

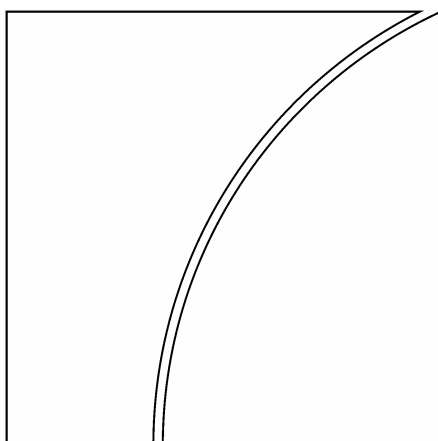


BANK FOR INTERNATIONAL SETTLEMENTS

BIS Quarterly Review

March 2005

International banking
and financial market
developments



BIS Quarterly Review
Monetary and Economic Department

Editorial Committee:

Claudio Borio
Már Gudmundsson
Robert McCauley

Frank Packer
Eli Remolona
Philip Turner

Paul Van den Bergh
William White

General queries concerning this commentary should be addressed to Frank Packer (tel +41 61 280 8449, e-mail: frank.packer@bis.org), queries concerning specific parts to the authors, whose details appear at the head of each section, and queries concerning the statistics to Philippe Mesny (tel +41 61 280 8425, e-mail: philippe.mesny@bis.org).

Requests for copies of publications, or for additions/changes to the mailing list, should be sent to:

Bank for International Settlements
Press & Communications
CH-4002 Basel, Switzerland

E-mail: publications@bis.org

Fax: +41 61 280 9100 and +41 61 280 8100

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Notations used in this Review

e	estimated
lhs, rhs	left-hand scale, right-hand scale
billion	thousand million
...	not available
.	not applicable
–	nil or negligible
\$	US dollar unless specified otherwise

Differences in totals are due to rounding.

1. Overview: low yields in robust economies

Long-term yields in the major markets remained surprisingly low into the new year. Despite a firming of global growth and further increases in US policy rates, long-term US dollar yields remained below the level prevailing when the US Federal Reserve first began to tighten. Long-term euro yields declined up to mid-February, with 30-year bund yields in particular falling well below their previous lows. Decreasing yields were not accompanied by a drop in consensus forecasts of inflation, suggesting that other factors were behind the rally in bond markets. One factor frequently mentioned by market participants was demand by pension funds and insurance companies for long-dated assets.

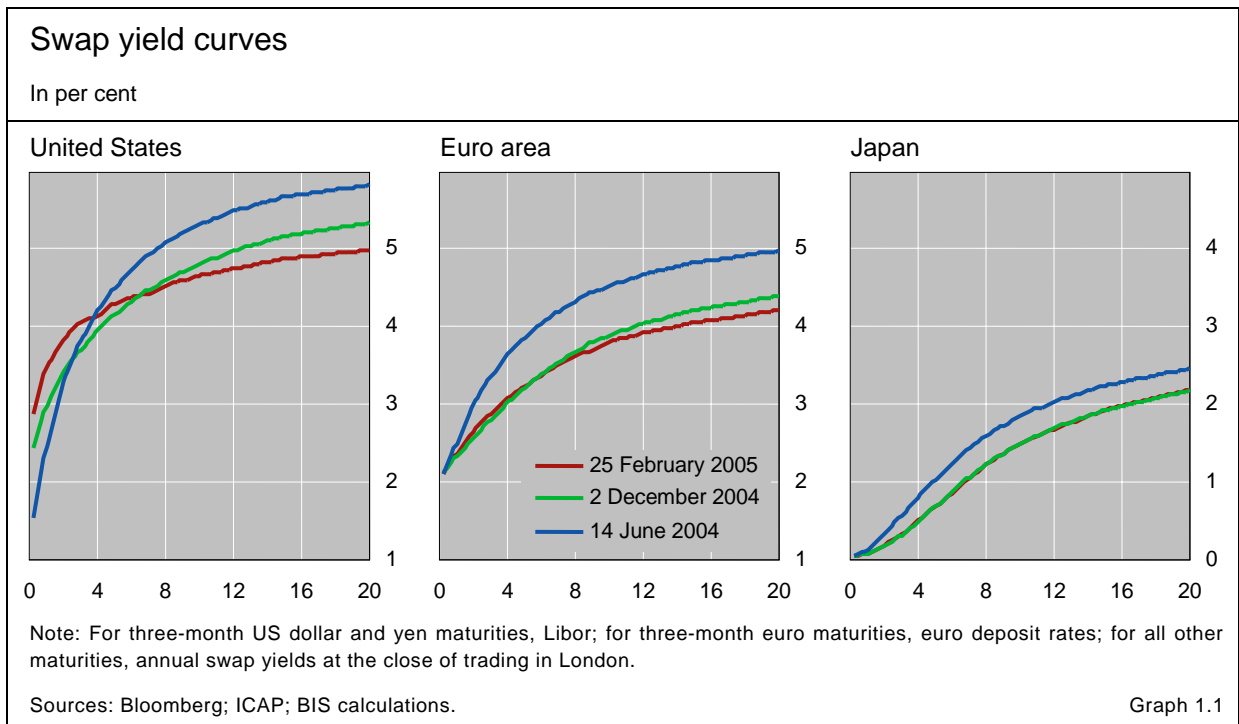
Investors' appetite for higher-yielding instruments signalled that they remained confident in the strength of the economic recovery. Towards the end of 2004, spreads on all types of debt – corporate and sovereign, investment grade and high-yield – narrowed to close to or even below their historical lows. Investors turned marginally more risk-averse early in the new year on concerns that US policy rates might increase faster than previously expected. Nevertheless, in February 2005 corporate and emerging market spreads were still close to their end-2004 levels.

Equity markets followed a path similar to that of credit markets, rallying up to the end of 2004 and then losing momentum in the new year. The prospect of corporate releveraging revived equity markets in late January. After several years of strengthening their balance sheets, US companies in particular again appear to have begun to look to equity buybacks as well as mergers and acquisitions to boost returns to shareholders, even at the cost of potentially increasing risks to bondholders.

Long-term rates remain range-bound in the face of Fed rate hikes

The flattening of the US yield curve, which began when the Federal Reserve started to raise rates in late June, continued in the period under review (Graph 1.1). At the long end, yields on US government securities, which had risen the previous quarter up to November, resumed a gentle downward drift in early December and into the new year. By 9 February, the yields on 10-year Treasuries were at 3.98%, the lowest level in more than three months (Graph 1.2). This occurred even as short-term rates were driven up by the

US yield curve
flattens



continuation of Fed tightening over the period, as well as clear signals that increases in policy rates would continue over the next few months at least.

One factor contributing to the unusually controlled behaviour of long-term rates in the face of Fed rate hikes was that macroeconomic data tended to undershoot expectations, despite consensus growth forecasts for 2005 that were edging up over the period (Graph 1.3). In particular, the all-important non-farm payroll figures announced in early December and February were well below expectations, triggering declines in yields on the days of the announcement of 16 and 9 basis points, respectively. On the price front, overall core consumer price inflation remained contained, and there was little evident spillover from rising oil prices to long-term inflation expectations.

Yields held down by weaker than expected job growth ...

A second likely reason for lower bond rates was reduced uncertainty over the course and impact of monetary tightening in the near term. The Fed continued to maintain its assessment of balanced risks to prices and growth over the period, as well as its expectation that the pace of tightening to come would be “measured”. The implied volatilities of US government bond futures approached the lows of the mid-1990s, while estimated risk premia on short- to medium-term yields declined markedly (Graph 1.2; see also the box on page 3). Admittedly, the release of the minutes of the December meeting of the FOMC on 4 January, the first time this had been done so soon, shook markets. The fact that certain FOMC members had remarked on excessive risk-taking in markets and possible inflationary pressures while questioning the need to communicate a likely “measured” pace of tightening triggered a brief sell-off in bond markets. Even so, subsequent comments from Fed officials, combined with the virtually unchanged written FOMC statement after the meeting of 2 February, supported the view that the Fed was not leaning towards a more rapid path for rate hikes.

... and reduced uncertainty about monetary policy

Decomposing long-term yields

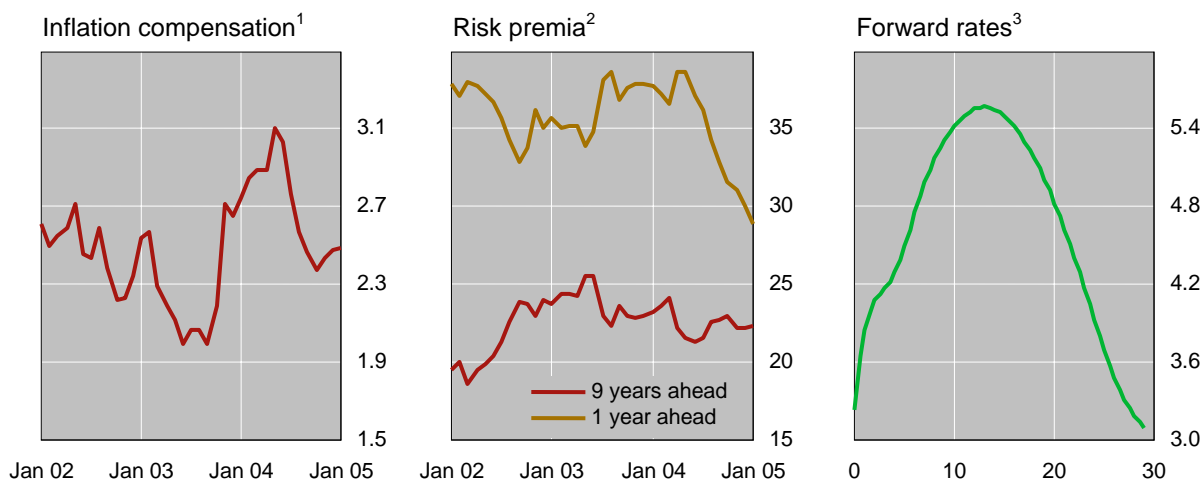
The low level of long-term interest rates in the major markets, in particular the United States, has surprised many market participants and observers. Since June 2004, the US economy has grown steadily, there has been a sharp rise in oil prices, and the Federal Reserve has increased policy rates by 150 basis points – and signalled more increases to come. Nevertheless, during the first two months of 2005, 10-year US Treasury yields remained at least 30 basis points below where they had been when the Federal Reserve first began to raise rates.

One way to assess whether the current level of long-term yields is consistent with underlying economic conditions is to decompose yields into their various components. Long-term interest rates can be considered a function of the expected future path of short-term interest rates and a time-varying risk premium. For example, the one-year forward Treasury rate at the nine-year horizon was around 5.3% on 25 February. This could have implied an expected short-term rate of 5.1%, with a risk premium of 20 basis points. Expected short-term rates can be decomposed into expected inflation and a real rate of interest, while the risk premium may fluctuate with changes in liquidity, investors' aversion to risk, or the degree of perceived inflation risk.

Some of the decline in long-term rates since mid-2004 may be due to an easing of long-term inflation expectations. Inflation compensation, as implied by the difference between nominal Treasury yields and inflation-indexed yields, has fallen over long horizons. For example, inflation compensation for the five to 10-year horizon has declined by more than 50 basis points since June 2004, to below 2.5% (see the left-hand panel of the graph). This suggests that longer-term inflation expectations may have fallen, although movements in inflation compensation can also be influenced by changes in market liquidity or in the premium for inflation risk. Economists' long-term forecasts of inflation have increased slightly since mid-2004, to 2.5%.

As for the real rate of interest, economic theory suggests that it will tend towards some "natural" rate, which is typically defined as the real short-term interest rate consistent with stable inflation. The natural rate fluctuates over time with, among other factors, the growth rate of productivity. The natural rate is not directly observable and thus is commonly estimated using a macroeconomic model. The natural rate in the United States was estimated to be close to

Factors influencing forward interest rates



¹ Difference between nominal and inflation-linked five-year forward rates, five years ahead; nominal Treasury yields are obtained from the fair market curves calculated by Bloomberg; monthly averages. ² Risk premia on one-year forward rates; derived from a three-factor affine model described in Q Dai and K Singleton, "Expectations puzzles, time-varying risk premia, and affine models of term structure", *Journal of Financial Economics*, 63, 2002, pp 415–41; monthly data; in basis points. ³ Nominal one-year forward interest rate curve on 25 February 2005; derived from a zero coupon Treasury curve calculated by Lehman Brothers.

Sources: Bloomberg; Lehman Brothers; BIS calculations.

3% in mid-2002 but may have declined to 2.6% more recently.^① In the short run, however, shocks to demand or supply can move the real interest rate above or below its natural rate.

In addition to inflation expectations and the real rate of interest, yield curves at a given point in time incorporate risk premia that drive a wedge between forward rates across maturities and the path of short rates expected by market participants. Risk premia at the short end of the US Treasury curve appear to have declined in recent years. This may reflect more effective communication by the Federal Reserve regarding its policy intentions and is consistent with the current low levels of implied and historical volatilities in fixed income markets. However, risk premia at the long end of the curve appear little changed. As estimated by a three-factor model of the yield curve, the risk premium embedded in the one-year forward rate nine years hence has remained close to 20 basis points since late 2002 (centre panel).

Taking these various components together suggests that the “equilibrium” forward short-term rate in the United States at longer maturities might lie in a range around 5.5%: long-term inflation expectations of 2.5% plus a natural rate of 2.6–3.0%, plus a risk premium of around 20 basis points. In other words, absent changes to these components, forward short-term rates at longer maturities are likely to stabilise over the long run in the vicinity of 5.5%. Estimates of the various components of long-term yields are very imprecise, and so 5.5% is best considered the midpoint of a potentially wide range.

Nonetheless, the current level of one-year forward rates seems on the low side of the range across almost all maturities (right-hand panel). As of 25 February, one-year forward rates were below 4.5% for five years, and did not reach 5% until eight years. At very long maturities, beyond 15 years, forward rates actually fall, eventually dropping well below 5%. The decline in forward rates at very long maturities may reflect decreases in some of the various components discussed above. Yet, it could also represent temporary imbalances in supply and demand for government securities. For example, strong demand from pension funds and insurance companies for long-duration assets, coupled with a declining supply of such assets, may be holding down long-term yields. This has been the case in the UK government bond market for many years.

^① See T Laubach and J C Williams, “Measuring the natural rate of interest”, *The Review of Economics and Statistics*, vol 85, no 4, November 2003, pp 1063–70; J Amato, “The role of the natural rate of interest in monetary policy”, *BIS Working Papers*, no 171, March 2005.

Despite these rationales for subdued changes in yields over the period, a number of observers argued that, given macroeconomic conditions and the historical record, the *level* of long-term yields in the United States might be unusually low (see box). The case appeared to be strengthened by the Congressional testimony of Federal Reserve Chairman Greenspan on 16 February, when he termed the low levels of long-term yields a “conundrum”. Long-term yields rose by 6 basis points on that day.

In the euro area, yields also fell markedly over the period under review, with the yield on the 10-year bund declining nearly 40 basis points from early December to an all-time low of 3.31% on 10 February. The spreads between US and euro area yields, which had widened considerably the previous quarter, stayed in a range of 60–70 basis points. Although part of the yield declines probably reflected diminishing expectations for growth in the euro area, the macroeconomic news from Europe was more mixed than negative. In fact, Germany's Ifo business sentiment indicator surprised on the upside in both December and January, suggesting that the mood in the export sector was still robust despite the euro appreciation of the previous quarter (Graph 1.3, left-hand panel).

Euro yields fall to record lows

In part, yield differentials reflected the market's expectation that the ECB would leave interest rates unchanged until late in the year. Although the ECB

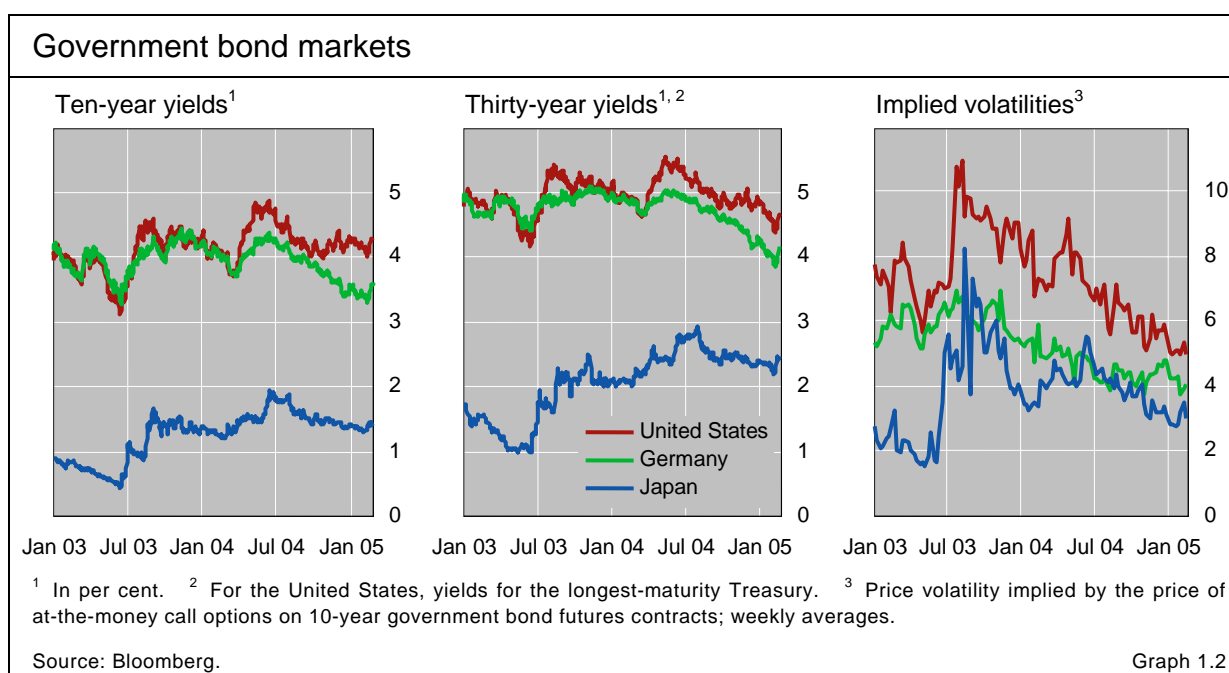
at times expressed concerns about excess liquidity and rapidly rising property prices, comments about the negative economic impact of the appreciating euro by senior ECB officials suggested to market participants an awareness of the fragility of the economic recovery in the euro area. In addition, by the January meetings, the Governing Council members were indicating that they were anticipating a return of euro area inflation to below 2% year on year, well within its target range.

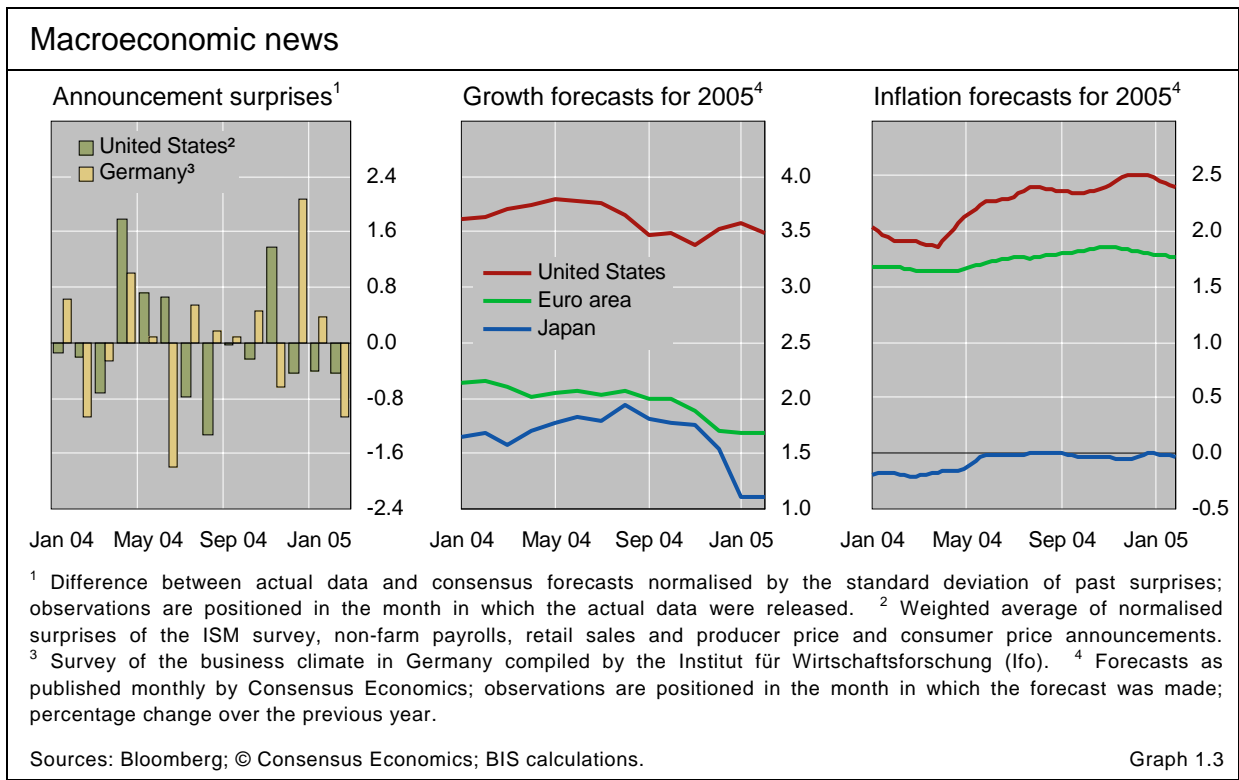
Strong demand for very long-dated bonds ...

In both the euro area and the United States, yield reductions were particularly pronounced at very long maturities. For instance, while swap yields from 10 out to 30 years had moved down more or less in parallel in the second half of last year, in the new year the decline in euro and dollar swap yields has been more marked at very long maturities (Graph 1.1). Yields hit new all-time lows for 30-year bunds, and approached the lows of early 2003 for the last on-the-run 30-year US Treasury (Graph 1.2, centre panel). A prospective increase in the supply of ultra long-dated paper, with the French government announcing in late February a 50-year bond issue and other European governments considering similar issues, did little to dampen investor enthusiasm.

... perhaps owing to pension reforms

Many market participants also cited structural factors underlying declining yields for long-maturity bonds. In the United States, announcements of possible pension reform were viewed as contributing to the rally in longer-term bonds. In particular, proposals to strengthen defined benefit pension plans by pricing assets and liabilities more accurately and minimising funding shortfalls reportedly prompted some pension funds to purchase long-dated assets. Structural factors appeared to have even more importance in the euro area. Some major bond indices in the euro area markets extended duration for technical reasons, pressuring some investors benchmarking themselves against those indices to raise the duration of their investments. Pension reform in the Netherlands increased the demand for long-dated assets, and an end-of-





year surge of funds into German life insurers (for tax-related reasons) left the sector with excess funds to invest in long-term securities. While such technical “demand factors” usually have a marginal impact on yields in relation to macroeconomic developments, in early 2005 they were widely thought to be exerting significant pressures on the long end of the curve, particularly in the euro area.

In Japan, long-term interest rates rose overall, bucking the trend in the other major markets. To be sure, yields fell in January, as expectations receded of an early end to both deflation and the Bank of Japan's policy of quantitative easing. A key event in this regard was the interim review, announced on 19 January, of last autumn's inflation forecasts by the Policy Board. This suggested a marked decline in anticipated price pressures, reflecting expectations of weaker growth (Graph 1.3, centre panel). However, starting in February, on the back of a positive surprise in the report on machinery orders and gains in the equity market, yields retraced ground, hitting 1.45% by 14 February, the highest level since last November.

Yen yields rebound in February

Spreads approach record lows at year-end

With long-term yields remaining low, investors in search of higher returns continued to turn to spread products, including emerging market debt. All types of debt – corporate and sovereign, investment grade and high-yield – rallied during the fourth quarter of 2004 (Graph 1.4). Indeed, by the end of December, spreads in all markets were close to or even below their historical lows. For example, in late December, spreads on A-rated corporate bonds denominated in US dollars stood at 64 basis points, 16 basis points above their previous low

Corporate and emerging market debt rally ...

of October 1997. Spreads on emerging market debt narrowed to only 335 basis points, far below their previous historical low.

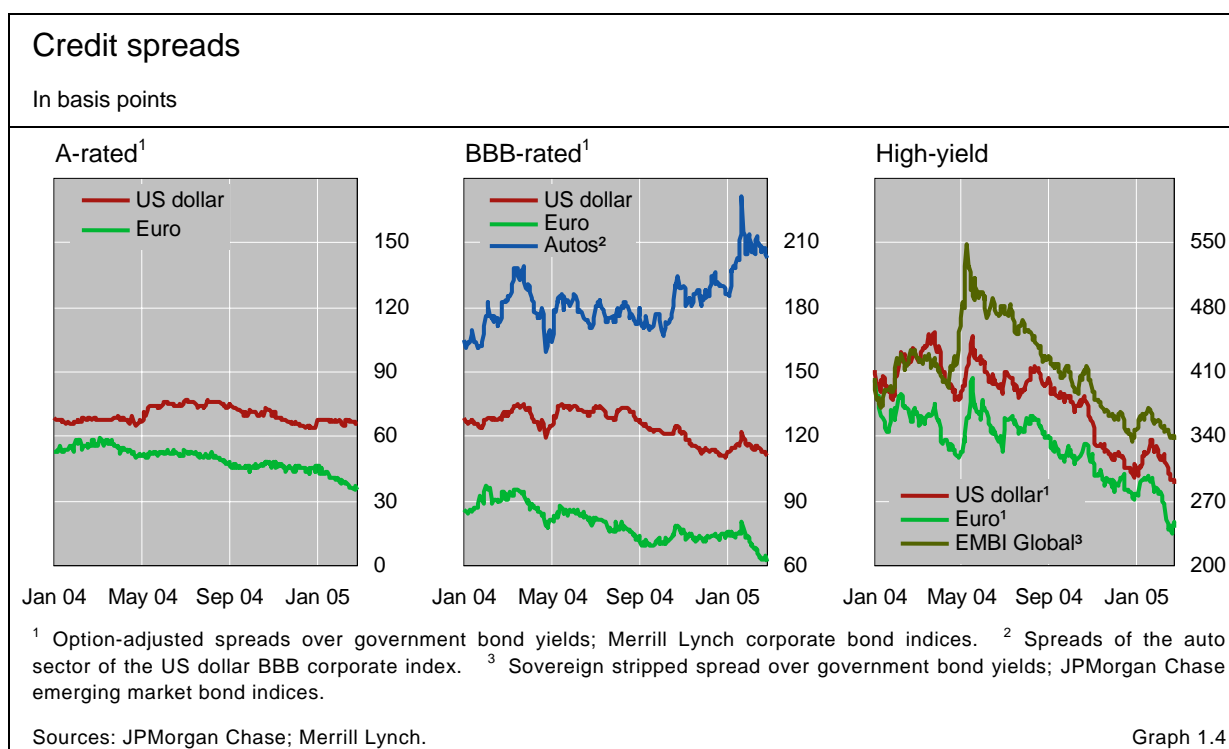
... despite strong issuance

Not even high levels of issuance seemed to dampen the appetite of investors for corporate and emerging market debt. Issuance of high-yield corporate bonds in the US market surged in the final quarter of 2004 (Graph 1.5). So too did signings of syndicated loans (see “Refinancing boosts syndicated lending to record levels” on page 29). Borrowing by emerging market entities in international bond and loan markets was also strong in the fourth quarter, bringing total borrowing in 2004 by emerging market issuers above its previous 1997 high (Graph 1.6).

Issuance of collateralised debt obligations (CDOs) helped to push spreads down, as CDO managers sought to purchase high-yield debt to back funded structures or sold protection in the credit default swap market to back synthetic deals. Issuance of funded CDOs, which is usually highest towards the end of the year, rose from approximately \$25 billion in each of the first three quarters of 2004 to nearly \$50 billion in the fourth (Graph 1.5). Leveraged loans, for example to finance leveraged buyouts, accounted for an unusually high proportion of collateral for funded structures in the fourth quarter: 45%, compared to 30% during the previous three quarters according to JPMorgan Chase. Consistent with past seasonal patterns, CDO issuance slowed sharply early in the new year.

Strong demand for CDOs

The demand for CDOs was in turn underpinned by the search for yield that has characterised financial markets since at least late 2003. Whereas commercial banks have historically dominated the CDO market, institutional investors are now becoming more active players. JPMorgan Chase estimates that almost 40% of a recent synthetic deal was placed with fund managers, and only one third with commercial banks. The relatively high yields offered on



CDOs are certainly a key factor behind the growing interest of fund managers. Owing to their complexity and illiquidity, AAA-rated CDOs typically yield at least 30 basis points more than comparably rated corporates; leveraged CDOs, such as CDOs backed by other CDOs or CDOs backed by leveraged loans, yield even more.

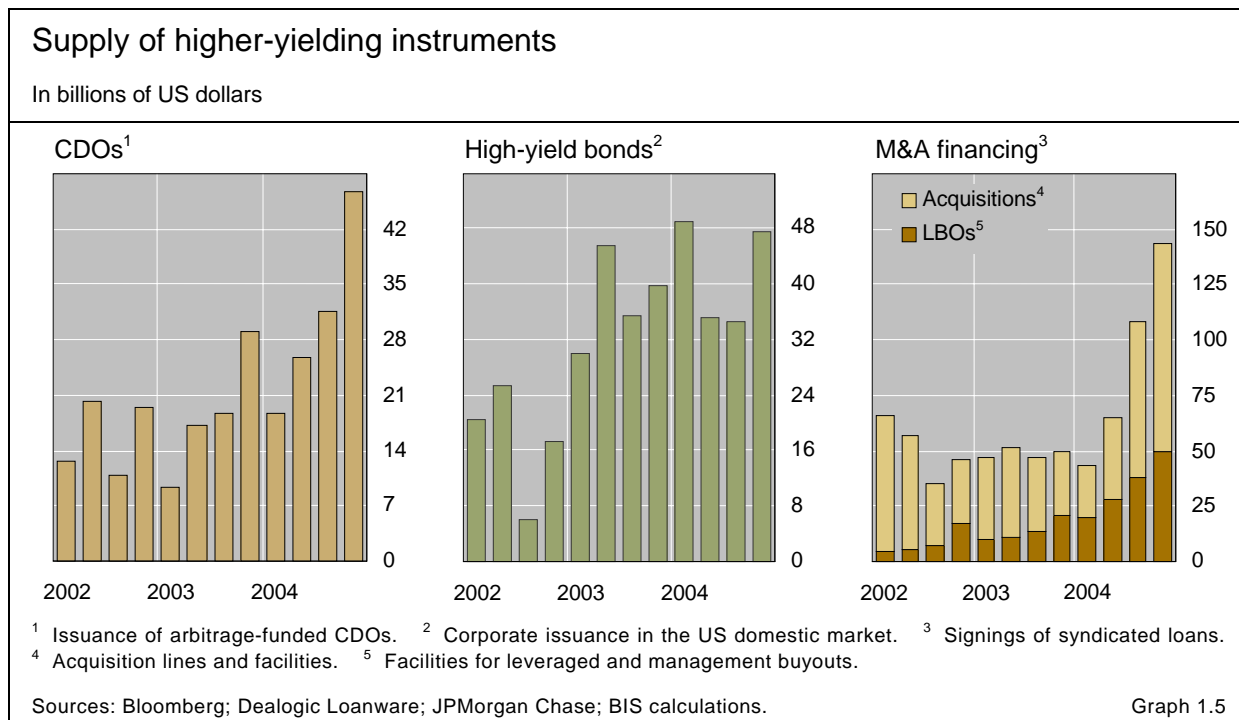
The search for yield waned temporarily early in the new year, especially among US investors. While investment grade spreads were stable or lower, high-yield corporate bond spreads widened by over 30 basis points in the first half of January, the largest move since May 2004 (Graph 1.4). Emerging market spreads also widened during this period. Nevertheless, the sell-off was mild and short-lived; spreads stayed well below their average 2004 levels and in February again approached their end-2004 levels.

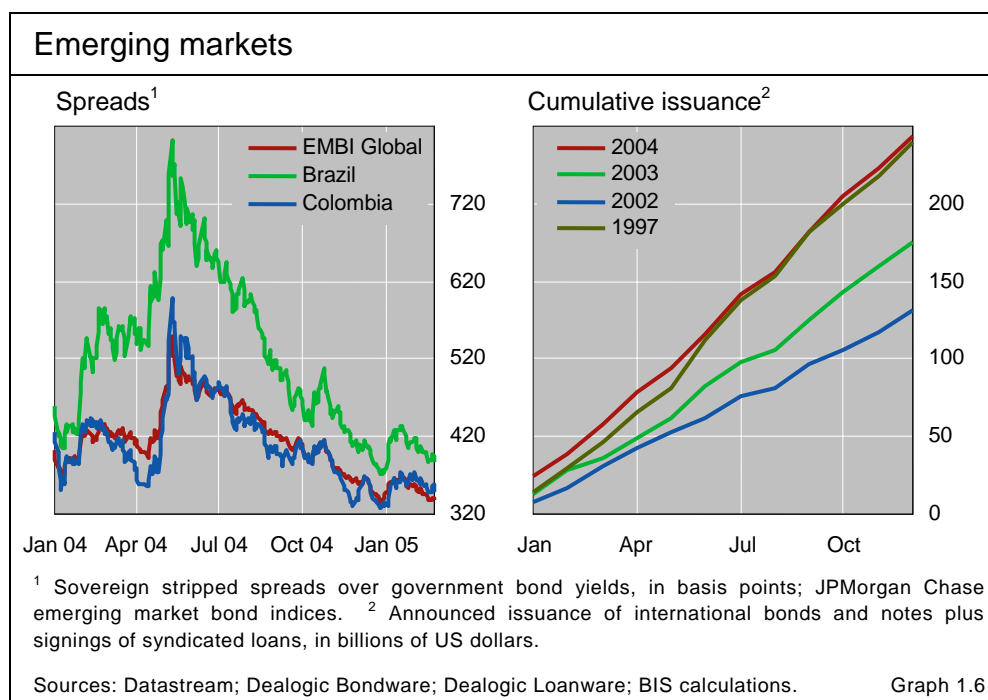
The initial widening of spreads was triggered by the prospect of a faster than expected pace of monetary policy tightening in the United States, highlighted by the release of the Federal Reserve's minutes on 4 January. Emerging market spreads widened by 9 basis points the following day, with Brazil and other South American countries being among those most affected by the sell-off (Graph 1.6). The reaction of corporate spreads was more subdued and was limited mainly to lower-rated issuers. This continues a pattern evident since at least the second quarter of 2004, during the sell-off in global bond markets. At the time, emerging market spreads had widened by much more than high-yield corporate spreads in response to changing expectations regarding the course of US monetary policy.

