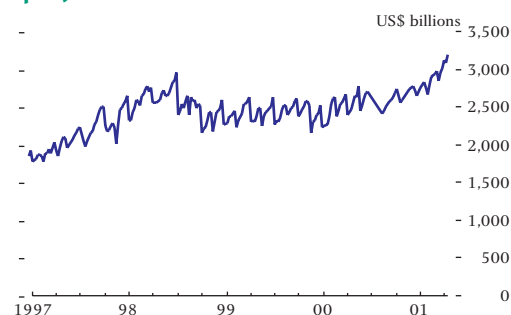
²⁶: For example, Swiss Re is reported to have entered into a contingent capital transaction with Royal Bank of Canada in 2000.

Chart 117:
Defaulted bond recovery values



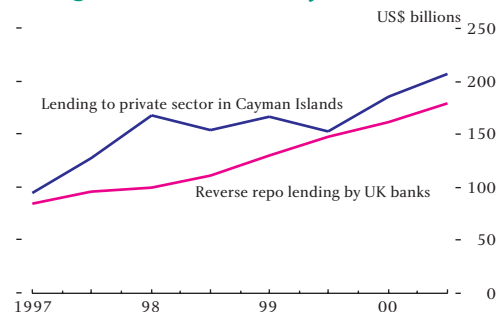
Source: Moody's Investors Service.

Chart 118:
Financing by primary US government securities dealers (repos plus reverse repos)



Source: Federal Reserve Bank of New York.

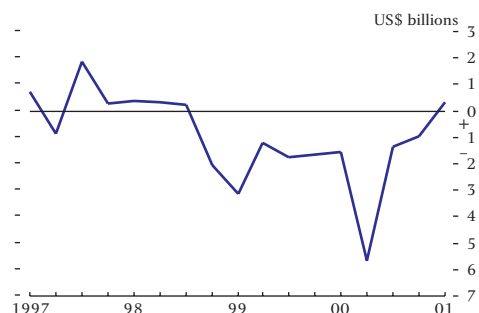
Chart 119:
Lending to the non-bank private sector in the Cayman Islands^(a) and reverse repo lending to non-residents by UK banks



Sources: BIS and Bank of England.

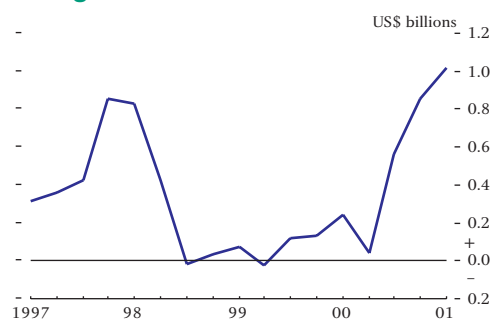
(a) Cross-border lending by BIS reporting banks. Total lending to the Cayman Islands during H1 was US\$ 231 billion. Adjusting for risk transfer to the country of ultimate risk, lending to the Cayman Islands was US\$ 186 billion. Adjustments for risk transfer are not available for individual economic sectors.

Chart 120:
Quarterly inflows into global macro hedge funds



Source: TASS Research.

Chart 121:
Quarterly inflows into convertible bond arbitrage



Source: TASS Research.

US\$6.9 billion was invested in hedge funds in 2001 Q1, the largest quarterly inflow since 1998 Q1 and approaching the US\$8 billion invested in the whole of 2000. Equity market (long/short and market neutral) funds have continued to attract the greatest share of investment. Funds investing in distressed debt – for example, of US, Japanese and some EME companies – also appear to be attracting more investment, but from a smaller base. Flows into global macro funds were positive in 2001 Q1 for the first quarter since the autumn of 1998 (Chart 120).

The population of investors in hedge funds also seems to be broadening to include more pension, insurance and investment funds. The number of ‘alternative investment strategy’ mutual funds has been increasing, typically as ‘funds of funds’, investing in a number of hedge funds. Some international banks and insurance companies have offered investors principal-protection, with the yield typically linked to the return on a fund of hedge funds but with the principal guaranteed – similar products are also said to be offered on some mutual funds. Most are thought to cover their risk exposure by ‘delta’ hedging: investing in the underlying hedge funds in combination with risk-free bonds.