The widening of high-yield corporate spreads accelerated in mid-January on concerns about a possible downgrade of General Motors to below investment grade. On 19 January, GM released a disappointing profit forecast for the first quarter of 2005. This led many market participants to shift forward their expectations of a downgrade by Standard & Poor's and raised the

Temporary widening of spreads in early January

Concerns about a downgrade of General Motors





prospect of GM's removal from investment grade bond indices. Such an action could force investors benchmarked against those indices to sell their holdings. Consequently, the spreads of GM and other auto manufacturers jumped sharply higher after the profit warning. The sell-off also spilled over into high-yield debt markets, as high-yield debt managers shifted out of lower-rated issuers and into GM. The sheer volume of debt owed by GM exacerbated the spillover, with at least \$30 billion in bonds – equivalent to approximately 3% of the outstanding stock of high-yield bonds – potentially affected by a downgrade.

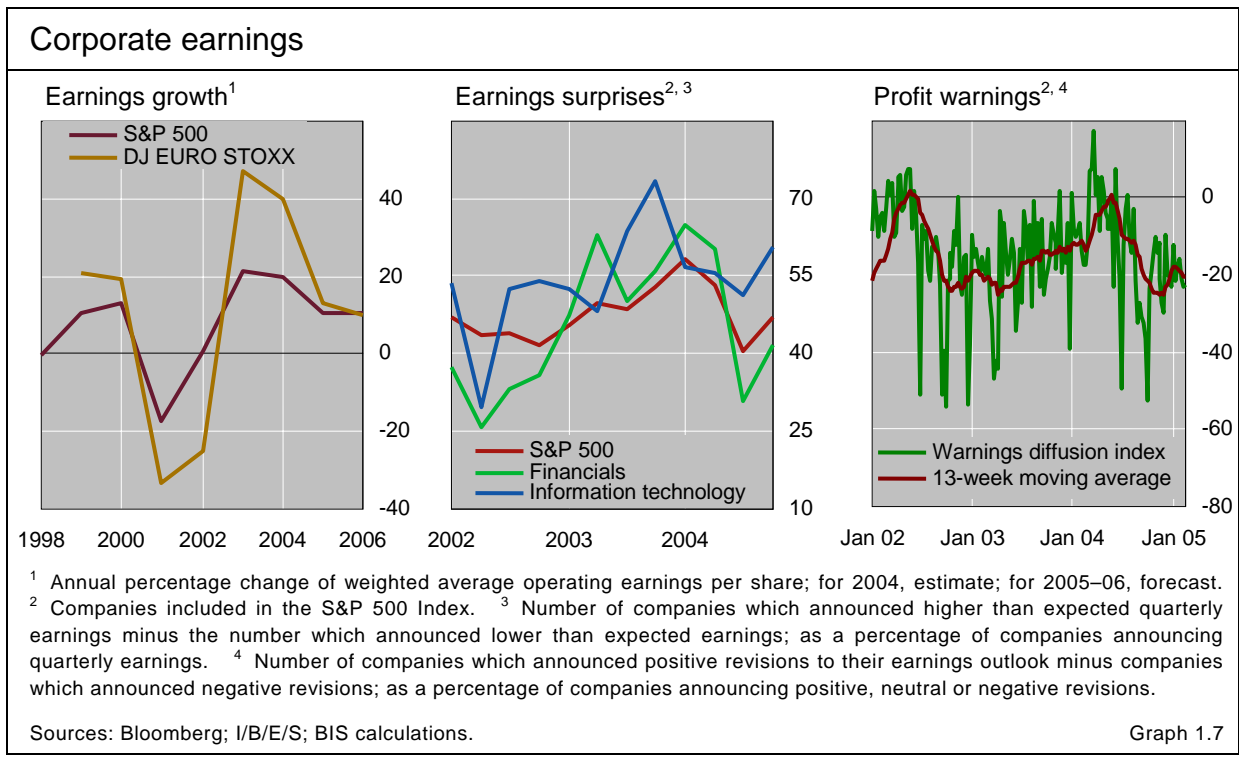
The sell-off was brought to a halt by a technical change in the way Lehman Brothers constructs its bond indices.¹ The change implied that a downgrade by S&P would not result in the ejection of GM from Lehman Brothers' investment grade bond indices. High-yield spreads tightened by 9 basis points in the two days following the change and continued to tighten up to the end of February, as investors felt that they had more scope to take on risk.

Credit cycle shows signs of peaking

Surprisingly strong corporate earnings also helped to narrow credit spreads in the first two months of the new year. Whereas third quarter earnings of S&P companies had disappointed, fourth quarter earnings (announced in January and February 2005) exceeded analysts' expectations (Graph 1.7). Furthermore, after increasing between June and November 2004, the number of firms

Earnings growth is expected to slow

¹ Lehman Brothers announced on 24 January that, when assessing whether to include a security in its fixed income indices, it would consider credit ratings from all three of the major rating agencies – Fitch, S&P and Moody's – instead of taking the lower of S&P and Moody's. Since Fitch and Moody's rate GM one notch above S&P's rating, this diminished the near-term consequences of a possible S&P downgrade.



announcing negative revisions to their profit forecasts began to decline in December, and the number announcing positive revisions to increase. Nevertheless, earnings growth among S&P 500 companies is expected to slow from 19.7% in 2004 to 10.5% in 2005, and among EURO STOXX companies from 39.7% to 13.4%.

With revenues showing no signs of accelerating and costs having been cut for the past several years, signs are emerging of firms looking for alternative strategies to maintain their earnings growth, for example by releveraging their balance sheets. Stock buybacks and dividend payouts were one of the main drivers of issuance in the corporate bond market in 2004, accounting for 17% of funds raised according to Moody's. By contrast, in 2003 only 5% of funds raised had been funnelled to shareholders. Mergers and acquisitions also increased over the period under review, with many of the deals being financed with debt. Syndicated financing for leveraged and management buyouts rose to an all-time high of \$49 billion in the fourth quarter of 2004, more than twice as much as during the same period a year earlier, and financing for other types of acquisitions increased to \$94 billion (Graph 1.5).

Stock buybacks and dividend payouts are increasing

Such signs suggest that credit quality might have peaked in the United States. Indeed, the ratio of upgrades to downgrades by Moody's Investors Service fell to 0.7 among US firms in the fourth quarter of 2004 from 1.1 in the third, ending two years of steady improvement. Corporate defaults are expected to increase in 2005, albeit only marginally and from exceptionally low levels in late 2004. By contrast, credit quality still showed signs of improvement in Europe and Japan, as many firms remained focused on restructuring their operations and balance sheets.

Credit quality in emerging markets continues to improve

Credit quality in emerging markets also showed signs of improvement. While high commodity prices supported some emerging market borrowers,

many sovereigns and firms in emerging markets have made concerted efforts to reduce their vulnerability to changes in market conditions. These efforts included both extending the maturity of outstanding debt and tapping a growing market for local currency bonds (see “The international debt securities market” on page 31). Emerging market borrowers were very active in international debt markets in 2004, but most of the funds raised were used to repay maturing debt; net issuance remained well below its previous high.

Mergers revive equity markets

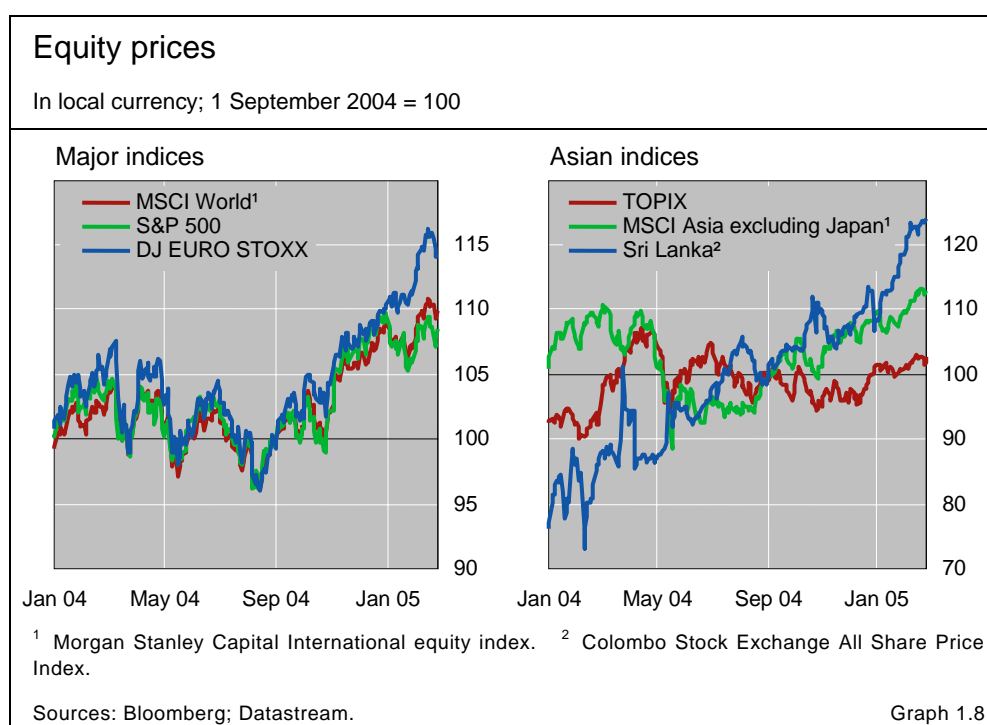
Equity markets rally to their highest level since 2001 ...

The prospect of corporate releveraging helped give a boost to equity markets in the new year. After posting strong gains in the closing months of 2004, global equity markets moved up again in February 2005 following a series of mergers and acquisitions (Graph 1.8). On 15 February, the MSCI World index closed at its highest level since August 2001, having gained 10% in 2004 and a further 2% over the first six weeks of 2005.

In equity markets as in credit markets, investors turned marginally more risk-averse early in the new year. In the United States and the United Kingdom, measures of effective risk aversion derived from equity index options moved higher after declining in late 2004 (Graph 1.9). The shift in sentiment may have been triggered by the prospect of a faster than expected pace of monetary policy tightening in the United States; the S&P 500 fell by nearly 1% on 5 January, following the release of the Federal Reserve’s minutes. Interestingly, no such increase in effective risk aversion was evident in Germany, where the ECB continues to be expected to leave policy rates unchanged until at least late 2005.

... despite higher oil prices

A rapid run-up in oil prices put additional downward pressure on equity prices in the new year. Cold weather in the United States, concerns about



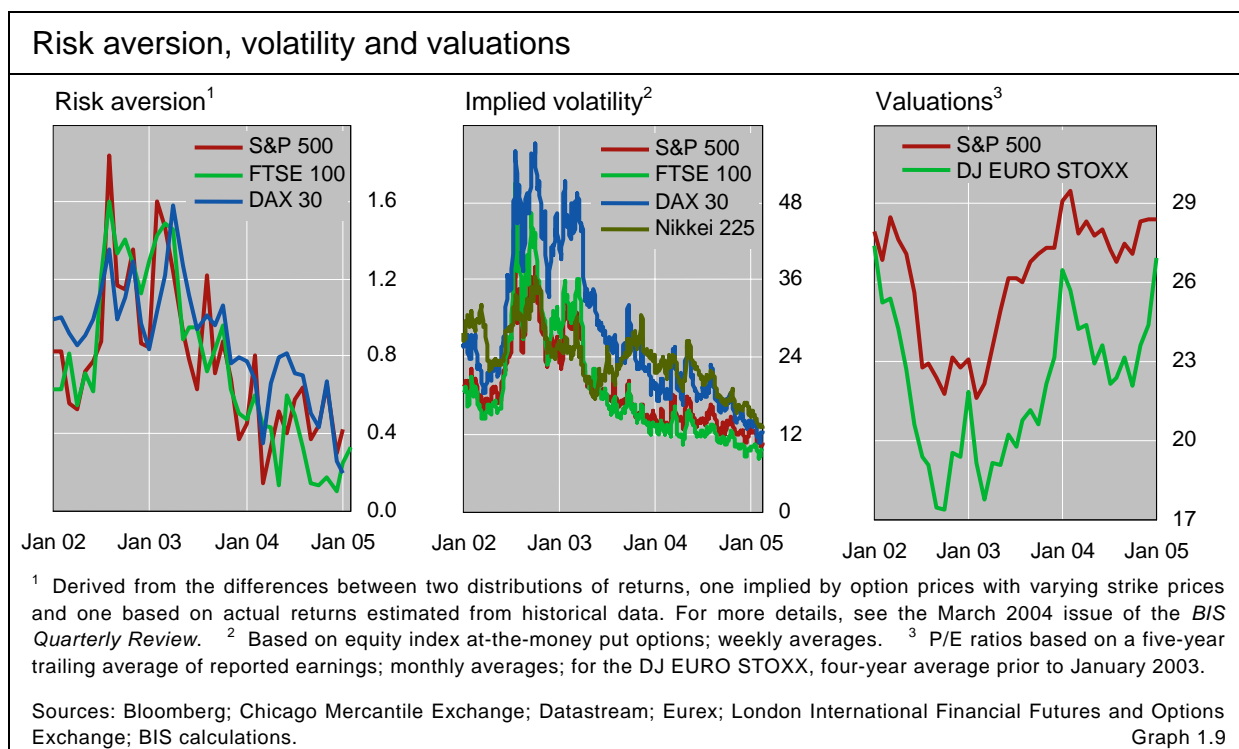
unrest in Iraq around elections there and rumours of production cuts by OPEC members all contributed to a 15% increase in the price of Brent crude in January. Prices continued to drift upwards in February, with Brent crude nearing \$50 a barrel in late February, not far below its October 2004 high.

Surprisingly strong corporate earnings helped to turn sentiment around (Graph 1.7). Investors were at first unsettled by disappointing fourth quarter results from companies including aluminium producer Alcoa and biotech firm Genentech as well as profit warnings from chipmakers Advanced Micro Devices and STMicroelectronics. Better than expected results from Intel, Samsung Electronics, IBM, Nokia and other bellwether firms later assuaged investors' concerns.

The announcement of several multibillion dollar mergers in late January further bolstered confidence among equity investors. The largest deal was Procter & Gamble's purchase of Gillette for \$55 billion, financed through an exchange of shares but accompanied by a share buyback equal to nearly half of the purchase price. Other large deals included the acquisition of Travelers Life & Annuity by MetLife for almost \$12 billion in cash and shares and "Ma Bell", AT&T, by one of its "baby Bells", SBC Communications, for \$15 billion in shares. Risk aversion declined further following the US payrolls report on 4 February, which relieved concerns that the Federal Reserve might raise policy rates at an accelerated pace.

Pickup in M&A activity

Notwithstanding the fluctuations described above, in the early part of 2005 historical and implied volatilities in equity markets fell to their lowest levels in nearly 10 years (Graph 1.9). Investors were seemingly unusually confident in equity valuations. Based on forward earnings, the price/earnings ratio for the S&P 500 in mid-February was in line with its 1961–95 average of 17. But forward earnings have in the past tended to be overly optimistic, and based on



a five-year trailing average of earnings the price/earnings ratio was well above its historical average, at 29. The price/earnings ratio for the DJ EURO STOXX was similarly high.

In Japan, expectations regarding the strength of the recovery indeed proved overly optimistic. Even as other major markets rallied during the fourth quarter of 2004, the Tokyo market languished, held back by disappointing reports on the domestic economy. For example, the TOPIX fell by 1% on 9 December following a machinery orders report that was much weaker than expected. Evidence of strong external demand pushed Japanese equities higher towards the end of 2004 and again in February 2005. However, even after a series of strong reports on industrial production, retail sales and housing starts at the end of February, Japanese equity prices remained below their April 2004 highs.

Asian markets
unaffected by the
tsunami

In contrast to Japan, other Asian markets rallied into the new year. Asian bond and equity prices were unaffected by the tsunami which hit countries around the Indian Ocean on 26 December. While the tsunami had a devastating human impact, with over 250,000 people killed, its impact on financial markets was relatively small. One of the countries most affected by the tsunami was Sri Lanka; in addition to large human losses, its fishery and tourism industries were severely damaged. Yet, after an initial 4% fall, the Sri Lankan stock market quickly rebounded, boosted in part by an outpouring of aid to support relief efforts and reconstruction. By the end of February, the Sri Lankan stock market was nearly 10% above its pre-tsunami close, and the rupee had appreciated by 5% against the US dollar (Graph 1.8).

2. The international banking market

Investment in international debt securities by BIS reporting banks drove overall claim growth in the third quarter of 2004. Purchases of these instruments by banks in the United Kingdom and the euro area were particularly strong, while Japanese banks continued to invest in US and euro area government securities. By contrast, the growth in loans to non-bank borrowers was positive but weak, and largely reflected new lending to offshore centres.

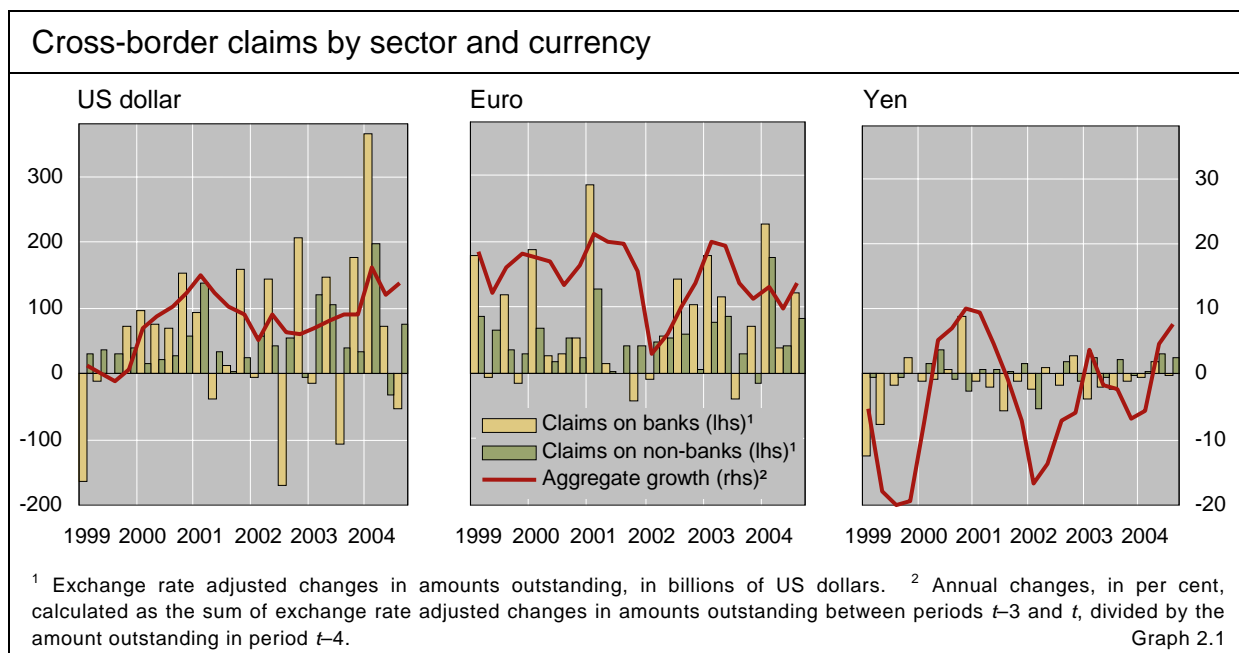
Overall, emerging market economies experienced a relatively large net outflow of funds, driven primarily by growth in deposits placed with BIS reporting banks. Such placements contributed to an outflow of funds from Asia-Pacific and the Middle East and Africa. A reduction in claims, as well as deposit placements abroad, was behind a net outflow from Latin America. In emerging Europe, strong growth in claims on the countries that had recently entered the European Union drove a small net inflow, despite relatively substantial deposit placements abroad by certain countries.

Purchases of international debt securities fuel claim growth

Investment in international debt securities drove the overall growth in claims in the third quarter of 2004. By contrast, the growth in loan claims remained weak. Overall, the total cross-border claims of BIS reporting banks rose by \$236 billion to \$17.7 trillion (Table 2.1). Over two thirds of the increase reflected purchases of government and other international debt securities, boosting claims on the non-bank sector in all three major currencies (Graph 2.1).

Loans to non-banks
are subdued

What modest growth there was in loan claims was largely the result of greater lending to non-banks in offshore and other financial centres. Lending to such borrowers located elsewhere, particularly in the euro area and the United States, was subdued. Following an outright contraction in the previous quarter, loans to non-banks worldwide rose by a modest \$50 billion in the third quarter. Most of this flowed to borrowers in the United Kingdom and the Cayman Islands, areas with considerable non-bank financial activity. Loans to non-banks in the euro area actually contracted for the first time in two years (by \$32.6 billion). While a particularly large reduction in loans from banks in the United Kingdom to borrowers in Belgium and Luxembourg was a contributing



factor, loans to non-banks in almost every major euro area country also declined.

Banks in Japan and the euro area invest in debt securities

With long-term US dollar and euro yields continuing to fall in the third quarter, BIS reporting banks' claims were boosted by investment in international debt securities. While this was partially due to the continued purchase of US and euro area government bonds by Japanese banks, other banking systems, in particular banks in the United Kingdom, Ireland, Germany, France and the Netherlands, also made sizeable investments in these debt instruments. Overall, purchases of US dollar-denominated debt securities totalled \$50 billion, offsetting an overall decrease in US dollar loans. Euro-denominated debt security claims expanded by \$71 billion to \$2.3 trillion, or 34% of the total outstanding stock of euro-denominated claims.

Banks in Japan increased international debt security claims the most, following a pattern evident since at least the first quarter of 2000. A relatively large reduction in interbank activity (\$16 billion) and in loans to borrowers in the United States and offshore centres was more than offset by a \$55 billion rise in international debt security claims. The BIS consolidated banking statistics, which consolidate worldwide positions, indicate that Japanese banks upped their exposure to the public sector by \$36 billion, primarily through the purchase of long-term debt issued by Germany and the United States. This pushed their total stock of outstanding claims on the public sector to \$434 billion, significantly higher than that of any other banking system.¹ Claims on the German public sector rose to 57% of their total international

Banks in Japan invest in debt securities ...

¹ Japanese banks account for 26% of total consolidated international claims on the public sector of BIS reporting banks. German banks come in second at 17%.

claims on Germany, up from 53% in the previous quarter. Claims on the US public sector rose as well, to 47% from 46% in the previous quarter.

International debt security claims were further boosted by European banking systems. Banks in the United Kingdom increased debt security claims by \$49 billion, primarily vis-à-vis non-banks in the United States and Germany. This seemed to be partially the result of banks located in the United Kingdom investing in US government securities; the BIS consolidated data indicate that UK banks' worldwide claims on the US public sector rose by \$13 billion in the third quarter of 2004 to \$23 billion. Banks in Germany also invested in international debt securities, much of which were issued by banks in the euro area, particularly in Ireland.

... as do banks in Ireland

Banks in Ireland invested in debt securities as well, a continuation of a trend evident since at least the second quarter of 2001. Starting from \$64 billion at that time, total international debt security claims of these banks reached \$220 billion in the third quarter of 2004, fifth behind banks in Japan, the United Kingdom, France and Germany (Graph 2.2). Over much of this time period, the BIS consolidated banking statistics, which provide a maturity

Cross-border claims of BIS reporting banks								
Exchange rate adjusted changes in amounts outstanding, in billions of US dollars ¹								
	2002	2003	2003		2004			Stocks at end-Sep 2004
	Year	Year	Q3	Q4	Q1	Q2	Q3	
Total cross-border claims	740.1	1,075.1	-110.0	315.8	1,231.7	240.2	236.1	17,706.8
on banks	425.0	530.1	-229.5	277.1	827.1	187.4	36.6	11,352.8
on non-banks	315.2	545.0	119.5	38.7	404.6	52.8	199.5	6,354.0
Loans: banks	395.1	452.0	-263.8	249.3	728.6	118.1	-5.3	9,605.4
non-banks	103.8	276.6	92.3	18.1	197.3	-20.2	50.0	3,238.1
Securities: banks	36.3	75.8	22.5	35.1	75.5	56.5	23.9	1,236.3
non-banks	202.2	208.3	8.3	6.5	190.1	32.1	136.8	2,740.6
Total claims by currency								
US dollar	320.4	500.0	-68.3	210.9	562.7	37.9	21.4	6,949.9
Euro	453.3	502.6	-8.0	53.9	400.4	83.7	201.6	6,728.5
Yen	-42.3	-50.6	0.7	-15.0	-1.9	49.3	25.9	827.0
Other currencies ²	8.7	123.1	-34.4	66.0	270.5	69.3	-12.8	3,201.4
By residency of non-bank borrower								
Advanced economies	315.1	458.7	103.3	47.0	343.8	20.9	134.8	4,959.3
Euro area	117.4	157.4	50.5	-17.7	150.5	33.6	7.9	2,222.0
Japan	4.1	38.4	6.5	-5.2	0.1	20.5	14.7	212.0
United States	153.1	179.6	40.9	53.0	87.3	-32.9	48.6	1,615.8
Offshore centres	18.8	100.0	10.2	-10.1	41.6	33.6	62.0	767.4
Emerging economies	-16.5	5.0	4.9	3.1	23.9	1.6	-2.4	574.9
Unallocated ³	-2.2	-18.7	1.1	-1.3	-4.7	-3.3	5.1	52.4
<i>Memo: Local claims⁴</i>	<i>44.5</i>	<i>415.0</i>	<i>51.7</i>	<i>94.1</i>	<i>187.0</i>	<i>34.8</i>	<i>-0.6</i>	<i>2,541.8</i>

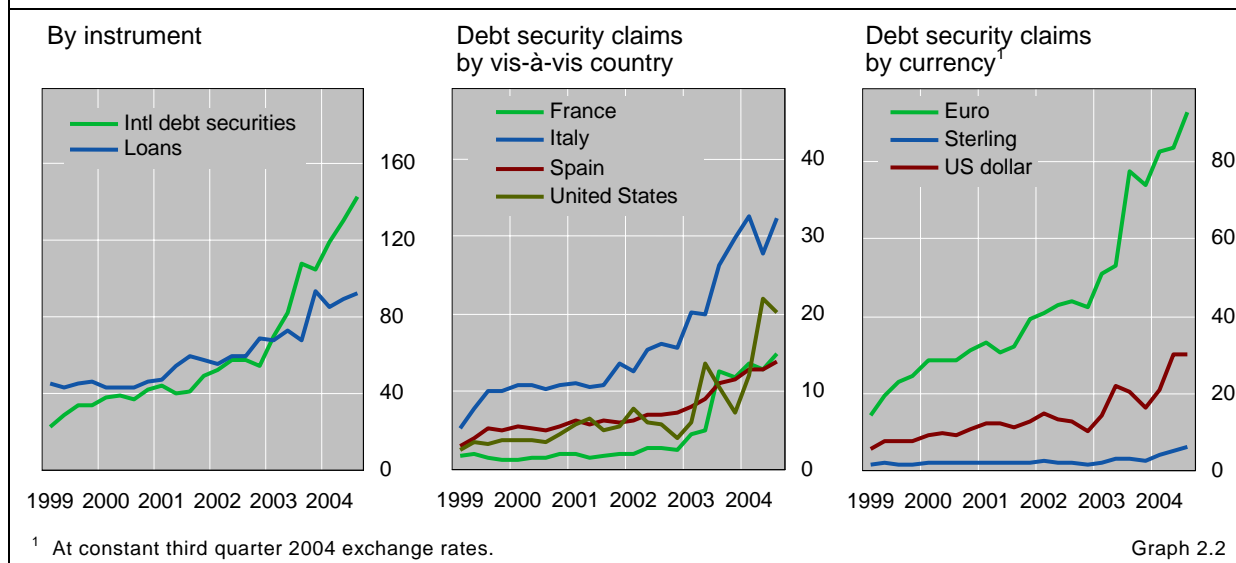
¹ Not adjusted for seasonal effects. ² Including unallocated currencies. ³ Including claims on international organisations.

⁴ Foreign currency claims on residents of the country in which the reporting bank is domiciled.

Table 2.1

Banks in Ireland: claims on the non-bank sector

Amounts outstanding, in billions of US dollars



breakdown, indicate that Irish banks' share of long-term claims in their total international claims rose from 36% to 67%.² In the most recent quarter, international debt security claims of banks in Ireland were up by \$21 billion; roughly half of this represented investment in debt securities issued by non-banks in Italy, France, the United Kingdom and Greece.

Hedge fund activity in the Caribbean offshore centres

The quarterly swings in claims on non-bank borrowers in Caribbean offshore centres – an area with substantial non-bank financial activity – has become an important driver of the overall claim flows of BIS reporting banks.³ Indeed, since the second quarter of 1996, the variance in the quarterly change in claims on the Caribbean offshore centres has been higher than that for any other single vis-à-vis country in the BIS statistics except the United States.⁴ Loan flows to non-banks in the Cayman Islands, often from banks located in the United States, are by far the biggest factor behind these quarterly swings. In the third quarter of 2004, claims on these borrowers reached \$436 billion, third behind claims on non-banks in the United States and the United Kingdom. Yet very little is known about the nature of this financial activity. Many types of non-bank financial institutions – including hedge funds, insurance companies

² The consolidated figures for Ireland are not available for the third quarter of 2004 since Ireland reports these statistics semiannually. Long-term claims are claims with a maturity of two years or more. Part of the rise in the share of these claims since the second quarter of 2001 is explained by a bank merger which caused a jump in this share from 35% of total international claims to 54% from the fourth quarter of 2001 to the second quarter of 2002.

³ For the purposes of this exercise, Caribbean offshore centres include the Cayman Islands, the Bahamas, Bermuda, the British West Indies and the Netherlands Antilles.

⁴ The variance in the exchange rate adjusted flows of claims on non-banks in the Cayman Islands ranks fourth behind that of claim flows vis-à-vis this sector in the United States, the United Kingdom and Japan.

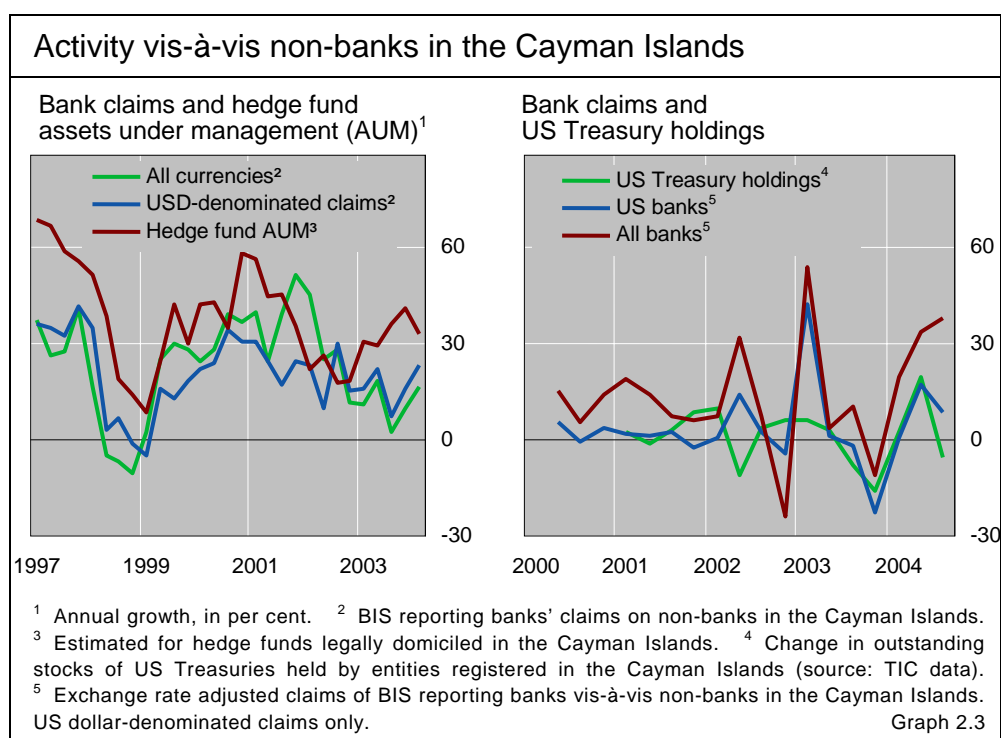
and special purpose vehicles – are legally domiciled in the Cayman Islands, making interpretation of the quarterly movements in the BIS data difficult.⁵

Claims on the Cayman Islands ...

Considered over a longer horizon, it does appear that hedge fund activity has contributed directly to the overall growth in claims on the Cayman Islands. The left-hand panel of Graph 2.3 presents a comparison between the year-on-year growth in assets under management in a (limited) sample of hedge funds that are legally domiciled in the Cayman Islands, and that of the stock of outstanding claims on non-banks in the Cayman Islands.⁶ While there have been deviations in these growth rates in the past (eg in 1997 and 2004), they do appear to move together over longer time periods. The collapse in both around the period of the Russian default and the near bankruptcy of the hedge fund Long-Term Capital Management (LTCM) in 1998 is particularly striking. This same pattern is evident around this period in other Caribbean offshore centres as well (Graph 2.4).⁷

... seem to reflect hedge fund activity

The more recent quarterly swings in claims on the Cayman Islands seem to be at least broadly consistent with anecdotal evidence on hedge fund activity. Market participants have cited hedge funds as a driving factor behind the rise in purchases of US Treasury securities by residents of the Cayman



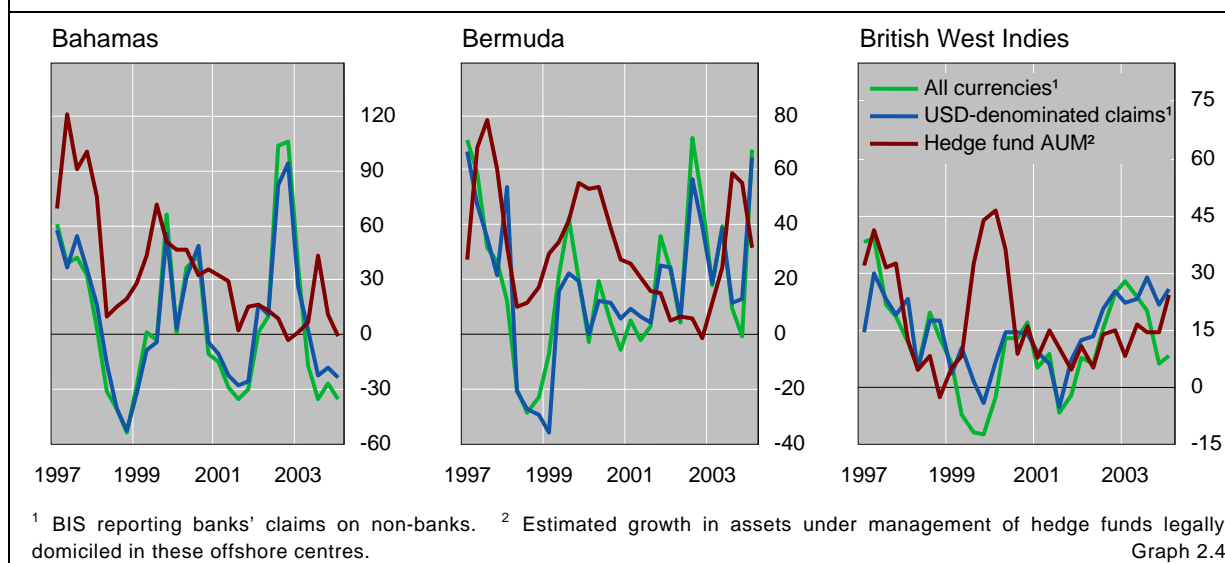
⁵ See the Bank of England's June 2001 *Financial Stability Review* for a discussion of activity in offshore centres.

⁶ The data on hedge funds is taken from the HFR database, which includes data on the assets under management and the legal domicile for a sample of approximately 900 individual hedge funds. Not all hedge funds that are legally domiciled in the Cayman Islands are included in this sample. A positive growth rate can reflect the addition of new funds to the database or growth in assets under management in existing funds.

⁷ The co-movement in the growth rates of assets under management and BIS reporting banks' claims on the non-bank sector in these other centres seems to break down after 1999.

Activity vis-à-vis non-banks in Caribbean offshore centres

Annual growth, in per cent



Islands in 2004.⁸ Such investment can be linked with BIS reporting banks' claims, at least to the extent that hedge funds finance these purchases through bank borrowing. As shown in the right-hand panel of Graph 2.3, the increase in claims on non-banks in the Cayman Islands over the course of 2004 seems to have roughly corresponded to purchases of US Treasuries by entities registered there.

Deposit growth drives outflow from emerging market economies

A net outflow from emerging market economies in the third quarter, the largest in four years, resulted from relatively large placements of deposits in BIS reporting banks. Banks in the Middle East and Africa, Asia-Pacific and emerging Europe contributed to a combined \$50 billion increase in deposit liabilities vis-à-vis emerging markets. In emerging Europe, this was primarily due to new deposits placed by banks in Russia, the fifth consecutive quarterly rise. An increase in US dollar-denominated deposits by banks in Saudi Arabia drove the net outflow from the Middle East and Africa, while deposit placements by banks in several countries in Asia-Pacific, in particular Korea, India and Taiwan (China),⁹ were responsible for the net outflow there. On net, funds flowed out of Latin America for the 10th consecutive quarter, this time as a result of reduced credit to all sectors.

⁸ See "Treasury Islands", *Bloomberg Markets*, February 2005. Investment in US Treasury bonds by residents in the Caribbean has made the region the fourth largest holder of US government debt behind Japan, China and the United Kingdom.

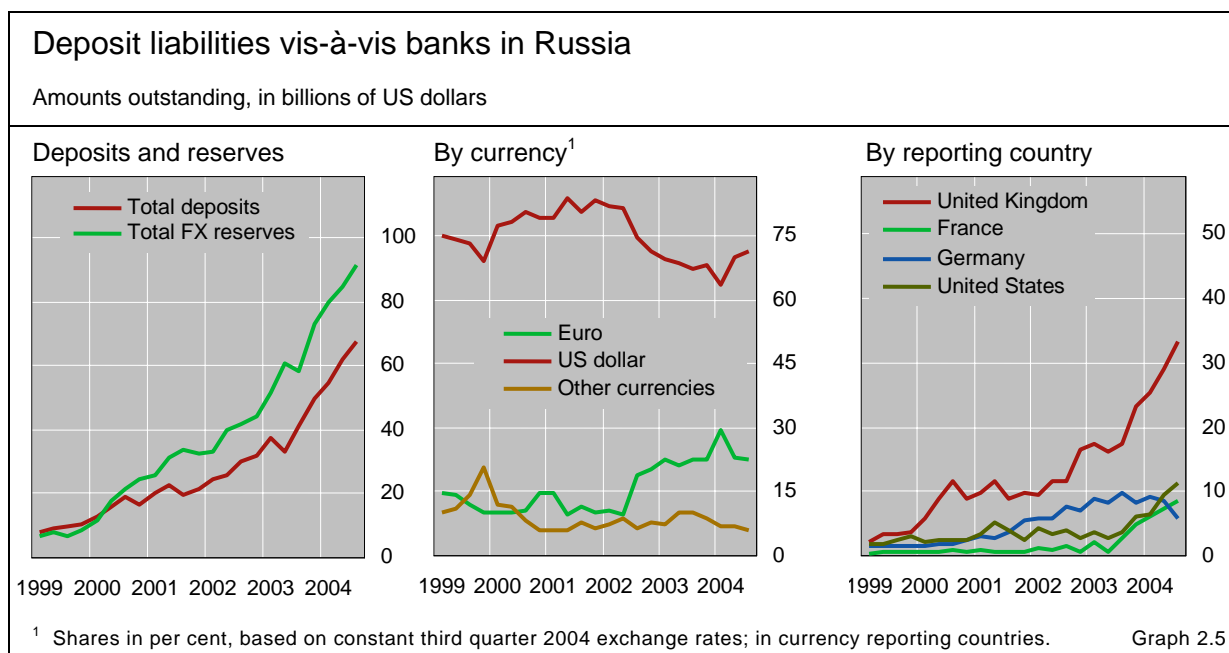
⁹ Hereinafter Taiwan.

New claims on EU accession countries outpace Russia's deposit placements

A net inflow to emerging Europe ...

New credit to borrowers in emerging Europe was strong, and led to a relatively small net inflow of funds into the region of \$1.7 billion. Total claims on the region rose by \$8.4 billion, virtually all flowing to borrowers in the countries that had recently joined the European Union. While much of this reflected interbank activity, BIS reporting banks' investment in international debt securities issued by non-banks in these countries contributed as well. Elsewhere, a fifth consecutive quarterly increase in deposits placed abroad by banks in Russia partially offset the overall rise in claims.

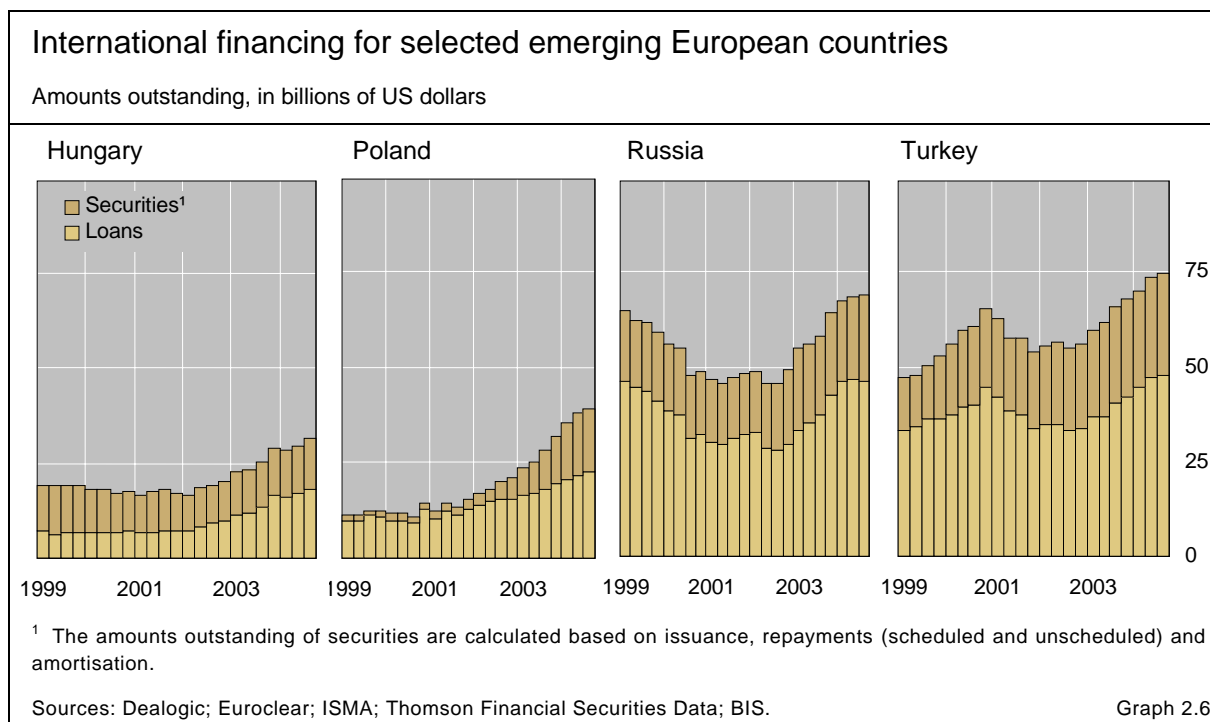
The continued placement of deposits in BIS reporting banks by banks resident in Russia has gone hand in hand with the accumulation of foreign exchange reserves by the Russian monetary authority.¹⁰ These reserves increased by \$6.9 billion in the third quarter of 2004 to \$91 billion (Graph 2.5, left-hand panel).¹¹ At the same time, banks in Russia deposited \$5.7 billion, mainly in US dollars, with banks in the United Kingdom, the United States and France. Until mid-2002, US dollars accounted for over 80% of deposit liabilities vis-à-vis banks in Russia (Graph 2.5, centre panel).¹² This share gradually fell to 64% by the first quarter of 2004 while, over this same time period, the share of euro-denominated deposits rose from 8% to 29%. Over the last two quarters,



¹⁰ Liabilities vis-à-vis banks include those vis-à-vis central banks. While data from the IMF indicate that Russia's foreign exchange reserves have been on the rise, they provide no information on the actual share of these reserves held as deposits in banks outside of Russia. See the banking chapter of the September 2004 *BIS Quarterly Review* for a discussion of the link between BIS reporting banks' liabilities vis-à-vis banks and foreign exchange reserves.

¹¹ Russia now accounts for 33% of the region's reserves, from 18% in the third quarter of 2000.

¹² The currency shares are calculated using data that have been partially corrected for valuation effects. The stocks of euro, yen, pound sterling and Swiss franc liabilities are converted to US dollars using constant third quarter 2004 exchange rates.



the deposit placements by banks in Russia have been primarily US dollar-denominated, driving the currency's share of total deposit liabilities vis-à-vis banks in Russia back up to 71.5%.

Elsewhere in the region, the growth in claims remained strong, particularly vis-à-vis the countries which had recently joined the European Union. The expansion in claims on all sectors in these countries has been evident since at least 2002. Between the fourth quarter of 1999 and the second quarter of 2002, the year-over-year growth in claims on banks in the recent accession countries was 9%. This average growth rate has jumped to 22% since the second quarter of 2002. Similarly, the corresponding growth in claims on non-banks in these countries rose from 13% to 17% across these time periods. In the most recent quarter, new lending to banks in Poland, Malta, Slovakia and Hungary drove the \$8.4 billion rise in total claims on the accession countries, although new lending to non-banks in Cyprus and, to a lesser extent, Hungary was noteworthy as well.

Over the longer term, loans from BIS reporting banks have continued to outpace issuance of international debt securities by borrowers in some emerging European countries (Graph 2.6).¹³ Indeed, even as the outstanding stock of loans has continued to grow, the stock of outstanding international bonds issued by borrowers in Russia and Hungary has not changed significantly since 1999. Even so, for some countries in the region at least, this picture can be misleading if interpreted as an indication of the relative importance of securities investment in the region. Local bond markets are large

... is driven by loans to recent EU accession countries

¹³ This is in contrast to the cross-border financing picture for the major borrowing countries in Latin America. See the banking chapter of the December 2004 *BIS Quarterly Review* for a discussion.

Cross-border bank flows to emerging economies

Exchange rate adjusted changes in amounts outstanding, in billions of US dollars

	Banks' positions ¹	2002	2003	2003		2004			Stocks at end-Sep 2004
		Year	Year	Q3	Q4	Q1	Q2	Q3	
Total ²	Claims	-37.0	64.9	20.6	14.7	67.9	26.6	-2.4	1,105.4
	Liabilities	-45.9	72.1	28.2	43.1	107.2	21.3	47.5	1,397.1
Argentina	Claims	-11.8	-8.5	-5.4	-2.1	-2.6	-1.1	-1.3	18.7
	Liabilities	0.0	-0.8	-2.2	0.7	0.3	0.1	-0.1	25.2
Brazil	Claims	-11.2	-7.2	1.4	-9.1	1.8	-4.0	-2.9	78.4
	Liabilities	-8.0	14.4	7.9	-3.4	5.0	-3.6	-7.0	51.1
China	Claims	-12.4	13.5	4.9	-1.0	13.9	10.1	-3.1	81.6
	Liabilities	-3.6	-6.4	1.8	1.8	21.6	20.5	-1.7	129.0
Czech Rep	Claims	2.3	3.7	0.8	1.7	-1.7	0.8	0.4	19.5
	Liabilities	-3.7	-2.4	0.2	-0.9	-2.6	2.5	-0.6	9.3
Indonesia	Claims	-6.0	-4.6	-1.9	-0.8	0.3	-0.9	0.4	28.5
	Liabilities	-2.4	0.2	-0.5	0.3	-0.2	-2.1	-0.2	33.7
Korea	Claims	8.2	-1.0	-1.5	0.1	14.3	-8.5	0.8	83.4
	Liabilities	0.5	7.3	2.1	12.1	21.7	-4.8	2.9	59.5
Mexico	Claims	3.1	-0.8	0.8	-0.9	7.5	-0.6	-8.1	63.8
	Liabilities	-11.4	6.2	-0.3	-0.1	4.0	-0.7	-5.5	59.9
Poland	Claims	2.9	3.3	1.0	0.4	2.4	2.0	1.5	39.1
	Liabilities	-3.1	-0.1	-1.0	1.2	3.0	3.9	-0.2	25.5
Russia	Claims	3.6	12.1	2.8	5.8	3.4	-0.3	-1.9	53.4
	Liabilities	9.6	16.2	7.2	7.9	5.0	7.8	5.5	76.1
South Africa	Claims	-0.4	-1.2	-0.9	-0.7	-0.1	0.5	-0.3	18.6
	Liabilities	2.7	9.7	1.4	2.8	3.9	1.6	0.7	38.3
Thailand	Claims	-5.0	-1.6	0.0	-1.6	-1.0	-0.4	1.7	19.1
	Liabilities	-4.6	5.7	0.9	3.2	-1.5	-0.8	1.7	28.2
Turkey	Claims	-2.8	5.3	3.4	0.1	4.1	3.4	0.0	51.7
	Liabilities	0.0	-0.4	1.0	0.9	2.9	0.9	1.1	25.2
<i>Memo:</i>									
New EU countries ³	Claims	9.2	20.9	5.6	8.5	3.9	6.6	8.4	139.0
	Liabilities	-5.9	-0.4	2.0	0.8	3.2	4.8	0.1	69.6
OPEC members	Claims	-9.9	-6.5	-1.9	2.0	9.2	1.8	5.2	145.8
	Liabilities	-8.8	-15.1	-10.2	12.2	16.5	-2.4	24.8	312.9

¹ External on-balance sheet positions of banks in the BIS reporting area. Liabilities mainly comprise deposits. An increase in claims represents an inflow to emerging economies; an increase in liabilities represents an outflow from emerging economies. ² All emerging economies. For details on additional countries, see Tables 6 and 7 in the Statistical Annex.

³ Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Slovakia and Slovenia.

Table 2.2

and well developed in many emerging European countries, and foreign investment in these markets, which is not captured in the BIS international debt securities data, has been substantial. Much of this investment has been concentrated in countries that are expected to join the euro area in the future, as investors take positions in anticipation of a convergence in interest rates once these countries adopt the euro as their domestic currency.

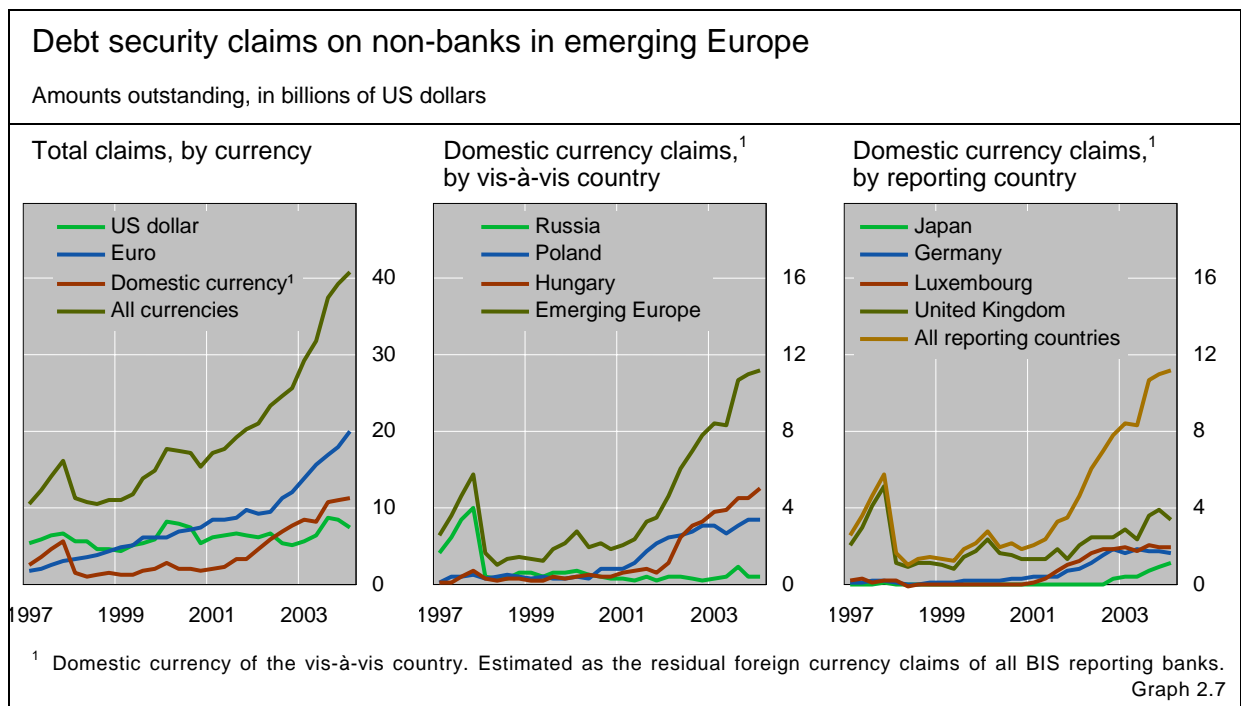
The BIS banking data, which include international debt securities held by reporting banks, seem to support this hypothesis. International debt security claims of BIS reporting banks on the non-bank sector in countries that recently joined the European Union accounted for 43% of total claims on this sector

BIS reporting banks invest in local bond markets

(region-wide) in the third quarter, up from 39% a year earlier and 33% two years ago. While much of this rise reflected purchases of euro-denominated international bonds issued by governments and corporates in these countries, a significant portion included purchases of domestic currency bonds issued by these same entities (Graph 2.7).¹⁴ In particular, investment by BIS reporting banks in local currency denominated debt securities in Poland and Hungary has risen sharply since the first quarter of 2001. Banks in the United Kingdom have long been invested in these securities; the sharp spike in 1998 reflected investment in local currency bonds issued by borrowers in Russia, and the subsequent decline in these positions following the Russian default (Graph 2.7, centre and right-hand panels). More recently, banks in the United Kingdom have increased their exposure to bond markets in Poland and Hungary, followed by banks in Germany, Luxembourg and Japan.

Loan writedowns contribute to outflow from Latin America

While the outstanding stock of claims on several of the region’s largest borrowing countries continued to fall, the net outflow of funds from Latin America was primarily the result of reduced claims on Mexico. Much of this was due to a one-off transaction: the acquisition by a subsidiary of a large international bank of the equity stakes of minority shareholders explained about half of the \$8.1 billion drop in claims on the country. Excluding this transaction, the fall in claims on the region as a whole reflected reduced credit to all sectors in Brazil, and the continuing writedown of loans vis-à-vis borrowers in Argentina.

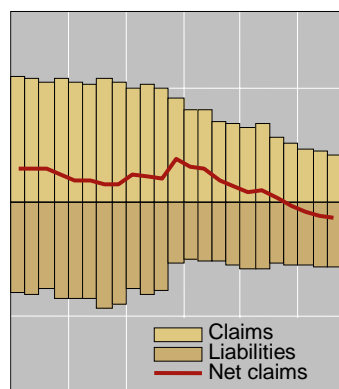


¹⁴ This can be seen in the rising stock of “residual other foreign currency claims”, which are international debt security claims denominated in a currency other than the five major currencies. This is likely to consist mostly of bonds issued in the domestic currency of the vis-à-vis country.

Positions vis-à-vis Argentina

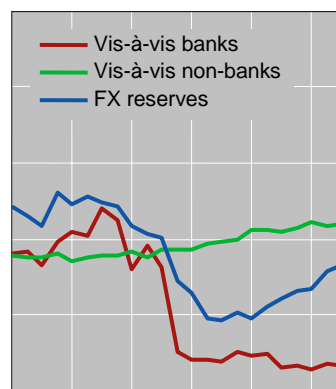
In billions of US dollars

Net claims¹



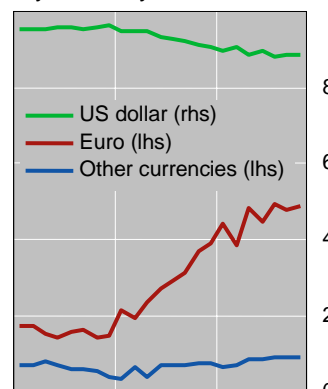
1999 2000 2001 2002 2003 2004

Deposit liabilities and FX reserves



1999 2000 2001 2002 2003 2004

Deposit liabilities, by currency²



1999 2001 2003

¹ Claims minus liabilities. ² As a share of total deposit liabilities in currency reporting countries, at constant third quarter 2004 exchange rates.

Graph 2.8

Banks reduce claims on Mexico and Brazil ...

After Mexico, claims on Brazil fell the most. Banks in offshore centres reduced interbank activity with banks in Brazil, while banks in the United States, the United Kingdom and the euro area reduced credit to the non-bank sector. The reduction in claims on banks occurred even as financial institutions in Brazil returned to the capital markets, with net issues of \$1.2 billion in the third quarter. BIS reporting banks' total claims on Brazil fell by \$2.9 billion to \$78.4 billion, from \$81.2 billion in the previous quarter and \$91 billion a year earlier. Despite this drop, Brazil experienced a relatively large net inflow of funds, as banks located there repatriated \$5.7 billion in deposits placed in banks abroad. Non-banks in Brazil repatriated an additional \$2 billion.

... as well as on Argentina

Even as claims on Argentina continued to fall, increased deposits placed abroad by non-banks in the country have made it a net creditor to the international banking system (Graph 2.8). The continued writedown of loans vis-à-vis Argentina has pushed down the stock of BIS reporting claims on the country to \$18.7 billion, from \$20 billion in the previous quarter and \$25.3 billion a year earlier. The net debt to BIS reporting banks of the Argentine banking sector fell from \$8.9 billion in the second quarter of 2002 to \$1.3 billion in the most recent quarter. Concurrent with this, BIS reporting banks' liabilities vis-à-vis Argentina have trended upwards, reflecting greater deposit placements by non-banks in banks in the United States, Switzerland and the euro area. Total liabilities vis-à-vis this sector have hovered near \$21 billion since the first quarter of 2003, up from an average of \$19 billion in 2002.

Deposit placements drive outflow from Asia-Pacific

Asia-Pacific experienced a large net outflow of funds, as both banks and non-banks in the region deposited funds with banks abroad. These deposit placements, coupled with a small reduction in claims on the region, yielded a

\$15 billion net outflow overall. For some countries, the placements by banks coincided with increases in foreign exchange reserves held by the monetary authorities in these countries.¹⁵

The reduction in claims on the region was primarily the result of reduced credit to banks in China. After having trended upwards since the fourth quarter of 2002, claims of BIS reporting banks on the Chinese banking sector fell by \$3.1 billion, reflecting reduced loans from banks in offshore centres and Japan. This reversal in the rise in claims on this sector may have been a reaction to new regulations adopted in the third quarter designed to curb the capital inflow that is contributing to official foreign exchange growth. In July 2004, restrictions on cross-border borrowing of foreign currency were extended to foreign banks operating in China. These had theretofore been less constrained than Chinese banks in borrowing foreign currency offshore to fund loans to corporate clients in China.

Rather than movements in claims, a rise in deposits placed with BIS reporting banks was behind the net outflow from Asia-Pacific in the most recent quarter. Total liabilities of BIS reporting banks vis-à-vis the region rose by \$13.3 billion. In particular, deposit placements accounted for a fifth consecutive net outflow from Korea. In a quarter in which foreign exchange reserves held by the Korean central bank grew by \$7.4 billion, banks in Korea deposited \$3.7 billion in BIS reporting banks, pushing their total deposits to \$50.5 billion.¹⁶ Banks in other countries also deposited funds abroad. These placements, coupled with a reduction in claims, contributed to a net outflow from Taiwan, the largest in the region. Banks in Taiwan placed \$2.7 billion (primarily US dollar-denominated) with banks in offshore centres, and an additional \$1.8 billion in banks in the United Kingdom. Deposit liabilities vis-à-vis banks in Malaysia and India also grew.

The moves in the most recent quarter seem to be a continuation of the strong growth in deposit liabilities vis-à-vis banks in Asia-Pacific. From the second quarter of 2003 to the third quarter of 2004, BIS reporting banks' deposit liabilities vis-à-vis banks in the region grew by \$157.5 billion to \$350.4 billion. Much of this reflected placements abroad by banks located in China, Korea, India and Taiwan. The majority of these funds were deposited in offshore centres, as well as in banks in the United Kingdom, the euro area and Japan.

While it is difficult to precisely track the currency composition of these placements, the BIS banking statistics provide some tentative evidence that the deposits placed abroad by banks in the region have been increasingly denominated in currencies other than the US dollar (Graph 2.9). Admittedly,

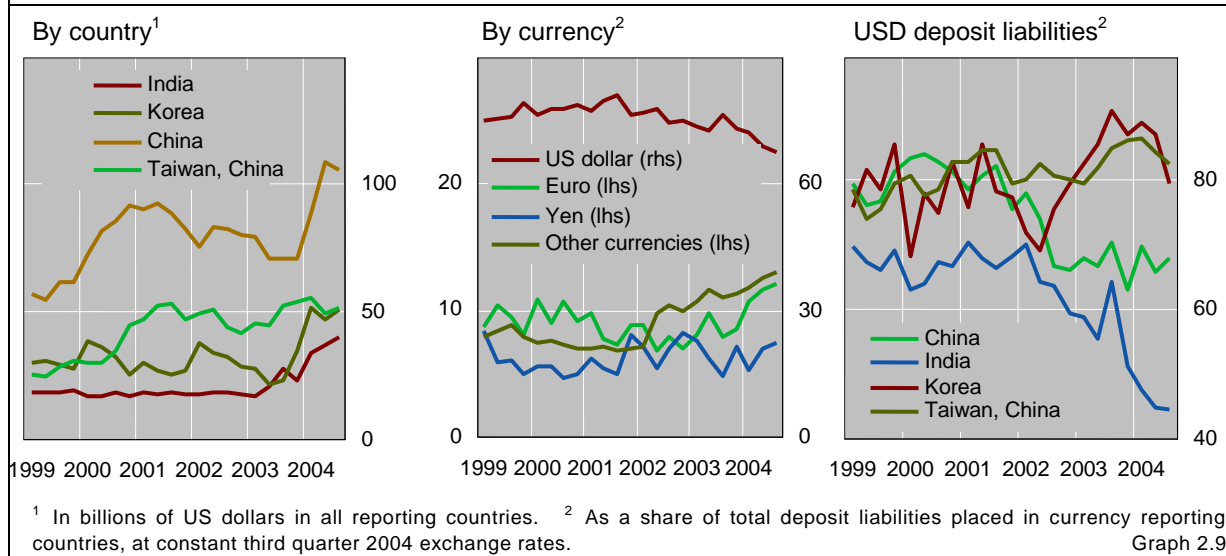
Deposits placed by banks in Asia-Pacific ...

... have risen over the past year

¹⁵ Total foreign exchange reserves held in the region grew by \$56.5 billion. Much of the growth was accounted for by China, although Korean, Malaysian and Indonesian foreign exchange reserves grew as well.

¹⁶ While US dollar-denominated deposits make up the bulk of total deposits placed (in currency reporting countries) by banks in Korea, the placements in the most recent quarter were primarily euro- and yen-denominated. Korea now accounts for 14% of the region's total foreign exchange reserves.

Deposit liabilities vis-à-vis banks in Asia Pacific



this data should be interpreted with caution because as much as 42% of the total stock of liabilities vis-à-vis banks in the region are deposited in BIS reporting countries that do not provide a currency breakdown, in particular Singapore and Hong Kong SAR.¹⁷ Furthermore, the deposits placed in BIS reporting banks will not capture currency exposure through the off-balance sheet positions of the region's banking sector.

Even so, the data from the countries that do report a currency breakdown indicate a fall in the share of US dollar-denominated deposits placed in reporting banks, from 81% in the third quarter of 2001 to 67% in the third quarter of 2004.¹⁸ This shift was most evident for banks in India, which place almost 90% of their deposits in currency reporting countries and account for 11% of the total deposit liabilities (of all BIS reporting banks) vis-à-vis banks in the region. The share of their US dollar-denominated deposits fell from 68% of total deposits placed in currency reporting countries in the third quarter of 2001 to 43% in the most recent quarter. The corresponding share for banks in China fell from 83% to 68% over this same period; this share declined until the third quarter of 2002, but has fluctuated around 68% since (Graph 2.9, right-hand panel).

Does this signal a more general shift away from dollar exposure by the region as a whole? The evidence on this question is far from conclusive. US dollar-denominated deposits placed (in currency reporting countries) by banks in the region continue to rise in absolute terms, suggesting, at most, that the currency shift described above is taking place at the margin. Furthermore, residents in the region continue to invest in US Treasury securities; the TIC

¹⁷ In the third quarter of 2004, 50% of the deposits in BIS reporting banks placed by banks in China were in currency reporting countries. The corresponding figures for India, Korea and Taiwan were 85%, 57% and 63% respectively.

¹⁸ The currency shares are calculated using data that have been partially corrected for valuation effects. The stocks of euro, yen, pound sterling and Swiss franc liabilities are converted to US dollars using constant third quarter 2004 exchange rates.

data indicate that the combined holdings of US Treasuries by residents in China, Taiwan, Korea, Thailand and India increased by \$52.4 billion between end-June 2003 and end-September 2004. Moreover, while the above figures are suggestive of such a shift away from US dollar exposure for the region's banking sector, the same phenomenon has not been evident in the non-bank sector. Deposit liabilities (of all BIS reporting banks) to non-banks in the region have fallen over the last year to \$148.6 billion, or 23% of all deposit liabilities vis-à-vis the region (from 40% a year earlier). Since the third quarter of 2001, the share of US dollar-denominated deposits in total deposits (placed in currency reporting countries) by these borrowers has remained roughly constant, sitting at 72% in the most recent quarter.¹⁹ While this share seems to have been declining for non-bank borrowers in India, it has, if anything, risen slightly for those in China.

¹⁹ The deposit liabilities of BIS reporting countries vis-à-vis non-banks in Asia-Pacific that provide a currency breakdown account for only 55% of the total deposit liabilities of all BIS reporting countries vis-à-vis the sector.

Refinancing boosts syndicated lending to record levels

Blaise Gadanecz

In the fourth quarter of 2004, signings of international syndicated loans reached their highest level since the BIS began compiling statistics on this market segment. Signings of new facilities totalled \$564 billion, bringing the volume for 2004 as a whole to a record high of \$1.8 trillion. Refinancing and merger financing boosted business. On a seasonally adjusted basis, signings have been trending up steadily since the second half of 2003.

Banks contributed a generous supply of new credits to borrowers from industrial countries. Spreads remained low by historical standards – especially on US refinancings – while average maturities rose, and a slightly lower proportion of loans carried collateral or covenants. US and western European borrowers secured record amounts for refinancing and M&A purposes (the LBO segment was exceptionally active: see the Overview on page 1). In the United States, the energy, telecoms and health care sectors were most active. Oracle and BellSouth Corp arranged the biggest amounts (\$9.5 billion and \$9 billion respectively, both for acquisition purposes). In western Europe, the lion's share of new lending was directed to the energy, automobile and retail sectors. The energy firm E.ON AG obtained the largest loan, rolling over €10 billion.

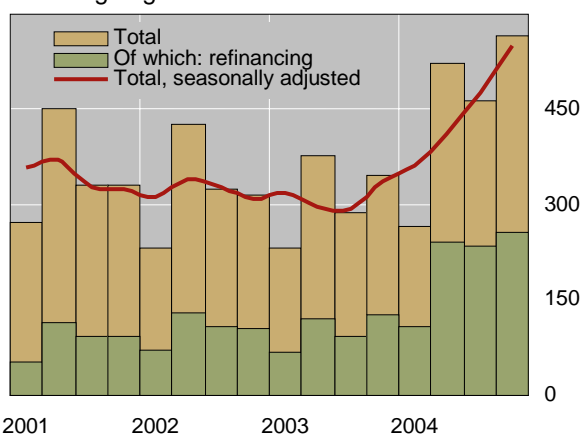
While supply conditions were favourable towards the end of the year, borrowers appear to have opted, in recent quarters, for a somewhat higher proportion of so-called club deals. These are loans syndicated to a small number of relationship banks, rather than being offered to a wider circle of financial institutions. This may have reflected a desire on the part of borrowers to work with smaller groups of lenders that are easier both to manage and to reward with higher-yielding ancillary business, such as treasury management or investment banking services.

Lending to emerging markets reached a peak not seen since the end of 1997. Borrowers from eastern Europe experienced a reduction in spreads and obtained the highest amounts – almost a third of the total amount of \$41.3 billion granted to emerging markets. Activity in the region was driven by Russian and Turkish banks as well as the Russian energy industry.[®] Lending to Asian and Latin American borrowers was also buoyant. While new funding for Asia was dispersed among a large number of countries, it was more concentrated for Latin America, where Mexican borrowers were most active. The cement and construction materials manufacturer CEMEX SA de CV raised \$5.3 billion, a large part of it through European acquisition vehicles, with a view to buying a cement manufacturer in the United Kingdom.