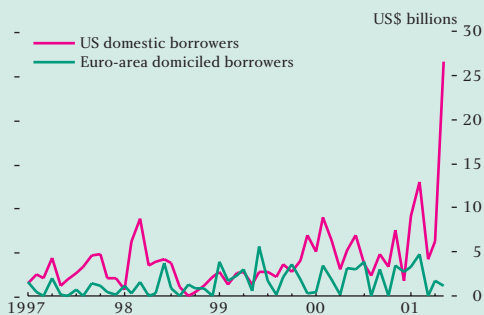
In general, so-called ‘crowded trades’ in which leveraged intermediaries and hedge funds are positioned ‘the same way round’ are said to have been less common in recent years than in the mid-1990s. One possible exception might be convertible bond arbitrage (Box 5). This has been a profitable hedge fund strategy, attracting investors (Chart 121) and contributing to increasing issuance of convertible bonds; sub-investment-grade companies have recently been large issuers in the United States. Funds are said typically to be leveraged around 4 or 5 times, and to have broadly the same types of positions. The strategy involves funds being ‘long equity volatility’ – they gain if equity implied volatility increases but lose if it decreases. Equity volatility rose during 2000 and into 2001, which may help to explain the recent profitability of the strategy. Volatility has fallen back somewhat more recently, but still remains high. The risk that a sudden fall in volatility could cause simultaneous forced sales of convertible bonds seems to be regarded in the market as relatively low. Another possible vulnerability to sudden pressures might be incomplete hedging of interest rate or credit risk on the bonds. Investment banking operations might also be exposed if they were to underwrite high-risk convertible bond issues on the expectation that hedge funds – but maybe no-one else – will buy them. Given the popularity of the trade, it is important that the various possible ways in which the strategy could go wrong are stress tested by intermediaries and investment funds.

Box 5: Convertible bond arbitrage

A convertible bond gives the bondholder a right to exchange the bond for a predetermined number of shares in the issuing company (exchangeable bonds are similar but the shares are in another company). Convertibles package together a straight bond and an embedded 'out-of-the-money' equity call option. As the bondholder has the option not to convert, the bond portion of the convertible sets a floor to its value.

Since the December *Review*, issuance of convertible bonds in the US has increased (Chart A), perhaps reflecting a combination of falling US bond yields in 2001 Q1 as well as high equity volatility. Some sub-investment-grade issuers, in particular, have been able to issue convertibles even though straight bond and equity markets were effectively closed to them.

Chart A:
US domestic and international convertible bond issuance



Sources: Capital Data and SDC Platinum.

Contacts suggests that investment funds, particularly specialist hedge funds, have been large buyers of convertibles. According to published data, at the end of 2001 Q1 a little less than 6 per cent of total hedge fund

assets were invested in convertible arbitrage funds¹. US hedge funds are said to own around 30 per cent of all convertible bond issues outstanding in the US.

An 'arbitrage' opportunity exists if the call option embedded in the convertible is under-priced. Issuers may be willing to sell call options on their shares in order to raise funds if they are liquidity constrained; or if they think the implied volatility is too high. The strategy involves purchasing the convertible bond and simultaneously selling short the underlying equity. The size of the short position is adjusted dynamically to ensure that it 'delta' hedges changes in the value of the embedded option as the equity price moves. Provided the delta-hedge can be maintained, the arbitrageur should be protected against any decline in the value of the equity. It remains exposed to interest rate and credit risk on the bond, but these can, in principle, be hedged using OTC derivatives such as asset swaps and credit default swaps². A fully hedged position leaves the arbitrageur 'long' volatility – it gains if the implied volatility of the share price increases and loses if it falls.

The arbitrageur is exposed if implied equity volatility falls, leading to a decline in the value of the embedded option. It may face a similar risk if it overpays for the convertible because of miscalculation or poor volatility assumptions. Markets in single stock options are often illiquid, so traders rely on pricing models. There is also a risk of the cost of maintaining a hedge increasing. For example, an equity may become more expensive to borrow to cover the short sale if, for example, the issuer is subject to a hostile take-over bid. The arbitrageur may be exposed if it chooses not to hedge fully the interest rate or credit risk on the bond. For example, returns on convertible bond arbitrage funds were negative in 1994, when US interest rates increased unexpectedly. There may also be exposures to counterparty credit risk on these various OTC hedging transactions.

Table A:
Risk assessment of convertible bond arbitrage (buy convertible bond; sell equity short; buy protection using credit default swaps; buy an asset swap)

	Investor wins (loses) on...	Investor loses (wins) on...
Equity price falls (rises)	Short stock position	Long convertible position
Credit spreads rise (fall)	Credit default swap	Long convertible position
Interest rates rise (falls)	Purchased asset swap	Long convertible position
Equity implied volatility rises	Long convertible bond position	
Equity implied volatility falls		Long convertible bond position

¹: TASS Research.

²: In an asset swap, the fund would agree to pay a counterparty the fixed interest payments on the convertible bond and receive floating rate payments linked to LIBOR plus (or minus) a fixed spread.