Signings of international syndicated credit facilities

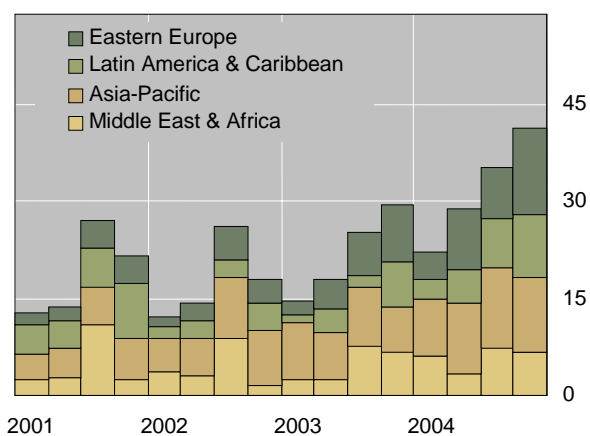
In billions of US dollars

Total signings



Sources: Dealogic Loanware; BIS.

Signings by emerging market entities



[®] Not included in these amounts is a \$10 billion loan – subsequently called off – that Gazprom had started to arrange in December for the acquisition of Yukos.

3. The international debt securities market

The fourth quarter completed a banner year for international debt securities. Issuance of bonds and notes in the quarter was \$826 billion on a gross basis, bringing the total for 2004 to \$3.3 trillion (Table 3.1). This represents a 14.5% expansion over 2003 and a historical peak relative to global GDP, indicating that borrowers had relatively easy access to international credit markets last year. The most significant increase in the fourth quarter was debt issued by the largest developed economies, particularly the euro area. Gross high-yield issuance in developed economies remained at an elevated level and gross issuance by entities in emerging market economies reached its highest yearly total ever, as spreads on emerging market debt fell to historical lows. In addition, net issuance of all international debt securities was up by almost \$80 billion and \$19 billion from entities in the euro area and the United States, respectively, in the fourth quarter (Table 3.2). By contrast, net issuance was negative in Japan.

Sharp turnaround in euro area issuance

Euro area issuance surges

Despite ongoing weakness in the euro area economy, both gross and net issuance of international debt securities by euro area entities rose markedly in the fourth quarter. Total gross issuance (bonds and notes plus money market securities) increased to \$614 billion, from \$543 billion in the third quarter, and net issuance to \$218 billion from \$138 billion. All of the largest euro area economies except Germany saw net issuance rise sharply. These increases in borrowing activity, expressed in US dollars as reported in Tables 3.1 and 3.2, mainly reflect a jump in issuance in euros and not valuation effects deriving from the decline in the dollar vis-à-vis the euro. For example, gross issuance in euros by euro area entities was €326 billion in the fourth quarter, up 13.4% over the previous one.

Rapid increase in borrowing by euro area corporates

Financial firms continued to account for the bulk of new international debt issuance from the euro area, but non-financial corporations increased borrowing much more rapidly, with net issuance expanding by a factor of five in the fourth quarter. By contrast, government borrowing continued to be weak, as in the third quarter, but this was largely in line with past seasonal patterns.

Gross issuance in the international bond and note markets							
In billions of US dollars							
	2003	2004	2003	2004			
	Year	Year	Q4	Q1	Q2	Q3	Q4
Total announced issues	2,885.5	3,303.4	711.8	982.8	768.8	725.7	826.1
Bond issues	1,611.1	1,790.4	404.5	570.1	402.5	377.8	440.0
Note issues	1,274.4	1,513.0	307.3	412.7	366.4	347.9	386.0
Floating rate issues	962.7	1,258.8	257.6	337.4	306.4	285.2	329.7
Straight fixed rate issues	1,834.7	1,987.3	427.6	628.0	444.1	430.0	485.2
Equity-related issues ¹	88.1	57.3	26.6	17.4	18.3	10.5	11.2
US dollar	1,171.8	1,154.5	268.1	357.2	257.3	255.5	284.5
Euro	1,288.1	1,598.0	316.9	478.5	379.0	349.7	390.7
Yen	102.8	111.5	29.0	29.3	33.8	22.4	26.1
Other currencies	322.9	439.4	97.7	117.8	98.7	98.0	124.8
Developed countries	2,621.6	3,012.4	656.8	906.8	694.8	655.4	755.5
United States	739.5	772.5	173.6	249.8	167.9	169.6	185.2
Euro area	1,294.4	1,463.1	327.2	438.7	355.2	305.2	364.0
Japan	48.3	61.9	18.5	20.3	19.8	12.0	9.8
Offshore centres	31.7	41.6	11.1	7.2	7.0	14.0	13.4
Emerging markets	139.7	152.1	33.8	45.1	36.7	35.0	35.3
Financial institutions	2,279.2	2,689.5	593.3	788.1	603.3	606.1	691.9
Private	1,913.3	2,276.1	506.0	663.4	515.7	501.2	595.9
Public	366.0	413.3	87.3	124.8	87.6	104.9	96.1
Corporate issuers	271.2	271.4	68.8	61.9	72.3	62.4	74.8
Private	219.1	231.2	56.6	52.8	60.6	57.0	60.7
Public	52.1	40.2	12.2	9.0	11.7	5.4	14.1
Governments	242.6	245.4	39.6	109.1	62.9	35.9	37.5
International organisations	92.5	97.2	10.1	23.7	30.3	21.3	21.9
Completed issues	2,866.6	3,303.2	734.4	934.1	796.5	708.4	864.2
<i>Memo: Repayments</i>	<i>1,478.0</i>	<i>1,740.3</i>	<i>326.3</i>	<i>448.4</i>	<i>453.2</i>	<i>403.0</i>	<i>435.8</i>

¹ Convertible bonds and bonds with equity warrants.

Sources: Dealogic; Euroclear; ISMA; Thomson Financial Securities Data; BIS.

Table 3.1

Net US issuance growing, but still at a low level

Net issuance of international debt securities by US borrowers once again rose in the fourth quarter, totalling \$59.6 billion. About two thirds of the increase in net issuance can be attributed to financial corporations, though borrowing by corporates increased by more on a percentage basis (82% versus 38%). The pickup in issuance may be partly a result of generally good price terms for US corporate borrowers, as spreads tightened in both the US and European markets. The fall in spreads was largest in the high-yield class (see below), yet they also fell on A- and BBB-rated debt, reaching levels not observed since 1998.

Increase in net US issuance in fourth quarter ...

... but yearly total still low by historical standards

On an annual basis, however, net issuance was still below the level posted in 2003. Even looking further back in time, US borrowers on the international debt market were relatively subdued in 2004. On an absolute basis, US net issuance of \$230 billion in 2004 fell short of the levels recorded in the years all the way back to 1998; a similar picture emerges when viewing net issuance as a percentage of GDP.

One reason for the weakness in net issuance witnessed earlier in 2004 was the marked decline in borrowing on the international market by Fannie Mae and Freddie Mac. Continuing this trend, combined net borrowing by these two institutions shrank for the second consecutive quarter, although the decline in new issuance of \$548 million in the fourth quarter was much less severe than the sharp fall of \$7,707 million seen in the third quarter. Nonetheless, in terms of gross issuance, Fannie Mae and Freddie Mac continued to be among the largest US borrowers in the fourth quarter, along with General Electric Credit Corporation and the Federal Home Loan Banks. Another possible

Main features of net issuance in international debt securities markets								
In billions of US dollars								
	2003	2004	2003	2004				Stocks at end-Dec 2004
	Year	Year	Q4	Q1	Q2	Q3	Q4	
Total net issues	1,463.9	1,623.9	457.3	520.5	347.7	323.2	432.4	13,928.0
Money market instruments ¹	75.3	61.0	49.2	34.9	4.4	17.8	4.0	663.8
Commercial paper	83.3	40.4	48.7	8.8	-3.4	25.8	9.1	483.3
Bonds and notes ¹	1,388.6	1,562.8	408.1	485.6	343.3	305.4	428.4	13,264.3
Floating rate issues	384.4	644.4	152.3	153.6	163.5	129.8	197.5	3,668.8
Straight fixed rate issues	983.3	924.6	240.0	338.8	172.1	178.3	235.3	9,225.0
Equity-related issues	20.9	-6.2	15.7	-6.8	7.7	-2.7	-4.4	370.5
Developed countries	1,357.3	1,493.6	433.4	484.8	317.8	291.6	399.4	12,474.8
United States	269.2	230.1	97.8	125.5	4.3	40.6	59.6	3,358.8
Euro area	768.1	803.2	223.2	231.8	215.6	138.3	217.6	6,208.7
Japan	-1.0	16.6	7.9	6.4	11.0	0.7	-1.5	298.3
Offshore centres	15.8	25.2	9.0	1.0	4.3	9.7	10.2	159.9
Emerging markets	67.6	82.0	19.0	24.7	18.5	14.7	23.9	737.1
Financial institutions	1,179.7	1,370.7	408.0	417.9	282.3	294.9	375.5	10,373.5
Private	976.0	1,146.4	347.7	343.1	234.9	236.6	331.8	8,747.0
Public	203.6	224.3	60.3	74.8	47.4	58.4	43.7	1,626.5
Corporate issuers	113.2	70.1	40.9	7.1	11.3	10.4	41.2	1,635.4
Private	93.4	52.0	37.3	-0.0	7.8	9.9	34.3	1,360.5
Public	19.8	18.1	3.6	7.1	3.5	0.5	6.9	275.0
Governments	147.9	160.0	12.5	85.5	47.0	10.8	16.8	1,362.8
International organisations	23.2	23.1	-4.2	10.0	7.1	7.1	-1.2	556.3
<i>Memo: Domestic CP²</i>	<i>-41.0</i>	<i>139.3</i>	<i>8.2</i>	<i>57.9</i>	<i>-19.8</i>	<i>-0.7</i>	<i>101.9</i>	<i>2,079.3</i>
<i>Of which: US</i>	<i>-81.3</i>	<i>114.0</i>	<i>-1.5</i>	<i>47.8</i>	<i>-26.8</i>	<i>6.7</i>	<i>86.3</i>	<i>1,402.7</i>

¹ Excluding notes issued by non-residents in the domestic market. ² Data for the fourth quarter of 2004 are partly estimated.

Sources: Dealogic; Euroclear; ISMA; Thomson Financial Securities Data; national authorities; BIS. Table 3.2

Net issuance of international debt securities by region and currency ¹								
In billions of US dollars								
		2003	2004	2003	2004			
		Year	Year	Q4	Q1	Q2	Q3	Q4
United States	US dollar	210.1	128.1	75.3	102.7	-28.5	6.6	47.3
	Euro	47.8	55.3	14.6	13.7	21.2	16.6	3.8
	Pound sterling	11.8	25.4	7.2	3.5	5.4	10.7	5.8
	Yen	-1.5	4.3	0.8	1.3	1.5	1.0	0.5
	Other	1.0	17.0	-0.1	4.4	4.7	5.7	2.1
Euro area	US dollar	87.1	76.8	24.2	17.9	34.7	10.0	14.1
	Euro	646.5	660.2	181.6	192.0	158.8	115.0	194.4
	Pound sterling	17.4	35.9	5.1	6.7	15.2	6.0	7.9
	Yen	-12.3	2.9	0.3	1.5	3.6	0.5	-2.7
	Other	29.4	27.5	12.1	13.7	3.3	6.6	3.8
Others	US dollar	164.4	202.5	48.8	53.8	47.1	46.8	54.8
	Euro	138.6	231.1	35.8	71.0	40.8	66.4	53.0
	Pound sterling	70.5	89.6	26.5	21.5	22.3	12.1	33.7
	Yen	9.4	16.5	10.6	2.5	10.7	3.2	0.2
	Other	43.6	50.8	14.6	14.5	6.9	15.9	13.5
Total	US dollar	461.6	407.4	148.3	174.4	53.3	63.4	116.2
	Euro	832.9	946.6	231.9	276.7	220.7	198.0	251.2
	Pound sterling	99.7	150.9	38.8	31.7	42.8	28.9	47.5
	Yen	-4.4	23.8	11.7	5.2	15.8	4.7	-1.9
	Other	74.0	95.3	26.6	32.6	15.0	28.3	19.5

¹ Based on the nationality of the borrower.

Sources: Dealogic; Euroclear; ISMA; Thomson Financial Securities Data; BIS.

Table 3.3

explanation for the weaker activity by US firms last year was a partial substitution out of longer-dated instruments by financial institutions as the commercial paper market rebounded in the United States.

Along with the rise in net issuance by US entities, the share of net borrowing by all nationalities in US dollars increased strongly, from 19.6% to 26.9%, in the fourth quarter (Table 3.3). At the same time, the shares of gross and net issuance in the euro declined slightly. In the light of the fact that the effective exchange rate of the dollar remained low relative to its historical average, and the US dollar depreciated by 5% in the quarter, these changes seem to run contrary to the positive relationship observed in the past between a currency's strength and its share of international debt issuance.

Share of net
issuance in US
dollars rises

Japanese issuance falters as economy slows

The most noticeable weak spot in the international debt securities market over the past two quarters has been the lack of new borrowing by Japanese entities. Net issuance declined during the fourth quarter, coming in at a negative -\$1.5 billion, following the modest increase of \$721 million in the third quarter. Gross issuance was also weak, totalling only \$20.4 billion. This reduction in borrowing came against a mixed economic background. On the one hand, the

Net issuance in
Japan is negative in
the fourth quarter ...

soft patch in the economy persisted and the expectation that goods price deflation was nearing its end subsided. On the other hand, rating upgrades outpaced downgrades on Japanese issuers and financing conditions remained favourable, as credit spreads continued to be tight. This suggests that the decline in issuance may have been mainly due to a reduced demand for funds on the international market by borrowers.

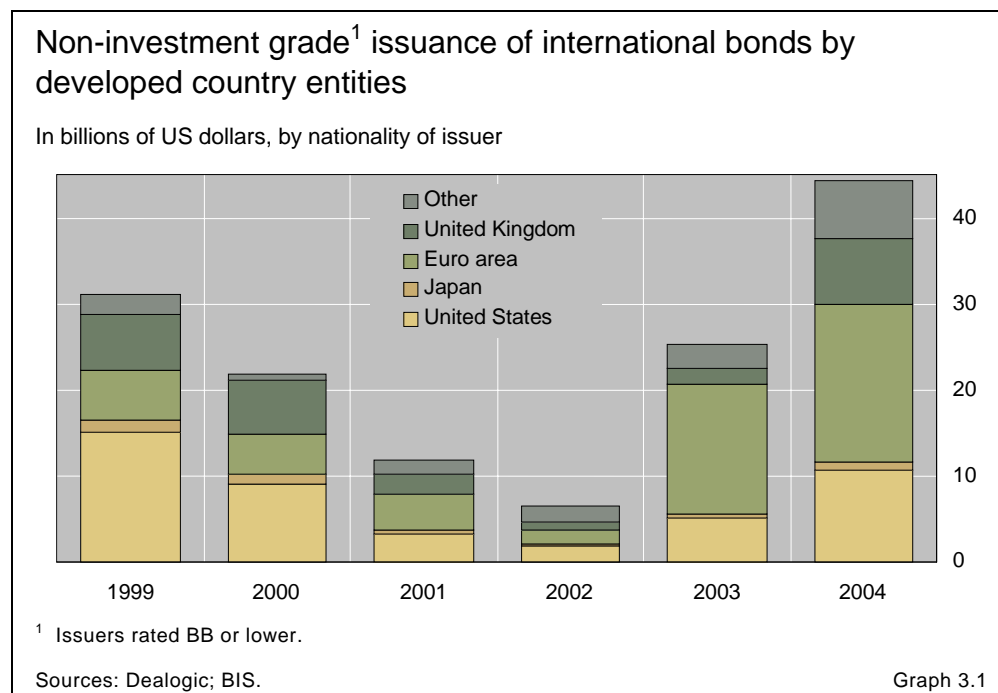
... but higher overall in 2004 than in 2003

From a longer-term perspective, however, net borrowing on the international market by Japanese entities showed marked improvement last year, which might be a sign that the general process of deleveraging by Japanese firms that has taken place over recent years has come to its end. Net issuance had been negative in 2000–03. By coming in at a positive \$16.6 billion in 2004, it reached its highest level since 1996. To be sure, part of this improvement was due to revaluation effects, as the yen appreciated by 4.3% vis-à-vis the dollar last year. But most of the increase was not simply due to valuation effects, as Japanese entities issued, on net, ¥1,585 billion worth of debt in yen on the international market in 2004, up from ¥615 billion in 2003.

High-yield issuance still buoyant

Market conditions remain attractive for high-yield borrowers ...

As global investors continued their search for yield during the fourth quarter, and in the process narrowed spreads on high-yield debt even further (see the Overview), lower-rated entities in developed economies continued their brisk rate of borrowing in the international market. Although gross high-yield issuance by nationals of developed economies fell slightly in the quarter to \$12.6 billion from \$13 billion in the previous one, the level of borrowing remained elevated. Indeed, for the year as a whole, gross issuance was \$44.3 billion, far eclipsing the total reached in every year since 1999 (Graph 3.1).



The modest overall drop in gross high-yield issuance masks some quite marked differences across economies. For instance, gross issuance by US-based entities grew by 1.5% in the quarter, whereas it declined significantly for entities in the euro area (-49%) and Japan (-59%). The fact that spreads on high-yield debt continued to narrow in the euro area from October to December suggests that the precipitous drop in issuance was driven by a lack of demand for funding by speculative grade firms given the persistent sluggishness displayed by the euro area economy. Similarly, the drop in total debt issuance for Japanese firms also appears to reflect weak demand on the part of borrowers.

... though borrowing differs sharply across countries

Technology and financial firms were the largest issuers of speculative grade debt in industrial countries in the fourth quarter. The largest private completion was by Elan Finance Corp Ltd of Ireland, a firm with a rating of B- and US residency, which issued a dollar-denominated bond in the amount of \$850 million at a spread of 387 basis points over seven-year US Treasuries. Rogers Wireless Inc, a Canadian firm rated BB, completed a \$550 million fixed rate issue with a spread of 330 basis points. HCA Inc (Hospital Corporation of America) completed an issue in the international market on 19 November 2004 in the amount of \$750 billion and at a spread of 220 basis points over 10-year US Treasuries.

Emerging market borrowing sets a new record in 2004

Borrowing in the international debt market by entities in emerging market countries set a record in 2004, totalling \$167 billion, surpassing the previous record level of \$163 billion reached in 1996. Net issuance of \$82 billion was also strong compared to the average level of \$46 billion recorded over the five-year period 1999–2003, but was still somewhat lower than the previous high of \$94 billion set in 1997. Emerging market borrowers clearly took advantage of the very favourable pricing environment, as spreads on JPMorgan Chase's EMBI+ fell below 350 basis points, a historical low, in December 2004 (see the Overview).

Gross issuance by emerging market economies sets a yearly record

Gross issuance by emerging market economies in the fourth quarter was \$39.8 billion, up from \$38.5 billion in the third quarter, but still below the levels reached in the first half of the year. Net issuance rose by a wider margin, going from \$14.7 billion to \$23.9 billion quarter to quarter. In fact, net borrowing reached its second highest quarterly level since early 2001, coming in slightly below the figure posted in the first quarter of 2004.

Most of the growth in net issuance during the latest quarter was due to Asian entities, though entities from Latin America and the Middle East and Africa posted gains as well (Graph 3.2). By contrast, net issuance was relatively flat in emerging Europe. Financial institutions once again topped governments in net borrowing, and there was only a slight increase in net issuance by non-financial corporations.

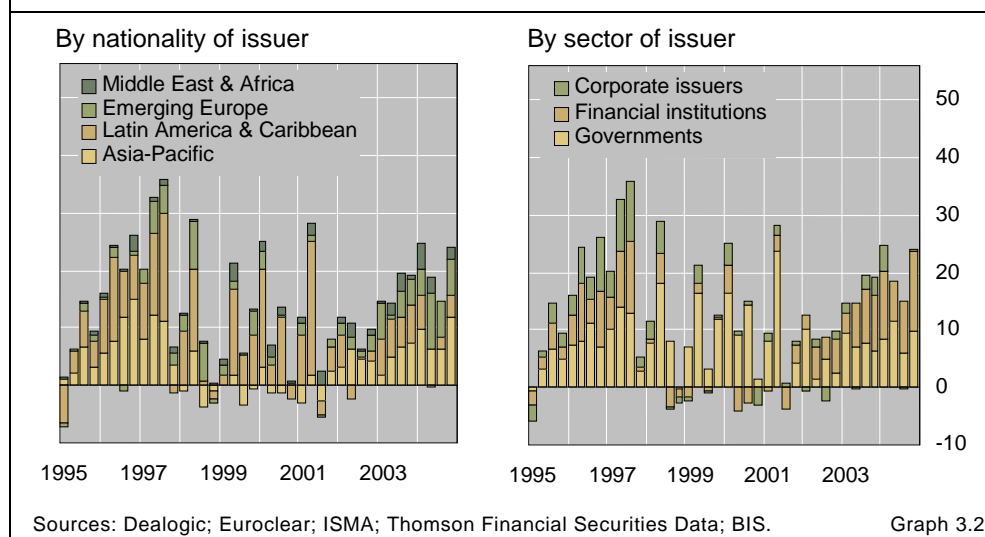
Borrowing is strongest by Asian entities ...

Among Asian borrowers, Chinese entities were the most active during the fourth quarter, with net issuance of \$4 billion accounting for one third of total net issuance from the region. The People's Republic of China came to the

... particularly the Chinese government ...

International debt securities issues by emerging market entities

Net issuance, in billions of US dollars



market on 21 October with two large issues. The larger of these was a 10-year bond denominated in euros and totalling \$1,248 million, while the other was a \$500 million bond denominated in US dollars, with a maturity of five years. The combined face value of these two issues represented the largest completion ever by the Chinese government in the international bond market. Amongst the objectives for the euro-denominated bond issue were the creation of a new euro benchmark and broader distribution of Chinese government debt across European investors. With nil repayments, this brought net issuance by the Chinese government to \$1.7 billion during the quarter, reversing a decline of \$300 million recorded in the previous one, in which the government did not issue any securities but only repaid a part of its existing debt.

... and Asian
financial institutions

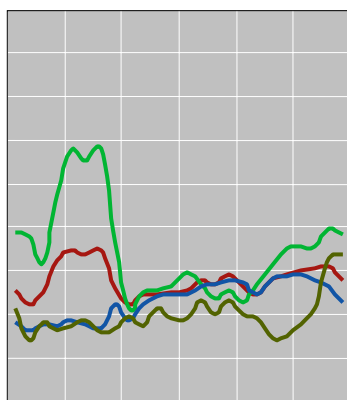
Nonetheless, despite the two large issues from the Chinese government, financial institutions continued to be the largest issuers of Asian debt in the international market. For instance, 63% of the net issuance out of China was due to Chinese financial institutions. Net issuance by financial institutions in Korea, Malaysia and India was also robust during the fourth quarter. For example, the Korea First Mortgage No 3 plc issued a euro-denominated bond with a long maturity of 31½ years that completed in early December in the amount of \$729 billion.

The Republic of the Philippines, normally a very active borrower, did not issue any debt during the fourth quarter in the face of adverse market conditions. Progress on fiscal consolidation, including the passage of legislation intended to boost tax revenues, helped to turn market sentiment around early in 2005. This paved the way for the announcement of a new bond on 26 January in the amount of \$1.5 billion and with a maturity of 25 years, the largest issue ever by the government and its first long-dated bond since 2000. Nevertheless, a one-notch downgrade by Standard & Poor's in mid-January, followed by a two-notch downgrade by Moody's in February, reminded investors of the Philippines' weak fiscal position.

Average maturity of emerging markets issues¹

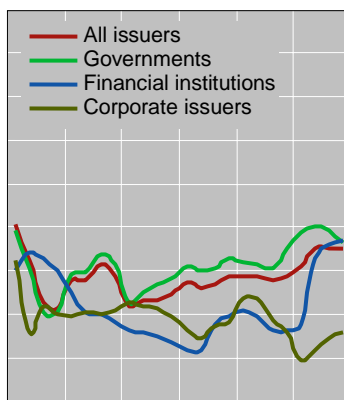
Fixed rated international bonds and notes, in number of years

Asia-Pacific



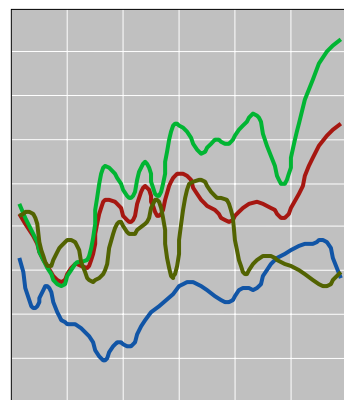
1999 2000 2001 2002 2003 2004

Emerging Europe



1999 2000 2001 2002 2003 2004

Latin America & Caribbean



1999 2000 2001 2002 2003 2004

¹ Four-quarter moving average.

Sources: Dealogic; Euroclear; ISMA; Thomson Financial Securities Data; BIS.

Graph 3.3

The largest issues in Latin America were completed by sovereigns, in both large and small economies. The government of Brazil issued a 15-year bond denominated in US dollars in the total amount of \$1 billion in October, and followed this up in December with a \$500 million 9.6-year bond. The Mexican government issued a 15¼-year medium-term note in euros for \$971 million and the Republic of Peru a 10-year bond in euros totalling \$806 million. The announcement of such large issues denominated in euros suggests that demand by European investors in search of higher-yielding debt securities was strong during the quarter. The Republic of Venezuela increased net issuance the most among Latin American governments, with its total rising from nil in the third quarter to \$2 billion in the fourth quarter. By contrast, net issuance by non-financial corporations in the region declined for the third consecutive quarter, and net issuance by financial institutions was negative (–\$1 billion).

The fourth quarter was also notable for the fact that gross issuance in local currency by Latin American entities reached its highest level by far (\$516.4 million) since the full onset of the Argentina crisis. This brought the total for 2004 to \$855.7 million, not far off the face value of \$939.1 million reached in 2001. This surge of borrowing in bonds and notes in local currency coincided with a significant increase in local currency bank loans to the region (see the section on the international banking market). Three debt securities were brought to the market during the quarter. The Republic of Colombia announced a bond issue in November totalling 954.5 billion Colombian pesos (\$373.8 million), while in December two medium-term notes were announced by Brazilian banks Banco Bradesco SA and Banco do Brasil SA, for 271 million and 125.7 million reais (\$97.4 million and \$45.2 million), respectively.

In emerging Europe, the largest single issue was by the Republic of Hungary, which launched a seven-year fixed rate bond in euros with a face value of \$1.263 billion and a coupon of 3.625%. The Republic of Turkey

Governments are the most active borrowers from Latin America ...

... and the value of local currency issues rises

Hungary and Turkey complete large issues

completed an issue in late November, in the amount of \$500 million. This was a dollar-denominated bond with a maturity of 10 $\frac{1}{2}$ years and issued at a spread of 286 basis points over 10-year US Treasuries. Borrowing by Russian financial firms, which had been fuelling issuance from emerging European economies in the recent past, slowed down in the fourth quarter, with net issuance falling from \$2.9 billion to \$1.9 billion.

Finally, borrowers from emerging market economies extended the average maturity of their bond and note issues in 2004. Along with record gross issuance and the tightening in spreads, this is a further indication that financing conditions as a whole were very favourable last year. Four-quarter moving averages of the maturity of newly issued bonds and notes across the main regions were 7.6 years (Asia-Pacific), 9.0 years (emerging Europe) and 14.7 years (Latin America) by end-2004 (Graph 3.3). For governments, the corresponding numbers were 9.7 years (Asia-Pacific), 9.3 years (emerging Europe) and 18.6 years (Latin America). However, in the fourth quarter specifically, average maturity declined across each of these regions and in most sectors.

4. Derivatives markets

In the last quarter of 2004 the combined value of trading in interest rate, stock index and currency contracts on organised exchanges fell by 3%, to \$279 trillion. The slowdown in global activity was due solely to the stagnant short-term interest rate segment; long-term interest rates, stock market indices and currencies registered solid growth. Notional amounts as of year-end returned close to the values prevailing in March, as a huge expansion in the first half of the year outweighed the declines in the second half.

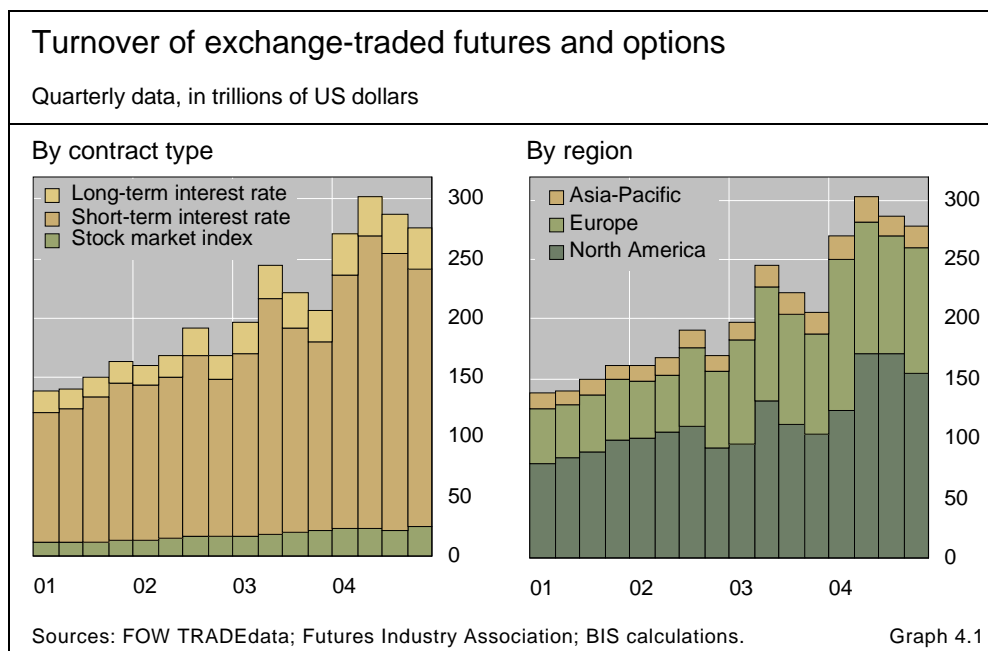
A greater convergence of views about the likely path of monetary policy in the United States after the first increase in policy rates in June probably explains the weak trading of short-term interest rate contracts. At the other end of the yield curve, as well as for stock indices, greater hedging-related activity in the fourth quarter of 2004 may have been stimulated by softer expected global GDP growth, while the sharp dollar depreciation may have contributed to expanded business in currency-related products.

The pattern of growth in activity was similar across geographical areas, with one major exception. Trading in short-term interest rate contracts, which for 2004 as a whole represented nearly 80% of overall trading on exchanges, was particularly low in Asia and the United States, but high on European exchanges.

Restrained trading on reduced rate uncertainty

The aggregate turnover of exchange-traded fixed income contracts fell by 5% in the last quarter of 2004, as in the previous quarter, to \$252 trillion. The decline was due entirely to reduced trading on short rate contracts. Trading on money market contracts, including those on eurodollar, Euribor and euroyen rates, fell by 7% to \$217 trillion. This slowdown in activity involved both futures and options, with turnover falling by 5% and 11% respectively (to \$164 trillion and \$53 trillion). By contrast, activity in bond-related instruments rose by 8% to \$36 trillion (Graph 4.1), where business in futures rose by 10%, but that in options fell by 4%.

Activity in fixed
income contracts
drops further ...



Activity in short-term contracts varied significantly across geographical regions. Trading was sharply down in the United States, by 13% to \$128 trillion, with both the futures and options segments falling by the same percentage (Graph 4.2). In contrast, business rose by 6% in Europe, to \$80 trillion, due to activity in futures, up 10%, while trading in options fell by 8%. Activity in Europe thus reached nearly two thirds that of the United States, up from only half the US size in the third quarter. The pickup in futures business in European marketplaces was apparent in both of the major contracts, with transactions growing by 7% in both the three-month eurosterling and the three-month Euribor contracts. Analogously, the slowdown in options trading in Europe was apparent in both contracts as well.

... due to reduced trading in short-term contracts ...

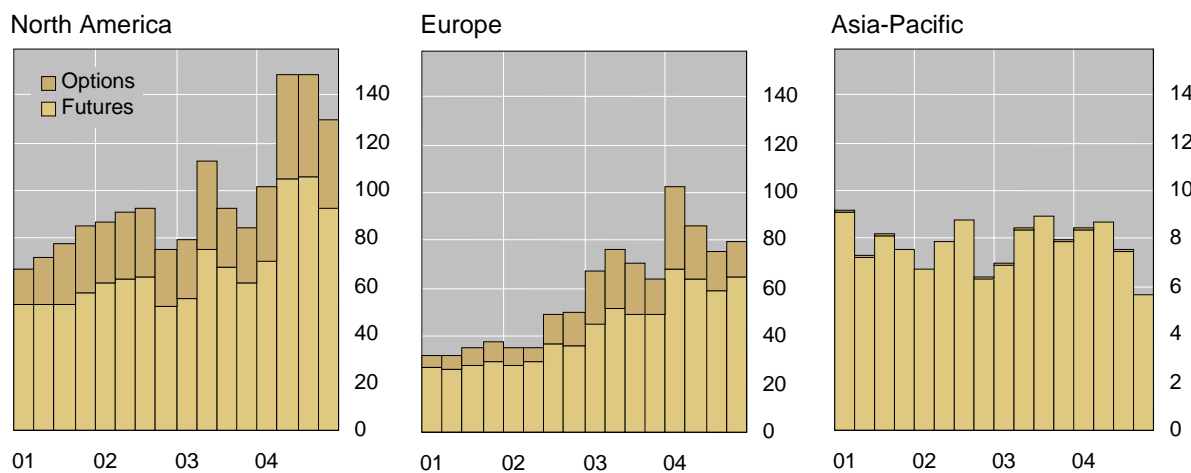
Lower activity in short-term interest rate derivatives, which appeared after the first increase of official rates in the United States in June, is probably due to reduced uncertainty and an increased degree of consensus over the course of monetary policy. In the second half of 2004, the Federal Reserve consistently signalled to the markets that the future path of short-term interest rates would be upwards but implemented gradually at a “measured pace”. In the last quarter of the year, implied volatility derived from either options on three-month eurodollar futures or from swaptions on the one-year rate with a short expiration decreased noticeably, from 34% to 24% and from 23% to 18% respectively.

A link between trading in short-term interest rate derivatives and the degree of consensus over the course of monetary policy is consistent with the pattern of business in federal funds futures. In the first half of 2004 (see the December 2004 issue of the *BIS Quarterly Review*) trading in federal funds futures had risen noticeably, owing to greater position-taking in an environment characterised by divergent views ahead of the first hike in rates by the Federal Reserve in June. However, transactions then fell sharply in July, and continued to fall through the last quarter. This pattern seems to mirror indications of less divergence of views about monetary policy. According to a Bloomberg survey,

... and less disagreement over the path of monetary policy

Turnover of short-term interest rate contracts

Quarterly contract turnover, in trillions of US dollars



Sources: FOW TRADEdata; Futures Industry Association; BIS calculations.

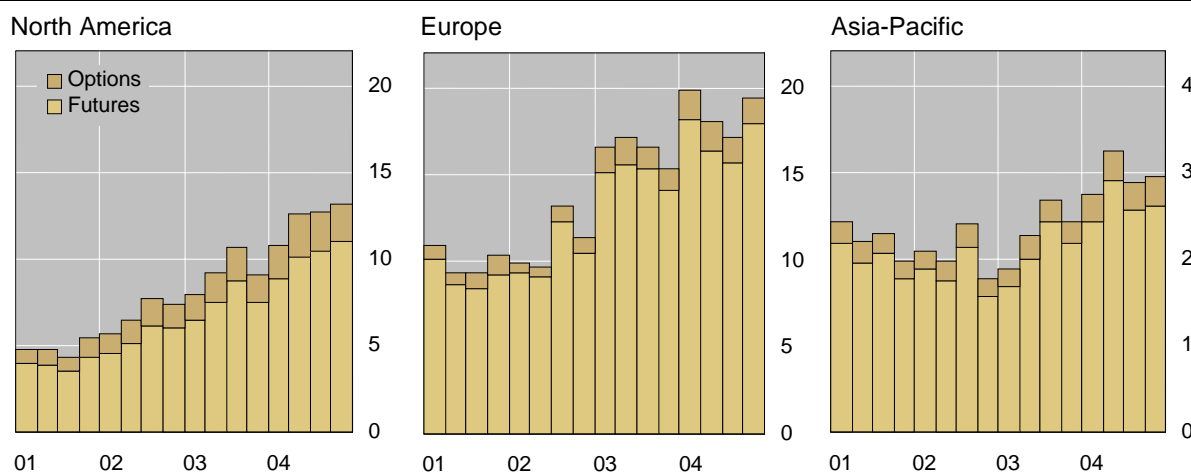
Graph 4.2

the standard deviation of federal funds rate target forecasts hit the year's maximum at the end of May and dropped visibly after the June decision, remaining at extremely low values since then.

As mentioned above, European short rate business was more robust during the quarter than that in the United States. This was particularly the case in November, when there was strong trading in European marketplaces (up 23%) while business in the United States was virtually flat. The contrast may be related to the fact that uncertainty about the path of rates did not appear to diminish as in the United States. Volatilities of three-month rates in Europe remained rather stable through the last quarter of 2004, compared to declines in the United States. Neither was there evidence of a decline in the dispersion of forecasts of official European rates.

Turnover of government bond contracts

Quarterly contract turnover, in trillions of US dollars



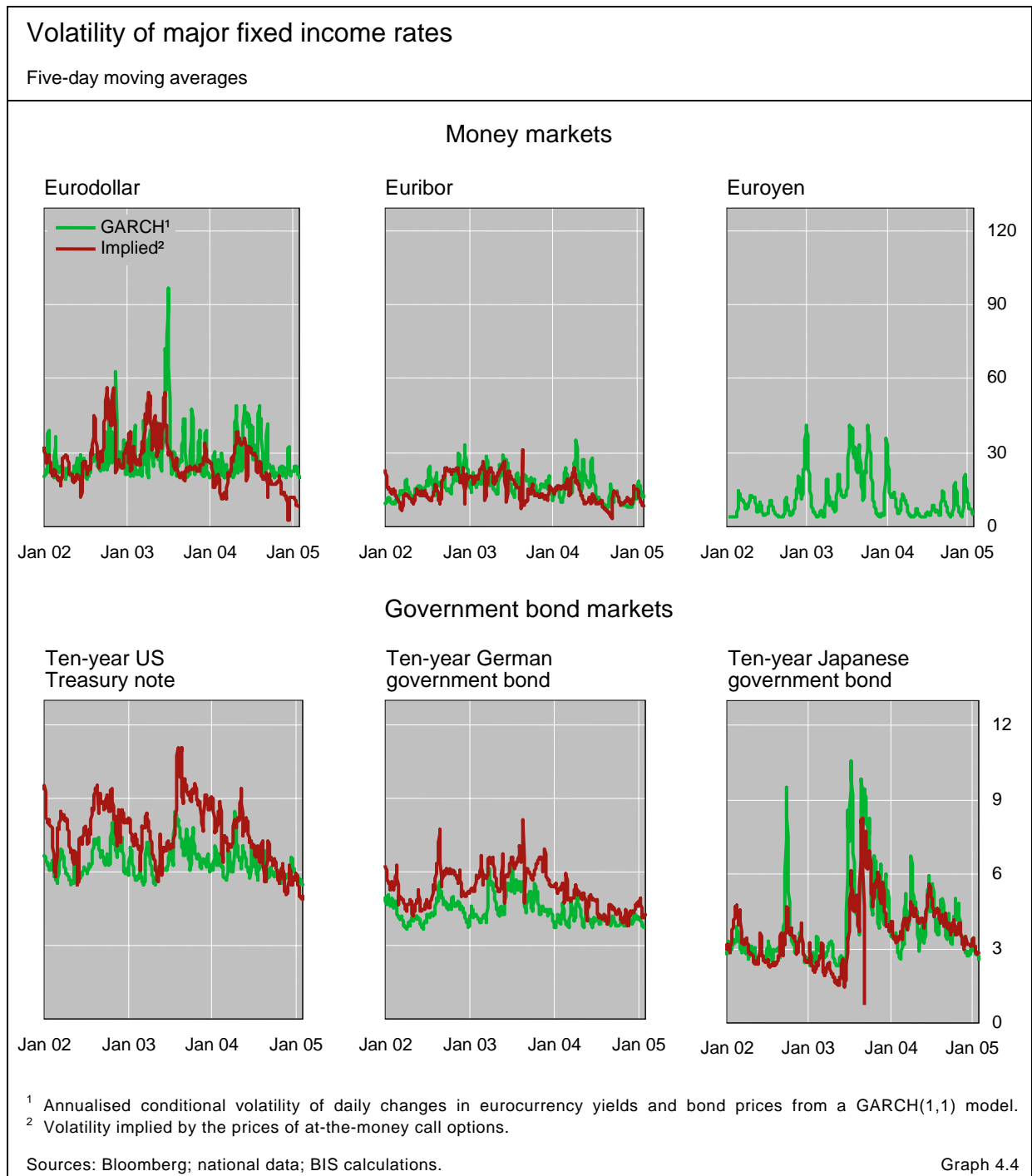
Sources: FOW TRADEdata; Futures Industry Association; BIS calculations.

Graph 4.3

In the long-term interest rate segment, contracts expanded by 8% in the fourth quarter, to \$36 trillion. Business was up 3% in North America to \$13 trillion, and by 13% in Europe to \$19 trillion (Graph 4.3). This activity could have been related to downward revisions of future economic growth, which might have boosted hedging activity at the long end of the yield curve. In the last quarter of 2004, growth forecasts for 2005 as compiled by Consensus Economics were revised downwards in both the United States and Europe.

Long-term bond contracts grow, especially in Europe

Trading at the long end of the maturity spectrum in the fourth quarter may also have been favoured by a flatter term structure of implied volatilities – a phenomenon particularly pronounced in the United States, due to sharply



falling volatilities at the short end and stable volatilities over longer maturities (Graph 4.4). The higher relative volatility of long-term rates has changed the risk-return characteristics of interest rate portfolios and has possibly increased the need for hedging activity.

Business falls in Asia for the second quarter in a row ...

In the Asia-Pacific region, turnover contracted by 17% to \$9 trillion. The decline was due to falling activity in short-term rates, down by 24%, while business in long rates rose by 3%. The contraction in the short-term segment was again largest in Asia, where activity, which had already dropped 25% in the third quarter, was down by an additional 46% in the last quarter of the year. Among Asian countries, declines were sharpest in Japan, where turnover of short-term contracts decreased by 27%, and in Singapore, where there was a 74% plunge in futures on three-month eurodollar instruments¹ and a 24% fall in futures on the three-month euroyen. The decline in short rate position-taking in Japan probably reflected less demand to hedge against the likelihood of the Bank of Japan ending its policy of quantitative easing over the near and medium term, since there was a marked reduction in GDP growth forecasts for 2005 from nearly 2% in June to just over 1% last December. In Australia, where interest rate derivatives transactions had soared by 18% in the third quarter, activity remained positive but grew at a much slower rate in the fourth quarter of the year, with short- and long-term contracts up by 5%.

... but keeps growing in Australia

Business in currency contracts expands further

Trading in currency products expands further ...

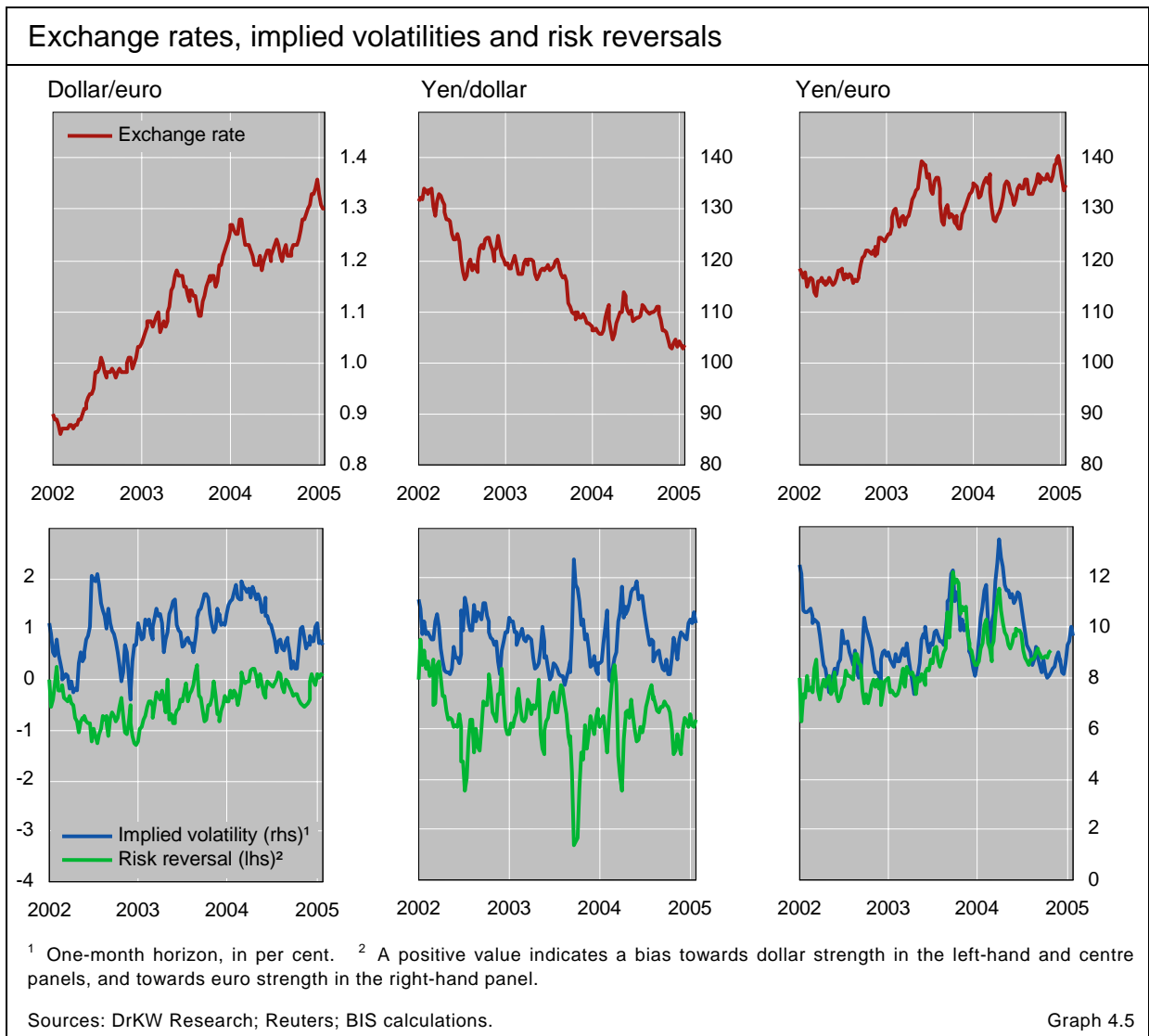
In sharp contrast to the decline in interest rate derivatives trading, turnover of exchange-traded currency derivatives amounted to \$2.3 trillion in the fourth quarter of 2004, a 36% rise from the previous quarter. Despite its growth, this segment of the overall exchange-traded derivatives market still represents only 1% of overall trading. Futures form the vast majority of derivatives in this category (\$2.1 trillion), with currency options representing just 8% of overall activity. The boom in the fourth quarter stemmed above all from strong business in the euro, yen and Swiss franc vis-à-vis the dollar, up by 44%, 41% and 36% respectively.

The increase in turnover was global, with business up 39% in the United States to \$2.1 trillion, by 43% in Europe to \$4 billion, and by 16% in Asia to \$30 billion. While activity remains highly concentrated in US marketplaces, where 90% of trading takes place, Brazil is a particularly active exchange especially for options trading. Business in futures and options traded on the São Paulo Mercantile and Futures Exchange (BMF) amounted to \$177 billion, six times the overall total in Asian and Australian exchanges (\$29 billion). Derivatives trading on the BMF started in 1986, and gained particular strength after 1994, in coincidence with the start of the Real Plan.

... favoured by a sliding dollar ...

Clear trends as well as higher volatility in foreign exchange markets are often associated with increased investment and hedging activity in those markets. The strong demand for currency hedging in the fourth quarter is thus

¹ These contracts are traded in Singapore under a Mutual Offset System Agreement with the Chicago Mercantile Exchange.



likely to be related to the further slide of the dollar against major currencies (2%, 5% and 4% against the euro in October, November and December respectively) as well as higher implied volatility, which rose from 8.8% per year in September to over 11% per year on average in the last quarter. By contrast, business was not associated with expected changes in the bilateral rates of main currency pairs, which can also stimulate hedging activity. In fact, risk reversals on the dollar/euro and yen/dollar pairs moved slightly towards less negative values and remained overall very close to zero, indicative of a neutral view about the future development of dollar exchange rates (Graph 4.5).

... and higher implied volatilities

Activity in stock indices surges again

After remaining stable in the second quarter and contracting in the third, global turnover in stock index contracts returned to robust growth in the last quarter of the year. Overall trading rose by 17% to \$25 trillion. Business was particularly strong in the Asia-Pacific region, rising 23% to \$9 trillion, and in the United States, up by 15% to \$10 trillion. Turnover grew more slowly in Europe, by 10% to \$5 trillion. This relatively lower growth came entirely from weak activity in the

Stock index turnover rises ...

... but less rapidly
in Europe

United Kingdom, where trading in stock index derivatives was up by 1% only, due to the complementary effects of falling turnover on the FTSE 100 index traded on the LIFFE and rising activity on the Swedish and Danish stock indices traded on the EDX exchange. Excluding the United Kingdom, business was up by nearly 20% on average in the other main countries of the area (by 29% in Spain, 23% in Italy, 14% in France and 11% in Germany).

The 17% rise in overall stock index business in terms of notional amounts compares with a 9% increase when activity is measured in terms of number of contracts. This type of discrepancy was evident in all regions but was particularly sizeable in European marketplaces, where the 10% rise in terms of notional amounts corresponded to a 2% fall in terms of number of contracts. This could indicate that the expansion in turnover may derive from an increase in the value of derivatives contracts following a surge in the levels of stock indices rather than from an actual increase in the volume of trading.

Overall, as measured by notional amounts, options turnover was up by 21%, to \$14 trillion, while business in futures grew by 11%, to \$11 trillion. The stronger growth in the options segment was mainly accounted for by the US market, where activity in such instruments was up by 22%. Turnover on the Chicago Board Options Exchange, which accounts for nearly 90% of trading in options in the United States, increased after declining for two consecutive quarters, with robust activity in the S&P 500, the Nasdaq 100 and the Dow Jones Industrial indices. Trading in options was also more buoyant than that in futures in Asian and Pacific marketplaces. In Europe, options turnover expanded by 12% against 6% for futures. Options business was particularly strong in Spain and Italy, up 64% and 29% respectively, although the two countries account for just slightly over 3% of total trading of equity index options in European marketplaces.

Trading pushed by
rising equity
indices ...

... in a context of
higher volatility

The surge in equity index trading in the United States and Europe may reflect the upward movement of the underlying indices, around 9% between end-September and end-December 2004 in both areas; these indices had been virtually flat in the first eight months of the year. Higher turnover may also be due to the reversal in the downward trend displayed by volatilities since mid-2002. Implied volatilities, which had fallen remarkably from the peaks of September 2002 and touched historical lows last September of 11% and 7% (annualised) in the United States and Europe respectively, started to increase in the fourth quarter and reached on average 13% and 14%.

On Asian exchanges, trading in the Korean stock market, which in the third quarter of 2004 had dropped by 26% due to ongoing investigations regarding derivatives trades, expanded by 26% in the fourth quarter. Business was also strong in Japan, up by 10%.

Individual stock
contracts rise

Increased business in equity-related products was also apparent in the increased turnover of contracts on individual stocks (data on which are available only in terms of number of contracts). After falling in the previous two quarters, the number of traded futures and options contracts rebounded by 12% in the fourth quarter. Futures traded in Asian marketplaces were particularly strong, up by 28%. Turnover in Europe and in the United States

was nearly flat, with the only exception being for options traded on US exchanges, which rose by 25%.

Trading in commodities remains unchanged

Activity in commodity markets, which can only be measured in terms of number of contracts, was virtually flat in the fourth quarter, with growth of less than 2%. Business edged down by 1% in the United States and was up by 5% in Europe, mainly due to increased trading in UK marketplaces.

Overall turnover of energy derivatives grew by 1%, albeit with high dispersion across areas. Contracts rose by 8% on Asian exchanges but fell by 3% in the United States and Europe. Total turnover may have increased more markedly in terms of notional amounts, since the price of energy products, which at the end of last year represented 42% of total commodities trading, rose in the last quarter of 2004. However, open interest, which records the number of contracts not yet closed, also fell, which may indicate that economic agents did indeed reduce hedging activity in the energy sector.

Energy trading up in Asia

Trading in non-precious metals derivatives rose by 8% overall, 9% in Europe and 6% in the United States and Asia. The increased business came almost entirely from the London Metal Exchange, where transactions were particularly strong for aluminium, copper and zinc. Given that trading activity in these commodities tends to lead changes in coincident cyclical indicators, the recent higher activity may anticipate a new upward reassessment of future global growth in 2005 after the downward revisions that took place in the fourth quarter of 2004.

Transactions rise for non-precious metals

Trading Asian currencies¹

Foreign exchange turnover in Asian currencies grew faster than the global total between 2001 and 2004. Renminbi trading rose particularly strongly. Evolving expectations about the renminbi seem to be joining the dollar/yen spot rate in exerting an influence on Asian foreign exchange markets. Asian currencies with more flexible exchange rates appear to be trading with an effective exchange rate orientation.

JEL classification: F31, F36.

The April 2004 Triennial Central Bank Survey of Foreign Exchange and Derivatives Market Activity confirmed that trading in several Asian currencies is growing very rapidly. Whereas global turnover expanded by 57% and 36% at current and constant exchange rates, respectively, activity in most major Asian currencies grew even faster. Renminbi turnover rose particularly strongly.

Three questions follow. First, what drove the rise in Asian currency trading in the three years following the 2001 survey? In particular, what explains the strong growth in some Asian currencies and the weaker growth in others? Second, could the exceptionally rapid expansion of renminbi turnover foreshadow a stronger influence of the Chinese currency in regional foreign exchange markets? Third, what might the renminbi's influence mean for the trading pattern of Asian currencies?

This special feature first shows that turnover in Asian currencies increased rapidly between 2001 and 2004. Both global factors such as the search for yield and a secular deepening in Asian financial markets contributed to the strong growth. The article then considers the apparently rising influence of the renminbi on the trading patterns of Asian currencies. Evolving expectations of the dollar/renminbi rate appear to be joining the dollar/yen spot rate in exhibiting significant co-movement with other regional currencies against the dollar. This evidence does not support the conventional wisdom that Asian currencies all trade in a dollar bloc. Instead, this may indicate that Asian currencies are increasingly trading with an effective exchange rate orientation.

¹ The views expressed in this article are those of the authors and do not necessarily reflect those of the BIS. We thank Claudio Borio, Gabriele Galati and Frank Packer for their comments. San Sau Fung, Paola Gallardo, Carlos Mallo, Les Skoczylas and Jhuvesh Sobrun provided research assistance.

Growing turnover in Asian currencies

Traditional foreign exchange trading in Asian currencies generally recorded much faster growth than the global total between 2001 and 2004 (Table 1). Growth rates exceeding 100% were common. Renminbi and rupiah turnover increased particularly strongly.² The main exceptions in this broad picture were the Hong Kong dollar, the Singapore dollar and the Malaysian ringgit, activity in which expanded more slowly than the global total. Trading in the Japanese yen also grew relatively slowly over the same period, even by the standards of the major currencies.

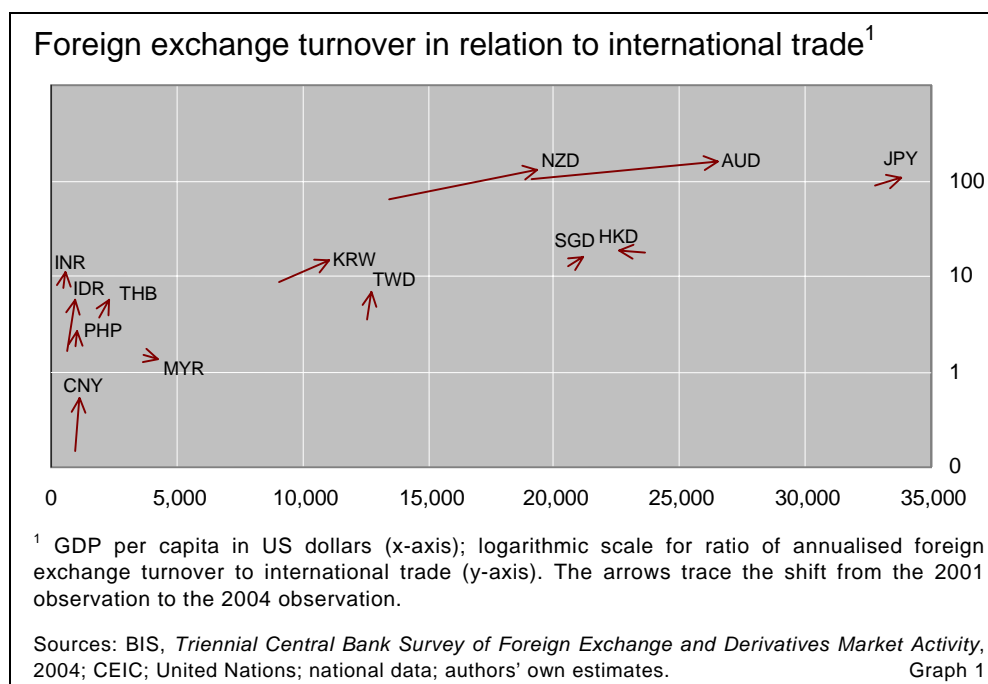
Turnover in Asian currencies grew strongly ...

Galati and Melvin (2004) cite the global search for yield as a driving force behind the surge in traditional foreign exchange trading between 2001 and 2004. The strong growth in turnover recorded for some Asian currencies over the same period was arguably a part of this global trend. The carry trade strategy benefited high-yielding currencies such as the Indonesian rupiah,

... owing to global and cyclical factors ...

Traditional foreign exchange market turnover in Asia-Pacific, April 2004 ¹					
Daily averages, in millions of US dollars					
	Spot	Forward ²	Swap	Total	Growth since 2001 (in %)
Australian dollar	28,539	9,788	58,796	97,123	96
Chinese renminbi	992	811	9	1,812	530 ³
Hong Kong dollar	6,827	2,221	24,133	33,181	21
Indian rupee	2,877	1,531	1,658	6,066	114
Indonesian rupiah	760	267	1,025	2,051	283
Japanese yen	130,382	47,135	181,715	359,231	35
Korean won	10,510	6,048	4,592	21,151	117
Malaysian ringgit	351	237	399	987	7
New Zealand dollar	4,018	1,462	12,181	17,661	163
Philippine peso	345	232	188	765	52
Singapore dollar	5,177	1,242	10,591	17,010	32
New Taiwan dollar	3,607	2,798	856	7,261	129
Thai baht	1,333	490	1,669	3,492	88
<i>Memo:</i>					
<i>US dollar</i>	528,639	170,357	874,083	1,573,080	48
<i>Euro</i>	272,887	88,243	298,231	659,361	49
<i>Pound sterling</i>	82,839	31,338	185,241	299,417	93
<i>Canadian dollar</i>	23,696	8,947	41,930	74,573	43
¹ Provisional figures; final results forthcoming. ² This category also includes transactions where only the difference between the contracted forward outright rate and the prevailing spot rate is settled at maturity, such as those involving non-deliverable forwards (ie forwards settled in dollars) and other contracts for differences. ³ Based on a 2001 figure adjusted upwards to render it more comparable with the 2004 figure.					
Source: BIS, <i>Triennial Central Bank Survey of Foreign Exchange and Derivatives Market Activity</i> , 2004. Table 1					

² Greater efforts to collect data on non-deliverable forwards in the 2004 survey may have played a role in boosting the recorded turnover in Asian currencies with non-deliverable forward trading, such as the Chinese renminbi, the Indian rupee, the Indonesian rupiah, the Korean won, the Philippine peso and the New Taiwan dollar.



just as it did the Australian and New Zealand dollars. Nonetheless, interest rates are only part of the story – after all, most capital flows into Asia target equities rather than bonds. More broadly, the revival of Asian economies in late 2003 stoked investors' interest in increasing their exposure to the region. The appreciating trend since 2002 among Asian currencies with flexible exchange rates also made them more attractive as an asset class.

... and financial catching-up

Beyond the global and cyclical factors, however, the rapid expansion in the trading of Asian currencies also reflects a secular deepening of financial markets in the region. Foreign exchange turnover and related capital account transactions are catching up with these economies' underlying role in international trade, perhaps tracing a logistic "S" curve (Graph 1). Currencies of the lower-income economies tend to turn over at a lower multiple of international trade. At the same time, currencies such as the renminbi and the rupiah can grow rapidly from their low bases, notwithstanding the inhibiting force of controls that separate the offshore and onshore markets.³ An exception is the ringgit, which did not exhibit such catching-up. Policy has not only banned the currency's offshore deliverability but also until recently managed to prevent offshore trading in non-deliverable forwards.

This theme of catching-up is perhaps even more evident when it comes to currency derivatives markets. Cross-currency swaps and options have not been extensively traded in a number of Asian currencies (Table 2). However, where such markets have been established, they can show stronger turnover growth from their low bases than do more developed derivatives markets.

³ In the case of the rupiah, even the rapid turnover growth between 2001 and 2004 has not yet restored activity to the pre-crisis levels seen in 1995 and 1996 (BIS (1997), Galati (2000)). The rupiah's status as the most actively traded emerging market currency at the time owed much to the carry trade.

Turnover of foreign exchange derivatives in Asia-Pacific, April 2004 ¹				
	Daily averages, in millions of US dollars		Growth since 2001 (in %) ²	
	Cross-currency swaps	Options	Cross-currency swaps	Options
Australian dollar	1,573	8,543	208	150
Chinese renminbi	4	136	...	272,355
Hong Kong dollar	293	365	3	385
Indian rupee	97	100	10,162	...
Indonesian rupiah	24	7	93	...
Japanese yen	3,354	37,430	70	58
Korean won	342	579	645	265
Malaysian ringgit	11	1
New Zealand dollar	80	811	-21	1,397
Philippine peso	4	5	77	...
Singapore dollar	54	272	199	69
New Taiwan dollar	102	718	369	398
Thai baht	246	125	2,121	2,858
<i>Memo:</i>				
<i>US dollar</i>	17,605	92,276	196	94
<i>Euro</i>	9,732	51,085	344	95
<i>Pound sterling</i>	4,835	11,645	301	126
<i>Canadian dollar</i>	521	5,884	44	98

¹ Provisional figures; final results forthcoming. ² Growth rates are not available in some cases due to negligible or unavailable turnover figures in 2001.

Source: BIS, *Triennial Central Bank Survey of Foreign Exchange and Derivatives Market Activity*, 2004. Table 2

Rising influence of the renminbi?

The rapid expansion of renminbi turnover coincided with a period of heightened expectations of further currency regime reform, which was often presumed to imply a prospective appreciation of the Chinese currency. Although the spot renminbi is still de facto fixed to the dollar – with trading mainly confined to a mostly onshore market – an increasingly active offshore market in non-deliverable forwards (NDFs) registers the strength of expectations of future spot rate movements. Formerly, this NDF market was thin, with trading of only a couple of hundred million dollars' worth of contracts (ultimately settled in dollars, hence non-deliverable) per day. But daily turnover can now hit a billion dollars or more (Ma et al (2004)). Accordingly, the renminbi NDF rates may bear more economic and market weight now than before.

Speculation over renminbi appreciation is seen to have increasingly influenced the trading pattern of Asian currencies. A recent study finds that large, China-specific event-driven moves of the one-year renminbi NDF have shown a significant spillover effect on the yen, the Australian dollar, Northeast Asian currencies plus the Singapore dollar and the Thai baht (Malcolm (2005)).

The renminbi NDF and Asian currencies track each other more generally, even after controlling for yen and euro movements. Table 3 shows the elasticities estimated from daily exchange rates. An elasticity of x indicates that

Renminbi speculation shows influence ...

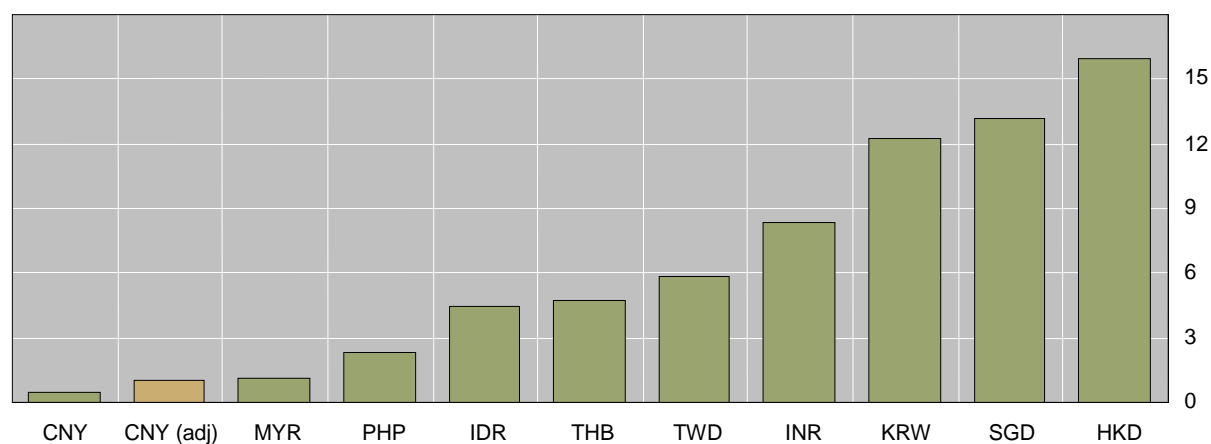
Renminbi trading: underestimated and underweighted?

Are the turnover data for the renminbi really comparable to those for other currencies? To approach this question, it helps to recall that the Triennial Survey data are a compound of data compiled by the home central bank and by the rest of the world's central banks. In the case of the renminbi, the former data set has a sizeable gap that the latter only partially fills. Chinese data reported to the BIS on domestic renminbi turnover do not fully capture bank transactions with non-bank financial and non-financial counterparties. Reported domestic renminbi turnover data cover only spot trades among members of the Shanghai-based China Foreign Exchange Trade System (CFETS). CFETS members include most domestic and foreign-owned banks as well as a few non-bank financial institutions. Thus, spot and forward transactions between banks, on the one hand, and most other non-bank financial counterparties plus all non-financial counterparties, on the other, are not captured in reported domestic turnover. However, the data collected by the rest of the world's central banks capture some renminbi spot transactions between some onshore non-bank financial and non-financial counterparties and onshore banks.^① Judging from the scale of these offshore customer deals relative to that of China's international transactions, however, a large portion of the onshore bank-customer trades is not captured in either onshore- or offshore-reported data.

It is not difficult to produce an estimate that would double the total reported renminbi turnover. Unreported bank-customer spot transactions within China could be large – owing in part to the practice of mandatory sales and purchases of foreign exchange and in part to the country's rapidly growing two-way cross-border flows. Assuming conservatively that these unreported bank-customer transactions might amount to half of China's 2003 gross trade flows of goods and commercial services, spot and total renminbi turnover would triple and double to \$2,900 million and \$3,600 million, respectively, compared with the \$992 million and \$1,812 million reported in Table 1.

However, a substantially larger estimate of domestic turnover, along with the offshore transactions in NDFs, does not alter the conclusion that turnover in the renminbi is still relatively low. Graph A suggests that, as a ratio to trade flows, turnover in the renminbi, adjusted or unadjusted, ranks at the bottom among the ratios for emerging Asian currencies.

Ratio of foreign exchange turnover to gross trade flows¹



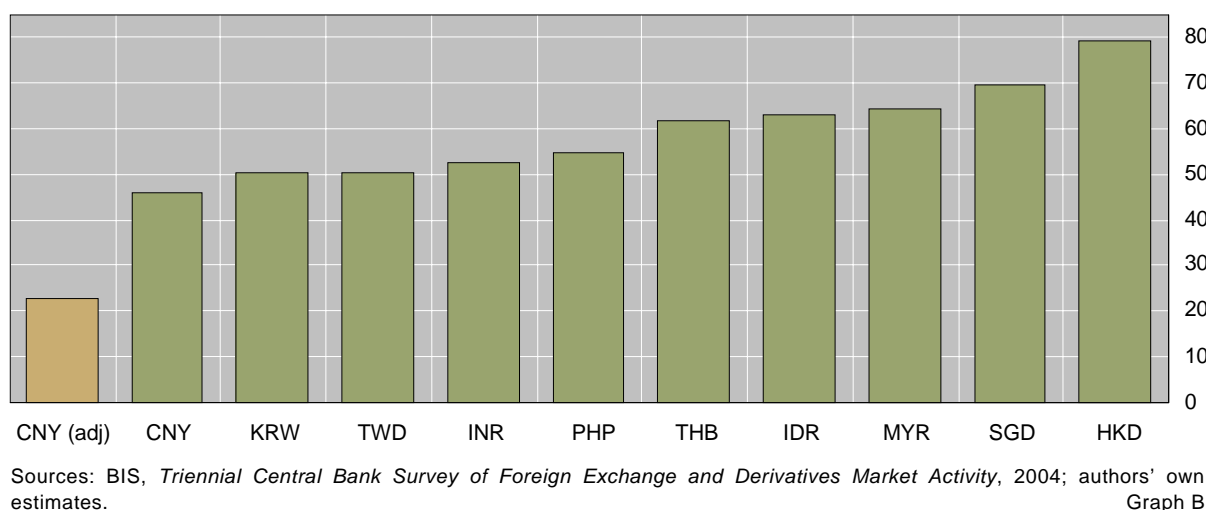
¹ Annual turnover is obtained by multiplying the average daily turnover in April 2004 by 256. Annual gross trade flows are the sum of exports and imports of goods and commercial services. Both turnover and trade flows are in current US dollars.

Sources: BIS, *Triennial Central Bank Survey of Foreign Exchange and Derivatives Market Activity*, 2004; CEIC; WTO; authors' own estimates. Graph A

^① The basis for the "location" of transactions was shifted in the 2004 survey from the legal entity ("legal booking centre") in the 2001 survey to the location of the sales desk ("telephone number").

Why has the renminbi market remained shallow by any measure? Four hypotheses can be advanced. The first is the absence of high-frequency cross-border flows, due to China's still tight control on portfolio flows. Ma and McCauley (2004) present evidence that, owing to these binding restrictions, onshore and offshore interest rates in the renminbi differ markedly. A second possibility is the absence of interbank forward/swap and option trading in China, despite a nascent bank-customer forward market onshore. Even including offshore NDFs, the ratio of forwards and swaps to total turnover for the renminbi remains the lowest among Asian currencies (Graph B).² Third, the high concentration in renminbi transactions among the big Chinese banks and their ability to net out trades before trading in the CFETS also reduces turnover. Finally, private renminbi transactions in China often have the character of one-way rather than two-way trade.

Forwards and swaps as a percentage of total foreign exchange turnover



² Adjusted for unreported bank-customer transactions, which should be mostly spot, this ratio would be even lower.

a 1% move in the yen (or euro or renminbi) against the US dollar is on average associated with an x% move in an Asian currency against the dollar. At the limit, an Asian currency that is fixed to the dollar would show no co-movement with the dollar values of the yen, the euro or the renminbi NDF (ie zero elasticity). The larger the value of x, the more the Asian currency co-moves with the relevant exchange rate (ie the less it is "pegged" to the dollar).

The estimates suggest that while movements in the dollar/yen spot rate remain the main influence on Asian currencies, the role of the renminbi NDF seems to be increasing.⁴ The renminbi's co-movement with Northeast Asian currencies strengthened in 2004 compared to 2003. In particular, the elasticity of the Korean won spot rate with respect to the renminbi NDF in 2004 was comparable in magnitude to that with respect to the yen. For the Hong Kong dollar forward and New Taiwan dollar spot, the influence of a given change in the renminbi NDF was in fact stronger than that of the same change in the

... even after controlling for the yen and the euro

⁴ Movements in the dollar/yen spot rate have been a leading influence on Asian foreign exchange markets since a number of formal or informal dollar pegs came undone during the Asian crisis. Galati and McCauley (1998) documented early evidence of higher post-crisis sensitivity of Asia-Pacific currencies to dollar/yen movements.

Co-movement of Asian currencies with the yen, euro and renminbi NDFs, 2003–04 ¹								
	2003				2004			
	JPY	EUR	CNY NDF	<i>Memo: R-squared</i>	JPY	EUR	CNY NDF	<i>Memo: R-squared</i>
KRW spot	0.33***	0.04	0.17*	0.203	0.32***	0.12***	0.30***	0.411
IDR spot	0.15***	0.09**	0.12	0.070	0.28***	0.12***	0.30**	0.210
SGD spot	0.21***	0.08***	0.15***	0.319	0.22***	0.11***	0.11*	0.392
THB spot	0.24***	0.04*	0.14**	0.304	0.22***	0.08***	0.13**	0.402
TWD spot	0.09***	0.03**	0.12***	0.218	0.20***	0.00	0.28***	0.217
CNY 1-year NDF	0.11***	0.00	–	0.041	0.12***	0.02	–	0.115
PHP spot	0.09**	0.01	0.02	0.023	0.08***	0.02	0.00	0.093
HKD 1-year forward	0.03***	0.01	0.08***	0.103	0.02***	0.03***	0.11***	0.246

¹ Elasticity coefficients are estimated by regressing the daily changes, in per cent, in Asian currency X (expressed in X per US dollar) on a constant and the daily changes, in per cent, in the yen, the euro and the one-year renminbi NDF (all in US dollar terms). Significance: *** = probability less than 0.001, ** = probability less than 0.01, * = probability less than 0.1.

Sources: Bloomberg; Datastream; national data; BIS calculations. Table 3

yen.⁵ Nevertheless, it is notable that any increase in the Chinese currency's role in Asian foreign exchange markets has not diminished the measured influence of the yen.

Asian currencies: a dollar bloc no more

Dollar bloc view not supported

The above results do not support the conventional wisdom that Asian currencies have gravitated back towards a US dollar bloc since the Asian crisis. Certainly, both the renminbi and the Malaysian ringgit adopted hard links to the dollar during the crisis, prompting some observers to argue that these would drag other regional currencies back towards dollar pegs (Ogawa and Ito (2002)). Academics and others discerned an “East Asian dollar standard” and a “neo-Bretton Woods”.⁶ However, the significantly positive elasticities estimated above do not lend support to such views, which would predict a negligible systematic relationship between Asian currencies and the yen or the euro.

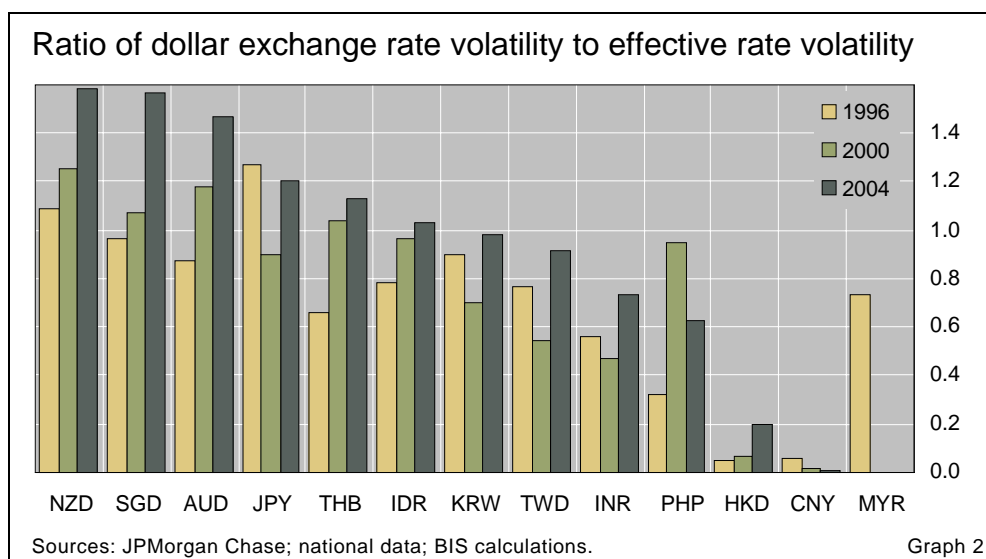
Signs of effective exchange rate orientation ...

If Asian currencies are not trading as a dollar bloc, how then should their current trading patterns be characterised? While some observers have envisioned gravitation towards the yen (Kwan (2001), Kim et al (2004)), a more plausible conjecture is that Asian currencies have moved in the direction of an effective exchange rate orientation, somewhat like that of the Singapore dollar (Kawai (2002)). This conjecture is consistent with the observed increase in the volatility of bilateral exchange rates relative to effective exchange rates in 2004 compared to 1996 among the Asian currencies with more flexible exchange rates (Graph 2).⁷ The Singapore dollar has long seen higher volatility against

⁵ However, given that the renminbi NDFs are only about a third as volatile as the dollar/yen, the overall effect of the yen on the New Taiwan dollar still measures larger.

⁶ Among such proponents are McKinnon and Schnabl (2003) and Dooley et al (2003).

⁷ It was easier to argue in 2000 than more recently that the dollar standard was being restored in East Asia. In any case, the contrast is clear between the sizeable ratios of the more flexible



the US dollar than against a basket of its trading partners' currencies.⁸ It has more recently been joined by the Thai baht. The Indonesian rupiah and the Korean won show nearly equal bilateral and effective volatilities.

The conjecture that Asian currencies are becoming less dollar-oriented and more effectively oriented also gains support from the regression analysis above. Elasticity coefficients on the yen in 2003 and 2004, even after controlling for the renminbi NDF, are considerably higher than those observed before the crisis (Tables 3 and 4). The importance of the yen is consistent with the widely appreciated third-market competition between Asian exporters and Japan. The euro also seems to have gained a significance that was not prefigured by that of the Deutsche mark. The renminbi's recent influence could reflect the growing trade ties between China and its Asian neighbours. For instance, China now serves as Korea's largest market, so it makes sense that the won moves as strongly with the renminbi as with the yen.

Two related observations are in order. First, there is a difference between the Singapore dollar's effective exchange rate orientation and that of other Asian currencies. The Singapore dollar's effective rate serves as the explicit focus of Singapore's monetary policy regime.⁹ For the other currencies, any such orientation seems to have emerged as a by-product of the interaction between more policy flexibility against the US dollar and fundamental factors such as the substantial trade links with non-dollar areas. These fundamental factors have in turn been reinforced by the behaviour of the authorities – be it

... though different from Singapore's case

currencies and the near zero ratios of the pegged Hong Kong dollar, renminbi and ringgit. The rise in the ratio for the Australian and New Zealand dollars reflects a shift from their trading with the US dollar to their trading with the euro.

⁸ The Singapore dollar's increasingly non-dollar orientation over time (as suggested by the regression estimates or strongly rising volatility ratio) illustrates the interaction between the authorities' broad-basket approach (comprising about a dozen currencies according to market estimates) and the increasing non-dollar orientation of a number of Singapore's Asian trading partners. As the Thai baht and the New Taiwan dollar respond more to the yen or the euro, the Singapore dollar in turn becomes more responsive as well, given the effective orientation.

⁹ See Monetary Authority of Singapore (2001) for an overview of Singapore's policy framework.

Co-movement of Asian currencies with the yen and Deutsche mark, 1995–96 ¹						
	1995			1996		
	JPY	DEM	<i>R-squared</i>	JPY	DEM	<i>R-squared</i>
KRW spot	0.11***	-0.05*	0.059	0.13***	0.01	0.083
IDR spot	-0.01	0.03*	0.003	-0.01	-0.04	0.006
SGD spot	0.16***	-0.04	0.119	0.11***	0.02	0.150
THB spot	0.08***	-0.01	0.281	0.09***	0.01	0.249
TWD spot	0.17***	-0.10***	0.116	0.04***	0.02	0.070
CNY spot	0.00	-0.01	0.001	0.00	0.00*	0.004
PHP spot	-0.01	-0.03	-0.002	0.00	0.00	-0.008
HKD 1-year forward	-0.01	0.01	-0.006	0.00	-0.01	-0.004
MYR spot	0.11***	-0.02	0.127	0.06***	0.01	0.058

¹ Elasticity coefficients and significance as in Table 3 except that the Deutsche mark is used instead of the euro.

Sources: Bloomberg; Datastream; national data; BIS calculations. Table 4

Market logic of increased renminbi influence

“open mouth” policy of public references to the yen or other cross-rates, or actual market intervention at extreme effective valuations.

Second, the detected co-movement with the renminbi NDF should not be taken to imply that the Asian authorities have actually placed the renminbi NDF in their implicit or explicit exchange rate basket. Such co-movement could result simply from market participants’ appreciation for the fundamental and/or policy reasons for an effective orientation. In particular, market participants might expect that, were the renminbi allowed to appreciate against the dollar, other Asian currencies would be allowed to strengthen as well without necessarily appreciating their respective effective exchange rates. This logic may underpin increased proxy trading in the Singapore dollar as market participants position for renminbi appreciation, as well as a possible review of the ringgit peg.¹⁰ If one dares to push the logic further, it is not inconceivable that a more liberalised and flexible renminbi spot rate in the future may play an anchor role for regional currencies, in addition to, if not instead of, the yen.¹¹

Conclusion

Turnover in Asian currencies has grown significantly in recent years. Less-traded currencies such as the renminbi have been catching up particularly rapidly. Trading patterns among regional currencies as well as their relationship with the major currencies have also evolved. Recent evidence suggests that the broad-basket effective exchange rate orientation that has long characterised the Singapore dollar may be gaining prominence in the market for other East Asian currencies. Market participants seem to be

¹⁰ Malaysia is Singapore’s top trading partner. Any renminbi appreciation has also been regarded by some observers as a possible trigger for a review of the ringgit peg.

¹¹ The vision of emerging Asia’s currencies eventually forming a regional bloc that floats against the dollar, the euro and also the yen has been put forth by Suttle and Fernandez (2005).

anticipating a world in which movements in the renminbi, in addition to those in the yen and the euro, matter to the trading of regional currencies.

References

Bank for International Settlements (1997): *67th Annual Report*, pp 97–117.

Dooley, M P, D Folkert-Landau and P Garber (2003): “An essay on the revised Bretton Woods system”, *NBER Working Papers*, no 9971, September.

Galati, G (2000): “Forex trading volumes, volatility and spreads in emerging market countries”, *BIS Quarterly Review*, November, pp 49–51.

Galati, G and R N McCauley (1998): “The yen/dollar exchange rate and fluctuations in Asia-Pacific currencies”, *BIS Quarterly Review*, November, pp 13–15.

Galati, G and M Melvin (2004): “Why has FX trading surged? Explaining the 2004 triennial survey”, *BIS Quarterly Review*, December, pp 67–74.

Kawai, M (2002): “Exchange rate arrangements in East Asia: lessons from the 1997–98 currency crisis”, Bank of Japan, Institute for Monetary and Economic Studies, *Monetary and Economic Studies*, vol 20, no S-1, December.

Kim, J Y, Y Wang and W Y Park (2004): *Coupling or decoupling of won/yen exchange rate*, paper presented at a workshop on “Monetary and exchange rate arrangements in East Asia” hosted by Claremont Graduate University and Korea Institute for International Economic Policy (KIEP), August, Seoul.

Kwan, C H (2001): *Yen bloc: toward economic integration in Asia*, The Brookings Institution Press, Washington DC.

Ma, G, C Ho and R N McCauley (2004): “The markets for non-deliverable forwards in Asia”, *BIS Quarterly Review*, June, pp 81–94. Summary translation in *China Money*, December, pp 4–8.

Ma, G and R N McCauley (2004): *Effectiveness of China’s capital controls*, paper presented at the second KIEP-PRI seminar on “Financial interdependence and exchange rate regimes in East Asia”, December, Tokyo.

Malcolm, J (2005): “Anticipating the spill-over from CNY reval”, Deutsche Bank, *Asian FX Strategy Notes*, 4 January.

McKinnon, R and G Schnabl (2003): *The East Asian dollar standard, fear of floating and original sin*, September, mimeo.

Monetary Authority of Singapore (2001): *Singapore’s exchange rate policy*, February.

Ogawa, E and T Ito (2002): “On the desirability of a regional basket currency arrangement”, *Journal of the Japanese and International Economies*, vol 16, no 3, pp 317–34.

Suttle, P and D Fernandez (2005): “Emerging Asia’s monetary future”, JPMorgan Chase, *Global issues*, January.

Time-varying exposures and leverage in hedge funds¹

Style analysis shows that as market conditions change so do the investment strategies of hedge funds. It also provides a simple indicator of hedge fund leverage that varies over time. The indicator suggests that leverage tended to be high in 1997–98 but lower more recently.

JEL classification: G11, G12.

Hedge funds are said to be nimble. They can quickly take large positions in various asset markets, only to unwind them as market conditions change. This flexibility and the ability to leverage positions are arguably the distinguishing characteristics that drive hedge fund returns but are also said to potentially add to market volatility. At the same time, little is known about hedge funds' actual strategies. While some information about their assets under management and returns on equity is available, far less is known about their portfolios and use of leverage. Under what market conditions do hedge funds change their investment positions? How does the leverage employed by the funds change as market conditions evolve? This article provides tentative answers to these questions, with a particular focus on the period surrounding the peak in equity markets in 2000.

We first investigate how hedge fund risk exposures vary over time. Our primary empirical tool is “regression-based style analysis”, an established technique used to uncover the risk factors that drive portfolio returns. A rolling application of this technique across hedge fund style families yields time-varying measures of exposure to a variety of risk factors which can, at a relatively broad level, shed light on changing investment tactics. The results confirm that hedge funds change investment tactics often. Further, they also suggest that hedge funds which reportedly belong to different style families, and thus presumably follow different investment strategies, have at least some commonality in their risk exposures. For example, the three broad fund families under consideration here, even those that are supposedly market neutral,

¹ We are grateful to Dimitrios Karampatos for outstanding research assistance. The views expressed in this article are those of the authors and do not necessarily reflect those of the BIS.

experienced similar changes in their risk exposures in the period surrounding the equity market peak in 2000.²

We then use this empirical framework to develop a rough time-varying indicator of leverage. Broadly, greater leverage can amplify returns, but at the expense of greater risk to hedge fund investors as well as to the counterparties that transact with the funds. However, even simple balance sheet measures of leverage cannot be constructed directly because hedge funds generally do not disclose their balance sheet positions. Moreover, much of what is called leverage in hedge funds arises not through outright borrowing but through off-balance sheet derivatives positions. Our indicator is based on a simple reinterpretation of the regression equation in style analysis, and captures the degree to which returns on assets are amplified in the returns on equity in hedge funds. Consistent with anecdotal evidence, this indicator suggests that leverage was at its highest in late 1997 and early 1998 for the hedge fund style families we consider. It reached a local high in 2000 around the peak in equity prices, but has been lower over the past few years.

Tracking growth with limited data

Painting a comprehensive picture of the hedge fund industry is virtually impossible given the data available. Hedge funds do not face the same disclosure requirements as other investment vehicles available to the retail investor, such as mutual funds. As a result, the main source of information on hedge funds is a small number of commercially available databases containing data which are *voluntarily* provided by the funds, presumably to publicise their track record and to attract additional capital. The performance information in these databases is typically limited to monthly returns (net of fees) and total assets under management (AUM). In most cases, there is no information on portfolio allocation, or measures of risk and leverage. This paper relies on the Hedge Funds Research (HFR) database, which represents, at best, 25–30% of the estimated total number of funds in existence.

Imperfect data on
hedge funds ...

The hedge funds are classified into (loosely defined) investment styles on the basis of their self-described investment strategy. This classification, made at the time the fund is entered in the database, rarely changes to reflect subsequent shifts in the fund's investment philosophy. For the purposes of the analysis below, the classifications provided by HFR are aggregated into broader investment style families (Table 1). Equity-focused funds concentrate on equity market investments, while directional funds reportedly follow strategies that represent bets on the direction of markets. By contrast, market neutral funds follow strategies that focus on hedged bets and arbitrage, and

... include
investment styles ...

² Ennis and Sebastian (2003) conduct a similar analysis using an index of fund of funds returns. See also IMF (2004) for an analysis of hedge funds' risk exposures during emerging market currency crises.

Number of hedge funds and assets under management ¹						
Investment style family	1996		2000		2004	
	Number of funds	Assets under management	Number of funds	Assets under management	Number of funds	Assets under management
Directional	101	5.6	231	15.0	295	18.6
Market neutral	307	19.7	886	68.0	1,500	144.6
Equity long/short	284	18.8	818	57.0	1,145	88.4
Funds of funds	166	9.8	520	32.7	1,079	101.2
All hedge funds ²	815	51.1	2,253	157.7	3,671	325.7

¹ The number of funds and total assets under management as listed in the compiled HFR monthly data files, as of end-January of each year. ² The totals across hedge fund style families do not sum to the total reported under "All hedge funds" because some sub-types (as classified by HFR) are not included in the four broad style families listed above.

Sources: HFR; BIS calculations. Table 1

thus their performance should be independent of the direction of the overall market.³

... and indicate substantial growth

Extrapolating from the sample of funds in the HFR database can be helpful in tracking the broad growth patterns in the hedge fund industry. Table 1 lists the number of funds and AUM in each of the family styles considered here. Overall, total AUM for all hedge funds in the HFR database was roughly \$326 billion in January 2004, considerably less than the industry estimates of \$0.6–1 trillion for all existing hedge funds. To the extent that the HFR sample is representative of the industry as a whole, the data imply that the number of directional funds more than doubled between January 1996 and January 2004, while the total AUM in these funds more than tripled. Even more exceptional growth is implied by the figures for market neutral and equity-focused funds. By January 2004, AUM in market neutral funds had risen to more than seven times its January 1996 value; in equity-focused funds, AUM was almost five times greater.

Time-varying risk exposures

Do funds in different style families indeed follow different investment strategies? Do they react similarly to common market events? Tracking the sensitivity of hedge fund returns to the returns on various asset markets can help in identifying changes in investment strategies. To this end, we use "regression-based style analysis", a technique first proposed by Sharpe (1992) in an application to mutual funds. Simply put, it involves the attribution of portfolio returns to a series of risk "factors", typically represented by the returns

³ These broad style families are aggregates of sub-families classified by HFR. Directional funds include the sub-families equity no-hedge, macro, market timing and short selling funds. Market neutral funds include distressed securities, equity hedge, event driven, market neutral and four arbitrage strategy sub-families. Equity funds include four emerging market focused sub-families, six equity sector-specific sub-families, equity hedge and equity no-hedge sub-families.

Box 1: Hedge fund databases and regression-based style analysis

Biases in hedge fund databases

The commercially available databases on hedge funds, including the HFR database used in this article, are based on information that is *voluntarily* reported by hedge funds. This gives rise to several biases that can cloud the interpretation of any empirical analysis based on these databases.^① First, hedge funds typically report to only one database vendor, implying that no one database provides a comprehensive picture of the industry (sample selection bias).^② Second, since the databases are assembled for the purpose of attracting new capital, they include historical performance only for the funds in existence during the last reporting period. This introduces a survivorship bias, since funds that stopped reporting at some point in the past are dropped. We have tried to partially correct for this by merging the monthly editions of the HFR database over the December 2001–November 2004 period. This preserves the information about funds that were included at one point in time during this period, but clearly does not distinguish between the various potential reasons for fund disappearance. Poor performance (or outright closure) is a frequent cause for a cessation in reporting, implying that the database would tend to flatter the overall performance of the industry. Conversely, larger funds may decide to close to new investors and thus cease reporting. This could bias downwards the performance information in the database if funds tend to close to new investors after a sustained period of good performance that attracts more AUM than can be profitably invested. Finally, funds that do report usually do so after a period of strong performance. Selective reporting of their past history will tend to overstate funds' average experience, and hence the average performance in the database (instant history bias).

Style analysis

In order to estimate the exposures of hedge funds to different asset classes, we have relied principally on “regression-based style analysis”. The technique uses a linear regression to attribute the observed performance of a portfolio (or a fund) to exposures to a set of underlying risk factors. Its basic premise is that the pattern of sensitivity of returns to the underlying risk factors would reveal to an outside analyst the unobserved pattern of portfolio exposures.

The technique can be illustrated by reference to a portfolio with allocations to k (known) assets. The overall portfolio return can be written as the weighted average of the returns on the individual assets, with the weights being the share of total funds invested in each asset:

$$R_t = w_1 F_t^1 + w_2 F_t^2 + \dots + w_k F_t^k$$

If the fund is fully invested, the sum of the portfolio shares should be equal to 100%. Analysts that do not know the portfolio weights (w) can infer them in the form of regression coefficients of the portfolio returns on asset returns. Typically, the analyst is also not aware of the exact set of securities in the portfolio. Thus, style analysis regressions are estimated using (as right-hand side variables) an array of broad market returns for the asset classes that are *thought to be* in the portfolio. Regression coefficients are then interpreted as exposures of the fund to these market risk factors. Moreover, since active management can produce excess returns over the broad market factors the regression is estimated with a constant term that captures the value of active management (if positive). Finally, because the fund could also have long or short cash positions the regression is estimated using returns in excess of the risk-free rate for both the dependent and independent variables:

$$(R_t - r_t^f) = \alpha + \beta_1 (F_t^1 - r_t^f) + \dots + \beta_k (F_t^k - r_t^f) + \varepsilon_{i,t}$$

^① See Fung and Hsieh (2000, 2002b) for discussion of these biases. ^② Agarwal et al (2004) compile the databases from three different commercial providers and find only a 10% overlap.

We estimate time-varying sensitivity parameters (β 's) for each hedge fund style family in a two-stage procedure. Our analysis is run on (unbalanced) panels of monthly returns for the funds belonging to each family across the January 1996–October 2004 time period. In the first stage, a stepwise regression is used to select from the universe of asset classes those that are relevant for the specific investment style. The selection criterion is based on the statistical significance of the excess returns on the factors (in Table 1) in explaining the excess returns of the group of funds over the entire sample period. The second stage involves rolling fixed window regressions for each of these panels of funds.[®] Each of these regressions is based on the *fixed set* of factors identified in the first stage. The estimated coefficients from these rolling regressions enable us to inspect the time-varying properties of the sensitivity to each of the risk factors through time.

[®] We have used six-, eight-, 12-, 18- and 24-month rolling windows with little impact on the qualitative nature of our results, although the estimated coefficients tend to be more volatile as the horizon shortens.

on asset classes that are *thought to be* potentially in the portfolio, by means of linear regression. The resulting regression coefficients measure the sensitivity of portfolio returns to changes in the returns on the underlying assets (for a more detailed discussion see the box on page 62).

Style analysis
applied to hedge
funds ...

A number of previous studies have applied variations of this technique in trying to characterise hedge fund investment strategies and in analysing the exposures of funds to particular asset classes.⁴ However, the characteristics of the hedge fund business model present some empirical complications. In particular, hedge funds tend to shift exposures more frequently than mutual funds, take larger short positions and make more extensive use of strategies resulting in non-linear payoffs relative to movements in market risk factors. We attempt to deal with these complications by slightly modifying the technique.

... with rolling
windows

In particular, to account for frequent shifts in strategy, we estimate the regressions for panels of funds that belong to the same style family over *rolling estimation windows* (through time), which yields time-varying exposure estimates. The cross-sectional dimension of the panel of individual hedge fund returns enriches the degrees of freedom in the estimation (and hence the precision of the estimated coefficients). The second modification we make to Sharpe's analysis is to allow for the sensitivity coefficients to take negative values in order to account for funds' short positions on particular asset classes. Finally, we follow Fung and Hsieh (2001) and Agarwal and Naik (2004) and include the returns on derivatives positions among the risk factors that can explain hedge fund performance.

We apply this rolling style analysis to several style families of hedge funds, and use as independent variables the risk factors listed in Table 2.⁵ The analysis is conducted using an 18-month rolling window on monthly data over

⁴ Examples include Fung and Hsieh (2001), Brown et al (2002), Agarwal and Naik (2004) and Brunnermeier and Nagel (2004).

⁵ Agarwal and Naik (2004) include the excess returns on *both* the at-the-money (ATM) and one strike price out-of-the-money (OTM) put and call options on the S&P 500 futures contract. For both puts and calls, the calculated returns on the ATM and OTM contracts are virtually identical. Our regressions include only the returns on the OTM contracts, as these had a marginally higher variance than those on the ATM contracts.

the 1996–2004 period, allowing us to investigate changing risk exposures around the equity market peak. Overall, the average (across funds and time) of excess returns over the sample period was roughly 9%, better than the 4% average excess returns on the S&P 500.⁶ Although different style families presumably follow different investment strategies, the average excess returns (and the volatility of these excess returns) for the broad families we consider here co-move to a considerable degree (Graph 1), suggesting commonalities in their risk exposures.

Style analysis results

The results from this style analysis can be summarised as follows. First, while there does appear to be heterogeneity in investment styles across hedge fund families, there are also striking similarities in the sensitivity of hedge fund returns to several of the risk factors. In particular, consistent with the Agarwal and Naik (2004) results, the excess returns on call and put options on the S&P 500 futures turn out to be some of the most qualitatively important risk factors. Second, the variation over time in the sensitivity to these option factors follows a similar pattern across hedge fund style families. For each style family, the estimated sensitivities suggest that hedge funds had increasing exposure to the stock market prior to the peak, but cut this exposure during the downturn. Specifically, the estimates are consistent with a strategy of being long call options (and short put options) on the S&P 500 during the period of rising equity prices in the late 1990s. Following the market downturn, the sensitivity to call options on the S&P 500 diminished greatly, while the sensitivity to the

Estimated risk exposures are similar across style families ...

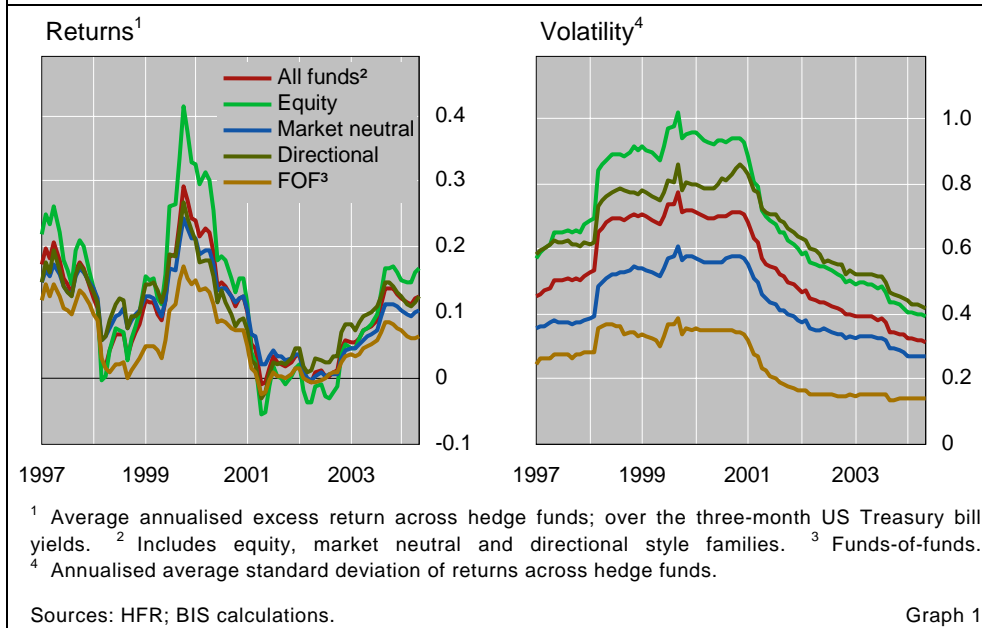
Risk factors	
<p>Option factors</p> <ul style="list-style-type: none"> Out-of-the-money call options Out-of-the-money put options <p>Equity market factors</p> <ul style="list-style-type: none"> Russell 3000 Index MSCI World ex US Equity Index MSCI Emerging Markets Equity Index Fama-French Small-Minus-Big (SMB) factor² Fama-French High-Minus-Low (HML) factor² Fama-French Momentum factor³ 	<p>Bond market factors</p> <ul style="list-style-type: none"> Salomon Brothers World Government Bond Index¹ Salomon Brothers Govt & Corp Bond Index Lehman Brothers US High Yield Corporate Index Lehman Brothers US High Yield (C to D)-rated Index Moody's Baa vs three-month US-TBills spread Moody's Baa vs 10-year US-TNotes spread <p>Other factors</p> <ul style="list-style-type: none"> Fed competitiveness weighted dollar index Goldman Sachs Commodity Index Gold price
<p>¹ All maturities, in US dollar terms. ² The SMB factor is defined as the average return on three small portfolios minus the average return on three big portfolios. The HML factor is defined as the average return on two value portfolios minus the average return on two growth portfolios. See Fama and French (1993) for a complete description of these factors. ³ The momentum factor is defined as the average return on two high prior return portfolios minus the average return on two low prior return portfolios.</p>	
<p>Sources: Bloomberg; Datastream; Tuck School of Business; BIS calculations.</p>	

Table 2

⁶ The return figures for hedge funds should be interpreted with caution because of well known biases in the databases on hedge fund performance. These biases are discussed in the box on page 62.

Excess returns and volatility by hedge fund strategy

Based on an 18-month rolling window



return on put options on the index turned positive. Interestingly, this pattern is particularly clear for hedge funds classified as market neutral.

These points are further highlighted in Graphs 2, 3 and 4. As the left-hand panel of each graph shows, excess returns on the S&P 500 Index peaked in March 2000, as did the excess returns for each of the three style families. In each case, the sensitivity of excess hedge fund returns to the excess returns on the call option increased at least up to March 2000, consistent with a strategy of increasing exposure to equity prices. This sensitivity fell dramatically following the peak in equity prices in March 2000.⁷ For equity and market neutral funds, this fall was accompanied by a reversal of the estimated exposure to the returns on put options; the sensitivities imply a shift from a position equivalent to selling puts on the S&P 500 Index to buying insurance against further market declines.⁸

Exposure to other equity-based risk factors seemed to be common across style families as well. For example, the sensitivities to the so-called Fama-French SMB factor – which captures the difference in returns on small capitalisation stocks over large capitalisation stocks – is particularly

... such that returns tend to peak together

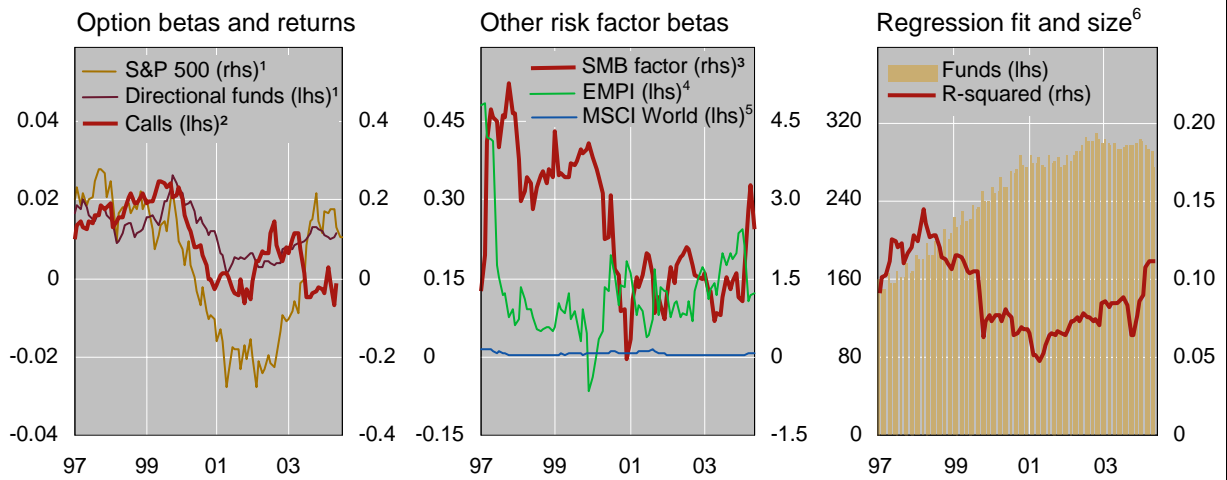
Funds were bullish on small cap stocks prior to the equity market peak ...

⁷ The variation over time in the statistical significance of these risk factors is consistent with this overall pattern. The t-statistic on the call option factor in the rolling regressions prior to March 2000 was statistically significant in virtually every individual window, averaging 5.26 for directional funds, 7.47 for equity funds and 6.79 for market neutral funds. After March 2000, this regressor was rarely significant, with average t-statistics of 1.02, 1.58 and 1.26 respectively.

⁸ The rolling beta for the put option factor is not included in Graph 2 on directional funds because this risk factor did not meet the criteria for inclusion into the regression specification in the first stage stepwise regression.

Risk exposures of directional funds

Based on an 18-month rolling window



¹ Moving average of excess returns; over three-month US Treasury bills. ² Coefficient on the excess returns on one strike out-of-the-money call option contracts on the S&P 500 futures. ³ Fama-French SMB factor. ⁴ MSCI emerging markets equity index. ⁵ MSCI world ex US equity index. ⁶ R-squared and number of funds for the rolling regressions of the directional family.

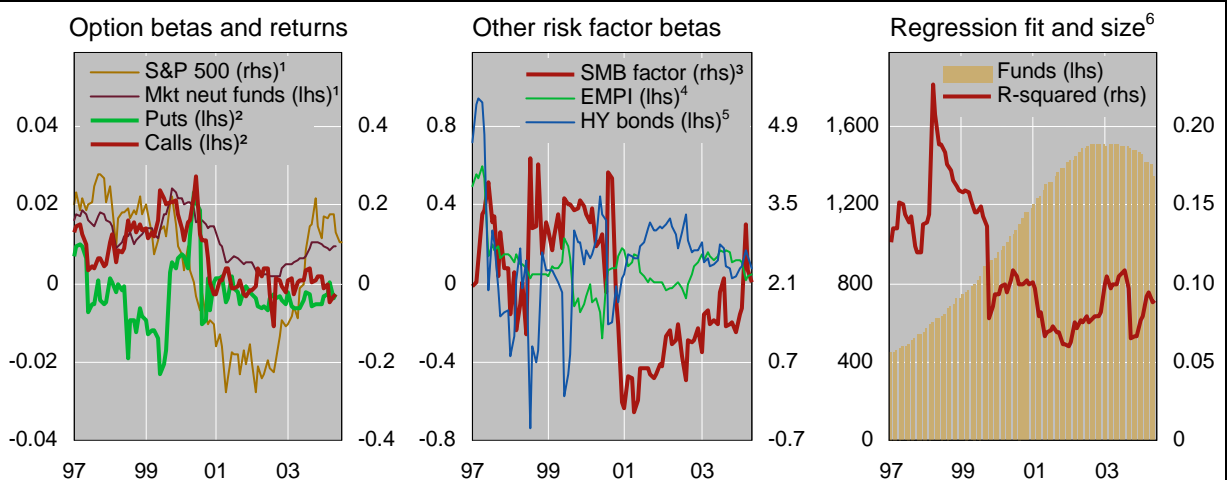
Sources: Datastream; HFR; Tuck School of Business; BIS calculations.

Graph 2

noteworthy. Prior to the peak in equity prices, directional funds seemed to follow strategies similar to a long position vis-à-vis this factor, implying greater exposure to smaller capitalisation stocks (Graph 2, centre panel). This is consistent with hedge fund investment in technology stocks and startup companies during the dotcom boom. Sensitivity to this factor turned negative following the market decline. Hedge funds following market neutral and equity-

Risk exposures of market neutral funds

Based on an 18-month rolling window



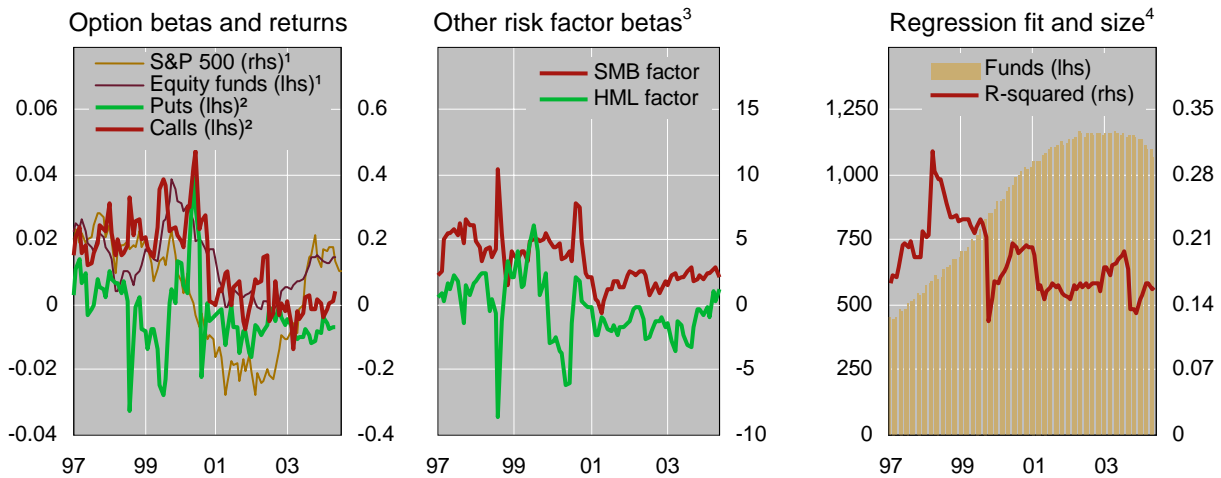
¹ Moving average of excess returns; over three-month US Treasury bills. ² Coefficient on the excess returns on one strike out-of-the-money option contracts on the S&P 500 futures. ³ Fama-French SMB factor. ⁴ MSCI Emerging Markets Equity Index. ⁵ Lehman Brothers US High Yield Corporate Index. ⁶ R-squared and number of funds for the rolling regressions of the market neutral family.

Sources: Datastream; HFR; Lehman Brothers; Tuck School of Business; BIS calculations.

Graph 3

Risk exposures of equity-focused funds

Based on an 18-month rolling window



¹ Moving average of excess returns; over three-month US Treasury bills. ² Coefficient on the excess returns on one strike out-of-the-money option contracts on the S&P 500 futures. ³ Fama-French SMB and HML factors. ⁴ R-squared and number of funds for the rolling regressions of the equity-focused family.

Sources: Datastream; HFR; Tuck School of Business; BIS calculations.

Graph 4

focused strategies displayed similar risk exposures; both style families appeared to be long the Fama-French SMB factor prior to the market downturn, as shown in the centre panels of Graphs 3 and 4. The sensitivities to this factor remained positive after March 2000, although at roughly half the value in both cases.⁹

... yet differed in exposures to interest rate risk

In addition to these common exposures, there does appear to be some degree of heterogeneity in the significant risk factors across style families. For example, exposure to fixed income market risk factors – as captured by the Lehman Brothers US High Yield Corporate Index, the Salomon Brothers World Government Bond Index and the Salomon Brothers Govt & Corp Bond Index – proved to be more important for market neutral and equity funds than for directional funds. The estimated sensitivity parameters on these risk factors seem to imply fluctuating long and short positions over the sample period.¹⁰ In addition, the excess returns on the Goldman Sachs Commodity Index and the Fed competitiveness weighted dollar index entered as significant risk exposures for these fund families as well.

Overall, these results allow for some tentative but broad conclusions. First, hedge funds that supposedly follow different investment strategies

⁹ The excess returns of all the style families tended to be sensitive to the returns in other equity markets as well, as captured by the MSCI World ex US Equity Index and the MSCI Emerging Markets Equity Index.

¹⁰ For market neutral funds, the coefficient on the excess returns on the Lehman Brothers US High Yield Corporate Index was significant beyond the 5% level in 73% of the regression windows, with an average t-statistic of 4.59, while that on the Salomon Brothers World Government Bond Index was significant in 72% of the windows, with an average t-statistic of 4.09. The results for these risk factors for equity-focused funds were significant only slightly less often with somewhat smaller average t-statistics.

appear to have, to some degree, similar risk exposures. The similarity in the pattern of exposure of directional funds and market neutral funds to the US equity market over the sample period is particularly striking. Second, while it seems that option-based risk factors aid in the consistent estimation of sensitivity parameters, the US equity market-based options that have been incorporated into the empirical literature thus far seem to be less important after March 2000.

Time-varying leverage

Leverage is an integral part of a hedge fund's investment strategy. A fund can achieve leverage in two complementary ways. The first involves outright borrowing. Taking on debt boosts the potential return to the investors in the fund, because returns are earned on a portfolio of assets that is larger than the funds they contributed (ie the AUM).¹¹ We refer to this as *balance sheet leverage*. Second, the fund can take off-balance sheet positions, such as derivatives and structured notes. These positions can amplify returns by allowing exposures to underlying assets without requiring a cash outlay equal to the value of the assets. We refer to this type of leverage as *instrument leverage*.¹²

Leverage amplifies sensitivity to market returns ...

To fix ideas, suppose for simplicity that the risk-free rate is zero and initial AUM is 10. Suppose further that the hedge fund borrows 90 to finance the purchase of a security for 100. If the value of the index at the end of the period moves to 105, the return on AUM is 50%. Alternatively, the hedge fund can obtain *an equivalent exposure* by placing the AUM of 10 as initial margin, and buying 100 worth of exposure to the equity index through futures contracts. In this simple example, the return on AUM is again 50% if the equity index moves to 105 by the end of the period.¹³

... either through borrowing or derivatives positions

The question we ask in this section is whether the data on hedge fund returns can be used to construct an indicator of leverage. Since leverage in either of the forms considered can amplify returns to investors in equivalent ways, one way to measure it would be to measure the degree to which the movement in fund returns is amplified compared to the movement in the underlying market risk factors. Style analysis provides such a measure. Our indicator is based on the premise that the sensitivity parameters estimated in our style regression for an *unlevered* portfolio would add up to unity (as they would do for a mutual fund in Sharpe's original application of the technique). In contrast, the returns on a *leveraged* portfolio can be thought of as the returns

¹¹ Clearly, this strategy also amplifies the potential losses in the case of portfolio underperformance.

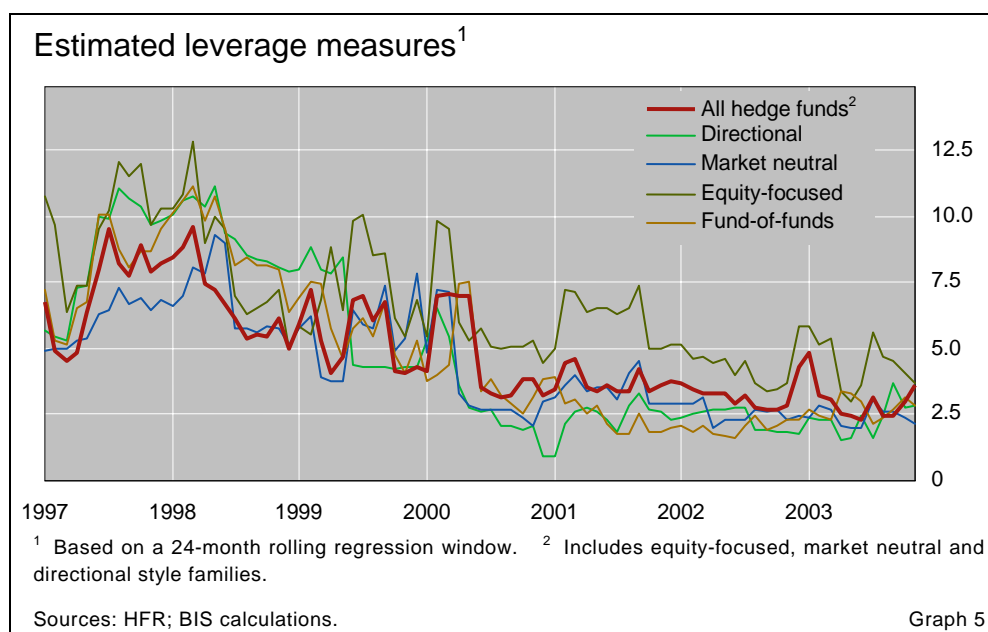
¹² Anecdotal evidence suggests that it is increasingly the case that hedge funds take large positions by entering into derivatives contracts, with various counterparties. The capital that funds collect from investors is used primarily as collateral for these transactions.

¹³ In the example, the price of the underlying security and the price of the derivative (eg the futures contract) move in lockstep. More generally, movements in the prices of derivatives are related in a non-linear way to movements in price of their underlying assets.

on the unlevered portfolio scaled up by a leverage factor. In short, our indicator is the sum of the sensitivity parameters from the style regression and is compatible with both types of leverage (see the box on page 70 for a more detailed discussion).¹⁴ Its level can be interpreted in a similar way to the ratio of the total size of the fund's asset portfolio to its AUM. For example, a value of 1 would imply no leverage, while a value of 2 would imply a total portfolio equal to twice the investors' capital.

While the relationship of our indicator to the balance sheet form of leverage is fairly direct, the link with instrument leverage is less straightforward. As explained in the box on page 70, the explanatory variables in the style regression are typically returns on broad market indices. To the extent that hedge funds engage in investments that have payoffs that resemble derivative instruments, their returns will be non-linearly related to the returns on the underlying market risk factors. This non-linearity would be reflected in higher estimated sensitivity of the fund's returns on these factors. For this reason, the value of our leverage indicator depends on the ability of our set of risk factors to adequately capture the investment positions of hedge funds.¹⁵ Clearly, the better the explanatory variables in the regression capture the return characteristics of the instruments in which the fund is invested, the lower the instrument leverage incorporated in our indicator. Indeed, we believe that the indicator is most useful as a gauge of trends in leverage over time rather than a cardinal measure of the level of leverage at any given point in time.

Option factors complicate the interpretation



¹⁴ For the case of hedge funds, this is not strictly true since we need to make some modifications to the factor betas prior to summing.

¹⁵ As indicated in the right-hand panel of Graphs 2–4, the goodness-of-fit measures are not particularly high, implying that a significant amount of variation in returns is left unexplained.

Box 2: Using style regressions to build an indicator of leverage

Our indicator of leverage is based on a modification of the style analysis framework detailed in Box 1 and a reinterpretation of the estimated coefficients. The first equation in that box describes the returns on a fund with long positions only in spot instruments and without any balance sheet leverage. If the same fund were to finance its portfolio by debt that represents a λ multiple of investors' funds (AUM) the return to its investors would be equal to:

$$R_t = -\lambda r_t^f + (1 + \lambda) * (w_1 F_t^1 + \dots + w_k F_t^k)$$

In this case, the w 's are the share of the overall portfolio invested in each (non-cash) asset. If an analyst knew the securities in the fund portfolio, and were to run the style regression as described in Box 1, the sum of the estimated coefficients (β 's) should be equal to $(1 + \lambda)$. Thus the difference between the sum of the estimated coefficients and unity would produce a measure of the fund's balance sheet leverage.

Of course the case of hedge funds presents a number of additional complications. Not only is the exact set of securities in the portfolio unknown, but it is also likely to include instruments that are non-linearly related to the underlying risk factors that are typically included in the style regression. In fact, the extent to which the ratio between the return on the non-linear strategy Φ_t^j and the return on the underlying factor F_t^j exceeds 1 could proxy for the degree of non-linearity. The average degree of non-linearity in the strategy of a fund can be represented as a common multiplier across the different asset classes in which the fund is invested. In style regression terms, this would be an additional scaling factor on the sensitivities of the hedge fund returns to the returns on the underlying broad market risk factors. On this basis, the sum of the estimated coefficients from the style regression would yield:

$$\sum \beta_i = (1 + \lambda) \zeta \sum w_i = (1 + \lambda) \zeta$$

where ζ stands for the average degree of non-linearity across all instruments in the fund's portfolio. The estimated coefficients are now interpreted as measuring the amplification effect of the two types of leverage. Clearly, without more assumptions we cannot distinguish between the two.

A further complication arises from the fact that hedge funds often take short positions in the underlying assets. This would clearly appear as a negative estimated coefficient in the style regression. Short positions, however, are another form of instrument leverage since the downside risk is theoretically unlimited. To account for this possibility, our indicator is the sum of the absolute values of the estimated coefficients. While this is only an approximate correction, it is necessary to account for the first-order measurement error introduced by using (long only) market indices as risk factors.

A value of the indicator greater than 1 suggests that the combined effect of the two types of leverage increases the sensitivity of fund returns to the returns on the market factors. The only slight modification we make to the calculation of this indicator is to include in the sum only those coefficients that are statistically significant beyond the 10% level.

With these caveats in mind, we apply this measure to the data. Graph 5 presents the extracted leverage indicators for the different fund styles based on the set of risk factors discussed in the previous section.¹⁶ While the indicators appear quite noisy, the broad movements over time seem to be at least consistent with anecdotal evidence on the evolution of leverage in the hedge fund industry. Leverage seems to have been at its highest in 1997–98. It

Estimated leverage
has declined

¹⁶ These estimates are based on 24-month rolling regressions; the indices estimated with shorter window lengths are choppier, but follow roughly similar patterns.

reached a local high around the equity market peak in 2000, but has been relatively low more recently.¹⁷

Conclusion

By relating portfolio returns to pre-specified market risk factors, style analysis can capture important aspects of the investment strategies of hedge funds. We apply this technique in rolling regressions to a large panel of individual hedge fund returns in an effort to better understand these dynamic strategies. Our results suggest that while there is considerable diversity in investment strategies among hedge fund style families, there are also striking similarities in their risk exposures. The most qualitatively significant risk factors in this regard seem to be those that replicate options on the S&P 500 Index.

Style analysis also yields a time-varying indicator of the leverage of hedge funds. This rough indicator, which tracks the degree to which the returns on risk factors are amplified in the returns on capital held by hedge funds, depends critically on the ability of the supposed risk factors to fully capture the true exposure of hedge funds. When estimated with a limited set of market risk factors, it appears to be quite noisy, at least relative to what anecdotal evidence would suggest. Nonetheless, its longer-term movements seem reasonable on average. More broadly, the framework outlined here for measuring leverage can be built upon as better risk factors are identified in the literature.

References

- Agarwal, V, N D Daniel and N Naik (2004): "Flows, performance and managerial incentives in hedge funds", working paper presented at the Gutmann Center Symposium on Hedge Funds, University of Vienna, 29 November.
- Agarwal, V and N Naik (2004): "Risks and portfolio decisions involving hedge funds", *The Review of Financial Studies*, Spring, vol 17, no 1, pp 63–98.
- Brown S, W Goetzmann and J Park (2002): "Hedge funds and the Asian currency crisis", *The Journal of Portfolio Management*, Summer, 6(4), pp 95–101.
- Brunnermeier, M K and S Nagel (2004): "Hedge funds and the technology bubble", *The Journal of Finance*, vol LIX, no 5, October, pp 2013–40.
- Committee on the Global Financial System (1999): *A review of financial market events in autumn 1998* ("The Johnson Report"), Bank for International Settlements, <http://www.bis.org/publ/cgfs12.pdf>.

¹⁷ If interpreted strictly as measuring balance sheet leverage, our estimate implies that, on average, leverage for the sample of hedge funds as a whole across the 1996–2004 time period was 4.9 times equity.

Ennis, M and M D Sebastian (2003): "A critical look at the case for hedge funds", *The Journal of Portfolio Management*, Summer, pp 103–12.

Fama, E and K French (1993): "Common Risk Factors in the Returns on Stocks and Bonds", *Journal of Financial Economics*, vol 33, no 1, pp 3–56.

Fung, W and D Hsieh (2000): "Performance characteristics of hedge funds and CTA funds: natural versus spurious biases", *Journal of Financial and Quantitative Analysis*, 35, 291–307.

——— (2001): "The risk in hedge fund strategies: theory and evidence from trend followers", *The Review of Financial Studies*, Summer, vol 14, no 2, pp 313–41.

——— (2002a): "Asset-based style factors for hedge funds", *Financial Analysts Journal*, September/October, pp 16–27.

——— (2002b): "Hedge-fund benchmarks: information content and biases", *Financial Analysts Journal*, January/February, pp 22–34.

International Monetary Fund (2004): *Global Financial Stability Report*, April, pp 146–8.

Sharpe, W (1992): "Asset allocation: management style and performance measurement", *The Journal of Portfolio Management*, winter, pp 7–19.

CDS index tranches and the pricing of credit risk correlations¹

Standardised loss tranches based on credit default swap (CDS) indices have increased liquidity in the market for credit risk correlations. Although progress is being made, quantitative modelling of these correlations is complex and not yet fully developed.

JEL classification: G12, G13, G14.

One of the most significant developments in financial markets in recent years has been the creation of liquid instruments that allow for the trading of credit risk correlations. Prime among these instruments are CDS index tranches. Broadly put, index tranches give investors, ie sellers of credit protection, the opportunity to take on exposures to specific segments of the CDS index default loss distribution. Each tranche has a different sensitivity to credit risk correlations among entities in the index. One of the main benefits of index tranches is higher liquidity. This has been achieved mainly through standardisation, yet it is also due to the liquidity in the single-name CDS and CDS index markets. In contrast, possibly owing to the limited liquidity in the corporate bond market, securities referencing corporate bond indices have not been actively traded.

The standardisation of index tranches may prove to be a significant further step towards more complete markets. Credit risk correlations have always been key risk components in portfolios of credit-risky securities. However, up until now, standardised products for the trading of credit risk correlations have not been available. The emergence of index tranches therefore fills a gap in the ability of the markets to transfer certain types of credit risks across individuals and institutions.

We examine CDS index tranches in this article. In the first section we introduce these securities, focusing on the mechanics of CDS-based contracts and market liquidity. In the second section we discuss the pricing of CDS index

¹ We thank JPMorgan Chase for providing us with data; Rishad Ahluwalia, Jakob Due and Mike Harris of JPMorgan Chase for useful discussions; Henrik Baun, Claudio Borio, Ingo Fender, Frank Packer and Eli Remolona for helpful comments; and Marian Micu for research assistance. The views expressed in this article are those of the authors and do not necessarily reflect those of the BIS.

tranches, with an emphasis on how these instruments allow for the trading of credit risk correlations.

CDS-based contracts: characteristics and liquidity

To understand the advantages offered by CDS index tranches for the trading of credit risk correlations, it is first necessary to understand their composition, namely, the structure of CDS indices and the underlying single-name CDS contracts.

CDS contracts

A single-name CDS contract is an insurance contract covering the risk that a specified credit defaults. Following a defined credit event, the protection buyer receives a payment from the protection seller to compensate for credit losses. In return, the protection buyer pays a premium to the protection seller over the life of the contract.²

Single-name CDSs are the building blocks

There are two main reasons why CDS contracts are more liquid than most corporate bonds. First, they are more standardised. For instance, the credit events that trigger payment to the protection buyer are now clearly defined in the ISDA credit derivatives definitions (ISDA (2003)).³ This is also the case for the settlement method.⁴ Second, CDS contracts allow market participants to go long credit risk without a cash payment, as well as go short credit risk with less difficulty and at lower cost than with corporate bonds.

CDS indices

A CDS index contract is an insurance contract covering default risk on the pool of names in the index. Index contracts differ slightly from single-name securities. The main difference is that a buyer of protection on the index is implicitly obligated to pay the same premium, called the fixed rate, on all the names in the index. In addition, index contracts restrict the eligible types of credit events to bankruptcy or failure to pay.⁵ In the case of a credit event, the entity is removed from the index and the contract continues (with a reduced notional amount) until maturity.

Liquidity of CDS indices is enhanced by ...

The market liquidity of CDS index contracts is enhanced by: (1) the emergence of widely accepted benchmark indices, which comprise the most

² Several sources contain descriptions of CDS contracts and their features (eg Anson et al (2003) and O’Kane, Naldi et al (2003)).

³ Credit events include bankruptcy, failure to pay, repudiation and material restructuring of debt (including acceleration).

⁴ Payoffs can be settled either by cash (with the protection buyer receiving par minus the default price of the reference asset) or in physical form (where the protection buyer delivers the defaulted security to the protection seller in return for a cash payment of par).

⁵ This corresponds to the no-restructuring (XR) documentation clause in single-name CDS contracts, ie excluding debt restructuring as a triggering event (see ISDA (2003) for a description of documentation clauses). See O’Kane, Pedersen and Turnbull (2003) for a discussion of common market practices, as well as Packer and Zhu (this issue of the *Quarterly Review*).

liquid single-name CDS contracts in the market and have a group of global dealers committed to market-making; (2) a clear geographical focus, relatively stable sector-rating composition and standardised maturities for each index; and (3) the availability of two different contract formats. We consider each element in turn.

... the creation of benchmark indices ...

First, the main traded CDS indices have now been consolidated into a single family under the names DJ CDX (for North America and emerging markets) and DJ iTraxx (for Europe and Asia); see Table 1.⁶ The composition of the new indices is chosen by participating dealers based on the liquidity of individual contracts, ie the most actively traded names are included. Once formed, an index remains static over its lifetime, except for entities that default, which are eliminated from the index. However, every six months a new rebalanced index is launched and associated “on-the-run” securities are issued.

... across regions and sectors ...

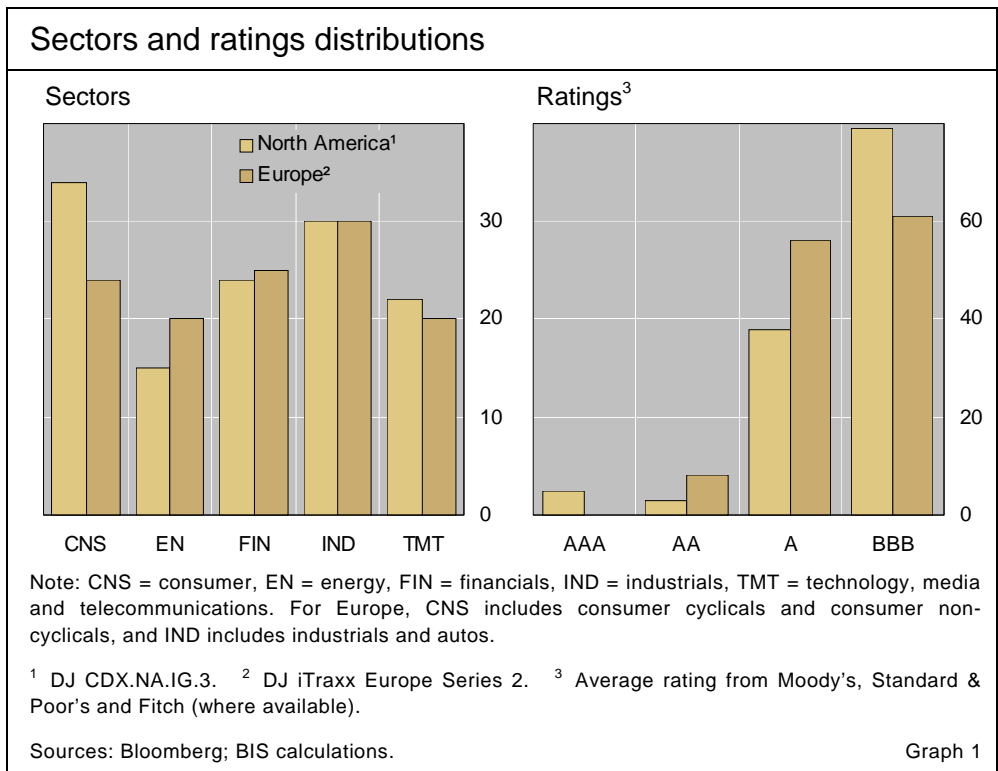
Second, indices have been created for the main currencies, investment grade and non-investment grade credits and the main sectors. At the

CDS indices ¹						
By region						
	North America	Europe	Japan	Asia excl Japan	Australia	Emerging markets
Master	CDX.NA.IG (125) CDX.NA.HY (100)	iTraxx Europe (125) iTraxx Corporate (52) ⁴ iTraxx Crossover (30) ⁵	iTraxx CJ (50) ²	iTraxx Asia (30)	iTraxx Australia (25)	CDX.EM (14) ³
Sub-indices	Financials (24) Consumer (34) Energy (15) Industrials (30) TMT (22) HiVol (30) B (44) BB (43) HB (30)	Financials (15) Autos (10) Consumer cyclicals (15) Consumer non-cyclicals (15) Energy (20) Industrials (20) TMT (20) HiVol (30)	Financials (10) Capital goods (10) Tech (10) HiVol (10)	Korea (8) Greater China (9) ⁶ Rest of Asia (13) ⁷	None	None

¹ Earlier generations of DJ Trac-x and iBoxx indices are still traded. This table summarises the composition of the most recently issued series, DJ CDX and DJ iTraxx, which are a by-product of the merger between the DJ Trac-x and iBoxx families. The number of reference entities in each index is given in parentheses. ² Maximum of 10 names in a given sector. ³ Includes only sovereigns: Brazil, Bulgaria, Colombia, Korea, Malaysia, Mexico, Panama, Peru, the Philippines, Romania, Russia, South Africa, Turkey and Venezuela. ⁴ Includes the largest, most liquid non-financial names from the iBoxx EUR Corporate bond index. ⁵ Most liquid non-financial names rated BBB/Baa3 or lower and on negative outlook. ⁶ Includes China, Hong Kong SAR and Taiwan (China), with at least two names from each. ⁷ Includes India, Malaysia, the Philippines, Singapore and Thailand.

Table 1

⁶ Two competing families of indices (Trac-x and iBoxx), supported by different dealers, were initially launched in 2003. Last year these indices were merged to form the new indices, which are administered by Dow Jones.



investment grade level, the broad indices in North America (CDX.NA.IG) and Europe (iTraxx Europe), which are the most actively traded, are each composed of 125 reference entities, with an equal weighting given to each. There are also indices for selected sectors; an index based on names with high systematic exposures (ie high market betas); indices composed of speculative grade firms; and indices for regions other than North America and Europe, such as Japan, Asia (excluding Japan), Australia and a selection of emerging market countries. Graph 1 shows the distribution across sectors and ratings in the most recently issued versions of CDX.NA.IG and iTraxx Europe. Securities on the main indices are available at five- and 10-year maturities.

Third, two types of index contracts, unfunded and funded, are traded to better tailor the securities to investors' preferences with respect to funding format and counterparty risk exposure. An unfunded contract is simply a multi-name CDS; the funded version is a bond, where, at origination, the buyer of protection receives a pool of collateral securities from the protection seller and pays an upfront notional, in addition to paying a quarterly premium. In an unfunded contract, the protection buyer is exposed to counterparty risk, whereas in a funded transaction the protection buyer is exposed to the risk of credit deterioration in the collateral pool (but not to counterparty risk).⁷

The relatively liquid nature of these instruments, compared to other credit products, has been reflected in fairly tight bid-offer spreads, at least on the most actively traded contracts. For instance, bid-offer spreads on five-year unfunded contracts on the CDX.NA.IG index have typically been in the range

... and availability of different contract types

Bid-offer spreads have been tight

⁷ In the event of defaults in the index, the protection buyer sells the collateral to recover losses on the CDS index.

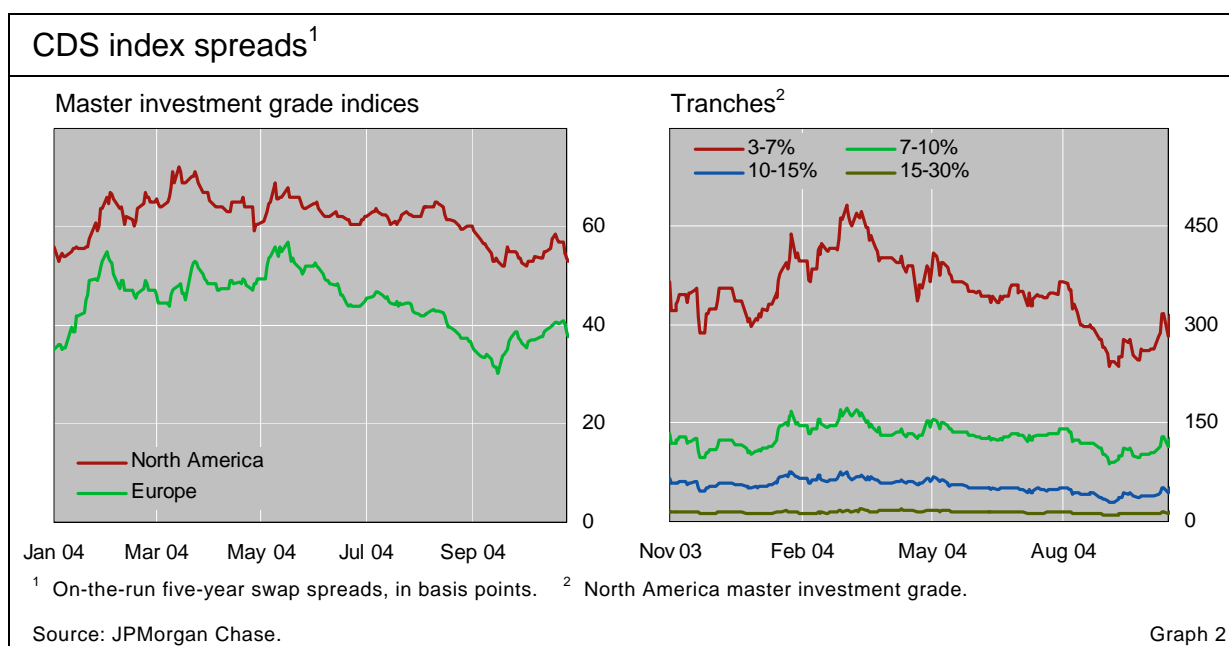
0.5–4 basis points. To put the size of this bid-offer differential in context, spreads on the broad investment grade indices have averaged about 62 basis points in North America and 45 basis points in Europe since January 2004 (Graph 2, left-hand panel).⁸

CDS index tranches

Compared to other CDOs, index tranches are standardised and more liquid

CDS index tranches are synthetic collateralised debt obligations (CDOs) based on a CDS index, where each tranche references a different segment of the loss distribution of the underlying CDS index.⁹ The main advantage of index tranches relative to other CDOs is that they are standardised. Standardisation applies to both the composition of the reference pool and the structure (“width”) of the tranches.

Standardisation helps to foster greater liquidity in the secondary market. The development of a liquid secondary market for the trading of other CDO tranches has thus far been elusive largely because the structure of most CDOs has been highly customised.¹⁰



⁸ At origination, the fixed spread for the index swap is set to be roughly equal to the average CDS spread for the names in the index. As time progresses, the index swap will have a positive value to the protection buyer when average spreads on individual names are high compared with the fixed rate. In this case, new buyers of protection would make a payment to the protection seller equal to this difference (and vice versa when average spreads are lower than the fixed rate).

⁹ In general, a CDO is a structured finance product in which the credit risk on a pool of assets is sold to investors. The claims issued against the assets in a CDO are prioritised (structured) in order of seniority, ie there are different levels or “tranches” of debt securities. This typically includes one or more investment grade classes and an equity (first loss) tranche. See CGFS (2005) for more detail on CDOs and their economics, and Gibson (2004) for a discussion of the risks in synthetic CDOs.

¹⁰ One of the main growth areas in the CDO market over the past couple of years has been so-called bespoke single-tranche CDOs. These are designed in accordance with a specific investor’s wishes. It could be argued that market forces are pushing towards two extremes:

Tranches have been issued on several indices, though most trading to date has been concentrated in the CDX.NA.IG index.¹¹ There are five tranches based on this index. The lowest tranche, known as the equity tranche, absorbs the first 3% of losses on the index due to defaults. If defaults occur over the lifetime of the tranche contract, the investor in an equity tranche is obliged to pay its counterparty an amount equal to the losses from default (the difference between par and the recovery price of the defaulted asset) up to a maximum of 3% of the total index. The next tranche (mezzanine) absorbs losses of 3–7% and is therefore fully insulated, by the equity tranche, from losses up to 3%. Further losses are absorbed by higher-ranking tranches. The 7–10% and 10–15% tranches are known as the senior tranches, while the super-senior tranche covers losses of 15–30%.¹²

Index tranches target segments of the default loss distribution

In return for bearing the risk of losses, investors receive a quarterly payment from buyers of protection equal to a premium times the effective outstanding notional amount of a given tranche.¹³ The premiums on the mezzanine and senior tranches are a running spread with no upfront payment. By contrast, buyers of protection on an equity tranche make an upfront payment that is a percentage of the original notional of the contract, in addition to paying a running spread premium of 500 basis points.¹⁴ The presence of a (relatively large) upfront payment changes the prospective timing of cash flows to the investor in an equity tranche compared to the case of receiving a running spread only, and therefore the equity investor's exposure to the timing of defaults is different. Market quotes of the premiums on the mezzanine and higher tranches are shown in Graph 2 (right-hand panel).¹⁵

Trading credit risk correlations: pricing the tranches

Credit risk correlations among the names in the index have a large impact on the riskiness of CDS index tranches. The high degree of sensitivity to credit risk correlations is clearly reflected in the pricing of the tranches. This implies

Credit risk correlations affect the riskiness of index tranches

standardised index tranches (which can be used in active trading) and bespoke tranches (which are designed for buy-and-hold purposes).

¹¹ Creditflux reports transactions volume of \$10.2 billion in the second quarter of 2004, with 82% of this total referencing iBoxx CDX.NA.IG Series 2 and Trac-x NA combined.

¹² Contracts for insuring against losses greater than 30% of the index currently do not exist.

¹³ The effective notional is the original notional less any losses incurred due to defaults that have impacted on the tranche (with a floor at zero).

¹⁴ A contract with an upfront payment can be converted into a contract with a running spread and no upfront payment. This is done by dividing the upfront payment by the (risky) duration of the tranche and adding any running spread. Thus, an equity tranche with an upfront payment of 37.5%, a running spread of 500 basis points and risky duration of 3.75 is equivalent to a contract with a running spread of $(37.5 \times 100 / 3.75) + 500$ basis points = 1,500 basis points. See O'Kane and Sen (2003) for an analysis of upfront versus running spread quoting conventions.

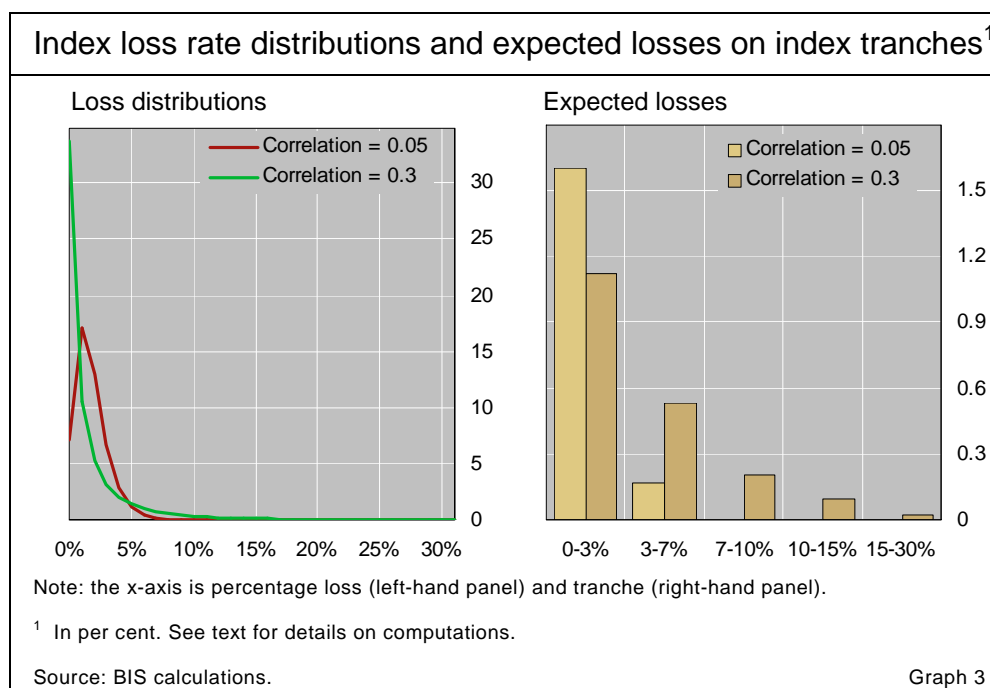
¹⁵ Bid-ask spreads have been 1–2 basis points for the most senior tranche and 5–10 basis points for the mezzanine tranches, while they have been 15–70 basis points for the equity tranche.

that, in conjunction with the greater liquidity of these instruments relative to other multi-name credit products, these securities offer a relatively efficient way of trading this form of risk.

To illustrate the importance of credit risk correlations on the value of the tranches, consider tranches with a five-year maturity on a CDS index consisting of 125 names whose characteristics are similar to the average credit in CDX.NA.IG Series 3.¹⁶ The left-hand panel of Graph 3 shows the five-year loss rate distribution, as a percentage of tranche size, from the equity to junior mezzanine tranche. The right-hand panel reports the expected loss as a percentage of the total index, on each tranche. This clearly illustrates that loss, both relative and absolute, is declining in tranche seniority. Indeed, the expected loss on the equity tranche is about 40–50% of notional in the cases shown in the graph.

The pricing of index tranches has focused on default time correlations

This example indicates that the market value of a given CDS index tranche will depend upon the joint default loss probability distribution for the reference entities in the index. In general, the joint default loss distribution incorporates both the correlations between individual default probability levels and the correlations between individual default times. In addition, the true loss distribution also incorporates correlations between losses-given-default and default probability levels (eg losses tend to be larger when the overall risk of default is higher, such as in recessions) and correlations between losses-given-default and default times (eg losses may be larger when defaults are clustered, such as when there are multiple defaults in an industry over a short period of time).



¹⁶ To calculate the loss distribution, we use a one-factor Gaussian copula model (see below) and assume identical five-year default probabilities (2.97%), constant recovery rates (40%) and constant identical pairwise default time correlations (0.05 or 0.3). The default rate is estimated using Moody's data for US Baa-rated corporate issuers over the period 1983–2003. The recovery rate is the average for defaulted senior unsecured US corporate bonds. The chosen values of default time correlations are roughly in the range used by the rating agencies.

Pricing index tranches

The premium on an index tranche is the spread paid by the protection buyer that equates the expected present value of default costs to be borne by the protection seller (“protection leg”) to the expected present value of investing in the tranche (“premium leg”). The value of the premium leg is the present value of the spread payments the protection seller receives from the protection buyer. Index contracts specify M quarterly payment dates, $t = t_1, t_2, \dots, t_M$, on which the buyer of protection makes payments to the seller. Note that payments are only made as long as the (uncertain) effective notional of the tranche at time t_i , denoted by $N(t_i)$, is positive. Assume also that investors discount expected future income streams using the (uncertain) discount factors $D(0, t_i)$. Given the tranche premium S , the expected present value of the premium leg is:[ⓐ]

$$V_{\text{prem}} = S \cdot E\left[\sum_{i=1}^M D(0, t_i) \cdot N(t_i)\right]$$

The expected tranche sizes depend on the number and timing of any future defaults and the expected costs of these future defaults (ie recovery rates).[ⓑ] The present value of the premium leg is lower if: the premium is low; the recovery rate is low; and default losses are incurred early. The expected present value of the protection leg is:[ⓒ]

$$V_{\text{prot}} = E\left[\sum_{i=1}^M D(0, t_i) \cdot (N(t_i) - N(t_{i-1}))\right]$$

The present value of the protection leg is lower if: the tranche size does not change; the recovery rate is high; and defaults occur late during the contract period. The tranche premium is found by solving $V_{\text{prem}} = V_{\text{prot}}$ for S :

$$S = \frac{E\left[\sum_{i=1}^M D(0, t_i) \cdot (N(t_i) - N(t_{i-1}))\right]}{E\left[\sum_{i=1}^M D(0, t_i) \cdot N(t_i)\right]}$$

Implementation

As can be seen from the equations above, two key factors are required to determine S : future effective tranche sizes and discount factors. Discount factors can be found via methods also used for other financial instruments (see Rebonato (2002)). To evaluate future tranche sizes, however, several inputs are needed: (1) the losses-given-default; (2) the number of defaults; and (3) the timing of defaults. All of these quantities are uncertain, and therefore expectations of them must be formed.

For the loss-given-default (or one minus the recovery rate), a simple approach is to assume that recovery rates are constant and equal to the average historical recovery rate on senior unsecured bonds for US corporations (typically around 40%). Recovery rates can also be estimated from CDS spreads.

Individual default probabilities for the names in the index can be estimated directly from single-name CDS spreads. Alternatively, they can be inferred indirectly from equity prices (eg Moody's KMV's expected default frequencies). Note that a recovery rate assumption is needed to extract default probabilities from CDS spreads.

The timing of defaults for the N entities over the lifetime of the contract can be calculated from a joint default time probability distribution. As this is unknown, a common approach is to assume that default times follow an N -dimensional multivariate normal distribution, ie the so-called Gaussian copula (see Nelsen (1999), Li (2000) and Cherubini et al (2004)).

[ⓐ] In practice, when defaults occur between payment dates, sellers of protection receive an accrual payment at the next payment date based on the previous effective tranche size. Note that any upfront payment on the equity tranche can be included in the present value of the premium leg by adding a constant. [ⓑ] Expectations are taken under a risk neutral measure, ie risk-adjusted expectations. [ⓒ] Assuming protection buyers receive compensation at the next scheduled payment date after a default has occurred.

In a *one-factor* Gaussian copula model, the correlations in default times are assumed to be equal and constant across entities. This is equivalent to assuming that there is a direct mapping from a latent random variable X_i to default times, where the evolution of X_i is given by:

$$X_i = \sqrt{\rho} \cdot M + \sqrt{1-\rho} \cdot Z_i$$

where M is a normally distributed random variable, the Z_i 's are mutually uncorrelated and normally distributed random variables and $-1 < \rho < 1$ is the constant pairwise correlation between default times (see Hull and White (2004) for further details). One interpretation of the one-factor Gaussian copula approach is that X_i is the value of assets held by entity i , and entity i defaults if its assets fall below some threshold. This is similar in spirit to a Merton-type model, where the option to not repay debt is exercised when asset value reaches a given threshold. With this interpretation, M can be seen as the single common risk factor, while the Z_i 's are N idiosyncratic risk factors, driving the values of firms' assets, and thus default times. The correlation parameter ρ can be estimated from correlations of equity returns, which are typically in the range 0–30%.

Up until now, the pricing of index tranches has focused on capturing the implications of default time correlations (see box). For this purpose, the so-called one-factor Gaussian copula model has become the market standard for gauging the prices on index tranches, similar to the Black-Scholes model for trading options. The term “copula” is meant to emphasise that this type of model “couples” individual-name default probability distributions together to form a joint default probability distribution (see Nelsen (1999)). The one-factor Gaussian copula assumes identical constant pairwise default time correlations across all firms, normally distributed default times and a normal joint default probability distribution. These simplifying assumptions make the one-factor Gaussian copula relatively easy to use to calculate valuations, which is one of the main reasons for its popularity.

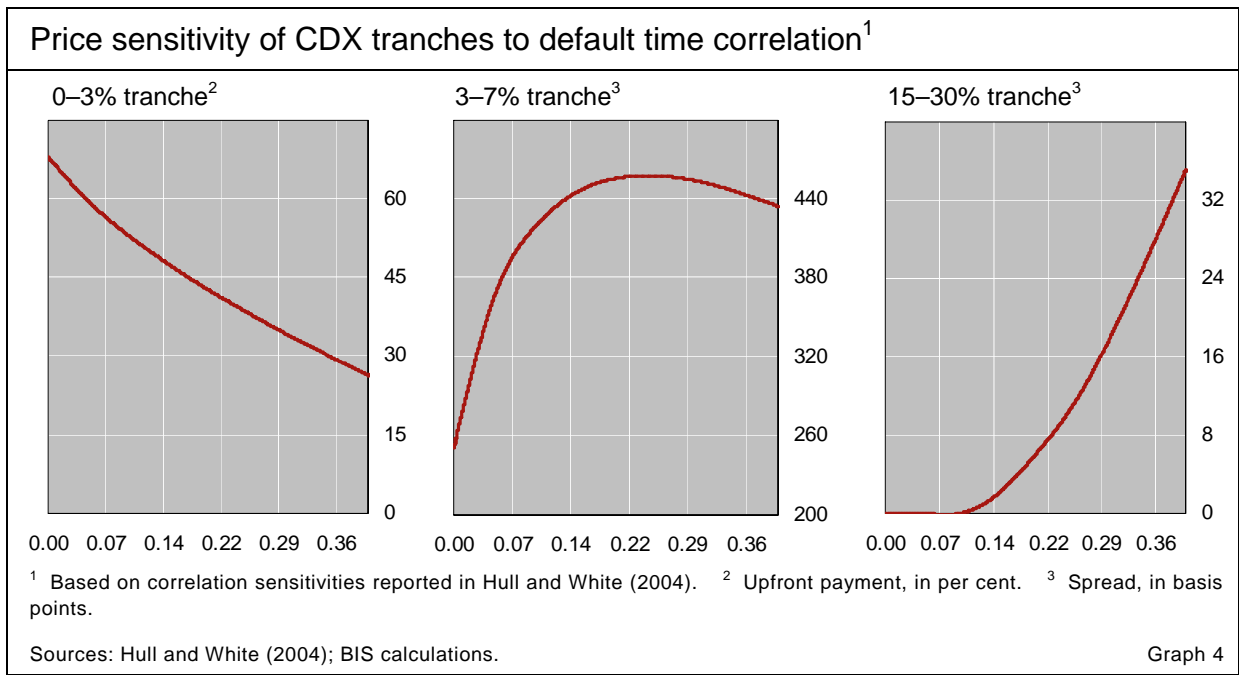
Default time correlations and tranche pricing

Higher correlations imply more default clustering

The importance of default time correlation for the riskiness of the different index tranches is apparent in Graph 3. It is shown in the left-hand panel that, depending on the tranche, the probabilities of having either very small or very large loss rates are higher when default time correlation is higher. This can easily be seen by comparing two extreme, albeit unrealistic, cases.

First, if correlation is zero, the probability of zero names (out of 125) defaulting within a five-year period is $(100 - 2.97)^{125} = 2.31\%$, where 2.97% is the average historical five-year-ahead default rate of Baa-rated firms. By contrast, if correlation is equal to one (ie if the portfolio can be viewed as a single credit), the probability of zero names defaulting is 97.03%. Yet the index could lose one minus the recovery rate ($= 1 - 0.4$) with probability 2.97%, making the expected loss equal to 1.78%.¹⁷ The right-hand panel of Graph 3 shows that the expected loss on the equity tranche is higher with low

¹⁷ Increasing default time correlation is equivalent to making the default probability random but with the same mean default probability. Note that a mean-preserving distribution of this type implies a higher average joint survival rate due to convexity of the joint survival probability distribution. See Lando (2004) for further discussion.



correlation. This is not the case for the mezzanine and senior tranches. Indeed, expected losses are higher on the senior tranches when correlation is higher.

As the risk of different tranches varies with default time correlation, so does the pricing of the tranches. This is illustrated in Graph 4, which plots the model-implied upfront payment on the equity tranche and spreads on the mezzanine and super-senior tranches as a function of default time correlation.¹⁸ Consider the equity tranche. More default clustering has little negative impact on the value of this tranche, as only few defaults are needed for this tranche to incur substantial losses. At the same time, a higher default time correlation increases the chance that no defaults will occur. Therefore, the upfront payment on the equity tranche declines as default time correlation increases. By contrast, the pricing of the senior tranche reflects its greater exposure to the risk of losses when defaults are more clustered. Unlike the equity and senior tranches, the price of the mezzanine tranche is generally not a monotonic function of default time correlation. With both high and low correlations, there is a high probability that this tranche will survive intact. However, for medium levels of default time correlation, there is a high risk that the mezzanine tranche will suffer substantial losses.

As correlation increases, the spread on the equity tranche declines ...

... whereas it increases on the senior tranche

Market prices and implied default time correlations

Evidence of the market's view on default time correlations can be inferred from market prices on CDS index tranches. This can be done by specifying a pricing model and all the necessary inputs for the model except the default time correlation. For instance, by specifying values for all of the inputs in the one-factor Gaussian copula model except for the constant pairwise default time correlation, it is possible to back out an implied correlation using market

Default time correlations can be inferred from market prices

¹⁸ Tranche prices are based on Hull and White (2004).

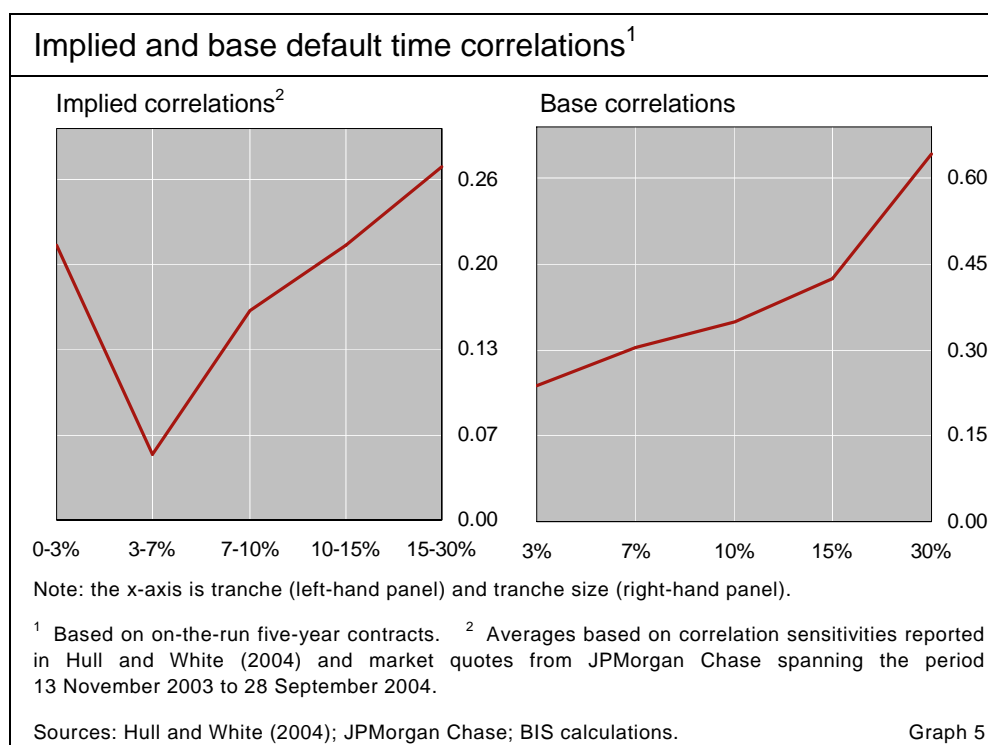
quotes.¹⁹ This is illustrated in the left-hand panel of Graph 5, which plots implied default time correlations for the index tranches over time.

Market-implied default time correlations have a smile ...

The left-hand panel in Graph 5 illustrates one of the puzzles observed in market quotes: the so-called “correlation smile”.²⁰ The correlation smile illustrates that, when using a one-factor Gaussian copula, market spreads on the mezzanine tranche (typically) imply a lower default time correlation than is implied by the spreads on equity and senior tranches. Thus, the degree of default clustering assumed by the market appears to be higher for the equity and senior tranches. If the one-factor Gaussian model is indeed the correct description of joint default dependence, then the same implied correlation value should be inferred for all tranches.

... and a skew

The right-hand panel in Graph 5 illustrates another implication of market quotes: the so-called “correlation skew”. It plots the market-implied base correlation against the upper bound for each tranche. For example, in the case of the CDX.NA.IG index, the base correlation for the 0–10% interval would be defined as the correlation which equates the price of this synthetic first loss tranche to the combined observed market values of the 0–3%, 3–7% and 7–10% tranches. The base correlation can be interpreted, from the perspective of the protection buyer, as the correlation in an insurance contract which pays out up until a given level of losses is reached. The fact that the base correlation curve is upward-sloping, or “skewed”, shows that market prices for index tranches imply that default time correlation is increasing with tranche seniority.



¹⁹ Index tranches are sometimes quoted in terms of implied correlation instead of spread.

²⁰ The correlation smile is reminiscent of the volatility smile with respect to strike prices extracted from equity options using the Black-Scholes model.

This reflects the fact that spreads are high on the senior tranches, at least relative to the low level of expected losses on these tranches implied by the model. This is reminiscent of the positive relationship between risk premia and credit quality observed for corporate bonds.²¹

There are several possible explanations for the correlation smile (and skew).²² One is that there is segmentation among investors across tranches and that these different investor groups hold different views about correlations. For instance, the views of sellers of protection on equity tranches (eg hedge funds) may differ from sellers of protection on mezzanine tranches (eg banks and securities firms). However, there is no compelling reason why different investor groups would systematically hold different views about correlations.

The correlation smile might reflect market segmentation ...

A second possible explanation is that the smile reflects market participants' uncertainty about how best to model credit risk correlations. The implication is that the equity and senior tranches, which are more sensitive to correlations, contain a "model risk" premium embedded in their prices. While this explanation can account for the relatively large premium on the senior tranche, it is not consistent with the relatively low equity tranche premium.

... uncertainty about credit risk correlations ...

A third explanation is that, even though the index tranche market has grown significantly over the past year, prices might still be subject to local demand conditions. For example, the implied correlation on the mezzanine tranche may reflect strong interest by banks in selling protection on this segment of the index loss distribution. This could be due to the hedging demands of banks, which may be short credit risk of this type as a result of their role as originators of other, notably single-tranche, CDOs.

... local demand conditions ...

A fourth explanation is that market participants may, in fact, use other models for pricing than the one-factor Gaussian copula. Possibilities include: (1) using fatter-tailed distributions (eg Student's-t); (2) relaxing the restriction of constant pairwise correlations; (3) allowing individual default probabilities to depend on macroeconomic risk factors; and (4) letting recovery rates vary over time and be correlated with default times and default probabilities.²³ For instance, the impact on pricing from using a fatter-tailed distribution, which implies more clustering of defaults, increases break-even spreads for senior tranches and lowers them for junior tranches. Alternatively, a positive correlation between losses-given-default and clustering of default times would lower the price on the most senior tranches for a given level of default time correlation. In this case, the implied correlation inferred from senior tranches (under a constant recovery rate assumption) would be upward biased. This could also explain the pricing of equity tranches, as higher recovery rates during times of little default clustering would imply that this tranche is more valuable.

... or the use of different pricing models

²¹ For further discussion of this, see Amato and Remolona (2004).

²² See also Bernand et al (2004).

²³ The importance of these elements for the modelling of credit risk have been discussed, respectively, by Hull and White (2004), Gregory and Laurent (2004), Duffie and Singleton (2003) and Altman et al (2004).

Looking forward

For CDS index-based markets to mature ...

... diversification must increase ...

... and credit risk modelling should improve ...

... to capture more types of credit risk codependencies

Despite rapid growth, the market for CDS index tranches is still relatively small. Furthermore, even though they have improved diversification opportunities at a lower cost to investors, these instruments still contain significant idiosyncratic risk because they only reference 125 names in five different sectors.²⁴ However, as these markets continue to mature, the number of underlying names is likely to increase and improve diversification. Thus, in future, index tranches should provide further scope for more efficient trading of credit risk correlations.

To improve market efficiency and limit the risk that exposures are accumulated in ways that are not fully appreciated, it is important for credit risk modelling to develop further. The main challenge appears to be developing frameworks that realistically capture credit risk correlations (see Duffie (2004)). As noted above, the valuation of CDS index tranches has so far mainly focused on modelling the correlation of default times. By contrast, correlations among default probabilities and losses-given-default (ie credit spread correlations), have received less attention. No doubt, progress is being made in developing more general models to capture credit risk codependencies.²⁵ For instance, some models incorporate contagion effects, which allow them to capture the impact on credit risk from declines in overall market liquidity, the failure of large firms or adverse industry-level developments.²⁶ Examples of large defaults that have had a market-wide impact include Enron and WorldCom; a recent example of an adverse industry development is the investigation by the New York Attorney General's office into insurance industry practices in the United States. Looking ahead, practitioners, as well as policymakers monitoring these markets, will face the challenge of designing robust models that capture these types of systematic and systemic events.

References

Altman, E I, B Brady, A Resti and A Sironi (2004): "The link between default and recovery rates: theory, empirical evidence and implications", *Journal of Business*, forthcoming.

Amato, J and E Remolona (2004): *The pricing of unexpected credit losses*, Bank for International Settlements, mimeo.

Anson, M, F Fabozzi, M Choudhry and R-R Chen (2003): *Credit derivatives: instruments, applications and pricing*, Wiley Finance.

²⁴ For a discussion of the importance of idiosyncratic risk in credit portfolios, see Amato and Remolona (2004).

²⁵ These dependencies could also include correlations between discount factors and credit risk.

²⁶ See Davis and Lo (2001) and Collin-Dufresne et al (2003) for theoretical models of credit risk contagion. Schönbucher and Schubert (2001) show how certain types of more general copulas are able to capture these general credit risk codependencies.

- Bernard, A, F Pourmokhtar, B Jacquard, D Baum, L Gibson, L Andersen and J Sidenius (2004): "The Bank of America guide to advanced correlation products", supplement, *Risk* magazine, May.
- Cherubini, U, E Luciano and W Vecchiato (2004): *Copula methods in finance*, Wiley, New York.
- Collin-Dufresne, P, R Goldstein and J Helwege (2003): *Is credit event risk priced? Modeling contagion via the updating of beliefs*, Carnegie Mellon University, mimeo.
- Committee on the Global Financial System (2005): *The role of ratings in structured finance: issues and implications*, Bank for International Settlements, Basel.
- Davis, M and V Lo (2001): "Infectious defaults", *Quantitative Finance*, 1, pp 382–87.
- Duffie, D (2004): "Time to adapt copula methods for modelling credit risk correlation", *Risk* magazine, April, p 77.
- Duffie, D and K J Singleton (2003): *Credit risk: pricing, measurement and management*, Princeton University Press.
- Gibson, M (2004): "Understanding the risk of synthetic CDOs", *FEDS Discussion Papers*, no 2004-36, Board of Governors of the Federal Reserve System.
- Gregory, J and J-P Laurent (2004): "In the core of correlation", *Risk* magazine, October, pp 87–91.
- Hull, J and A White (2004): "Valuation of a CDO and an n-th-to-default CDS without Monte Carlo simulation", *Journal of Derivatives*, forthcoming.
- International Swaps and Derivatives Association (2003): "ISDA Credit Derivatives Definitions", *Supplements and Commentaries*.
- Lando, D (2004): *Credit risk modeling: theory and applications*, Princeton University Press.
- Li, D (2000): "On default correlation: a copula function approach", *Journal of Fixed Income*, March, pp 43–54.
- Nelsen, R (1999): "An introduction to copulas", *Lecture Notes in Statistics*, Springer, Berlin.
- O’Kane, D, M Naldi, S Ganapati, A Berd, C Pedersen, L Schloegl and R Mashal (2003): "The Lehman Brothers guide to exotic credit derivatives", supplement, *Risk* magazine, November.
- O’Kane, D, C Pedersen and S Turnbull (2003): "The restructuring clause in credit default swap contracts", *Fixed income quantitative credit research*, Lehman Brothers, April.
- O’Kane, D and S Sen (2003): "Up-front credit default swaps", *Quantitative Credit Research Quarterly*, Lehman Brothers, Third Quarter.

Packer, F and H Zhu (2005): "Contractual terms and CDS pricing", *BIS Quarterly Review*, March.

Rebonato, R (2002): *Modern pricing of interest-rate derivatives*, Princeton University Press.

Schönbucher, P and D Schubert (2001): *Copula-dependent default risk in intensity models*, Department of Statistics, Bonn University, mimeo.

Contractual terms and CDS pricing¹

Contractual terms related to the definition of trigger events and deliverable obligations on single-name CDSs are priced into CDS spreads. Pricing of the differences in contract terms appears to have generally converged over time, although there still seems to be evidence of a degree of regional fragmentation.

JEL classification: G12, G13.

In recent years, the market for credit default swaps (CDSs) has expanded dramatically. In these financial contracts, a sequence of payments is promised in return for protection against the credit losses in the event of default. By offering investors the chance to gain or sell risk exposure to a reference entity without buying or selling the underlying bond or loan, credit default swaps have greatly increased liquidity in credit markets.

In parallel with the rapid growth of the CDS market, the menu of contractual terms available to the parties to a CDS contract has expanded as well. One major issue is the definition of a credit event that merits payout by the protection provider; another is the definition of deliverable obligation in the event of payout. The terms of the contracts as set out by the International Swaps and Derivatives Association (ISDA) have expanded over time; at present, for instance, at least four distinct clauses related to restructuring events are available in standardised form.

In this special feature, we examine the effect of different restructuring clauses on the pricing of CDSs. Using data available by obligor across contracts taken from a major market data provider, we find that CDS spreads tend to be significantly higher for those contracts with a broader definition of trigger events and/or less restriction on deliverable obligations. Depending on the contract comparison, changes in the expected probability of default (or credit event) and changes in the expected losses-given-default both appear to have a significant role on pricing, as theory would suggest.

The price changes associated with contractual distinctions can have significant implications for both markets and regulatory practice. Given the

¹ We thank Marcus Jellinghaus for helpful research assistance. We have also benefited from conversations with Ingo Fender and Jacob Gyntelberg. The views expressed in this article are those of the authors and do not necessarily reflect those of the BIS.

widespread use of credit derivative instruments, one major concern is whether the credit risk has been priced accurately. While this special feature does not directly address this issue, it offers evidence that the different degrees of protection upon restructuring are incorporated into CDS spreads. In addition, our quantitative estimates of the impact of contract terms may shed light on certain bank capital requirements for credit derivative instruments. In particular, the observed premia associated with restructuring clauses may be informative for determining the appropriate level of capital relief.²

The remainder of this special feature is organised as follows. In the next section, we briefly discuss the CDS market and the type of prevailing contractual arrangements. We then review the CDS data used for the project. In the fourth section, we present and test various hypotheses about the impact of contract terms on the pricing of CDSs, and in the fifth we present evidence that the valuation of contract term differences has converged over time. The final section concludes.

Contractual terms: definitions of restructuring and deliverable obligations

Since the original ISDA agreement in 1999, there have been six general categories of credit events under which payments from the protection seller to the protection buyer can be mandated: bankruptcy, failure to pay, repudiation/moratorium, obligation acceleration, obligation default and restructuring. In practice, the three principal credit events for corporate borrowers are bankruptcy, failure to pay and restructuring.

There is widespread agreement that the restructuring credit event is the toughest contingency to contract for in a CDS. Broadly speaking, this is due to two factors. First, the restructuring can often constitute a “soft” credit event, in which the loss to the owner of reference obligations is not obvious. Second, restructuring often retains a complex maturity structure for the firm’s obligations (in contrast to a default or bankruptcy, where debt is accelerated), so that debt of different maturities may remain outstanding with significant differences in value. Thus, the “cheapest to deliver” option,³ which is standard under normal CDS events, is often more valuable during a restructuring, and can present opportunistic protection buyers with the ability to earn a profit unrelated to a fundamental change in the credit quality of the obligation. In defining the scope and the degree of the protection upon restructuring, four different types of contract terms for restructuring events have evolved.

Difficulties in contracting for restructuring in a CDS

² The Basel II framework states that “restructuring” must be included as a credit loss event in order to receive full capital relief. Otherwise, only partial recognition of up to 60% of the hedge can be recognised as covered (BCBS (2004)). This treatment is tentative and subject to further review.

³ Another factor that affects the value of the “cheapest to deliver” option is the settlement mechanism, ie whether delivery of physical assets is required (so-called physical settlement) or not (known as cash settlement). This issue cannot be addressed in this special feature because of data limitations.

Initially, any restructuring qualified as a credit event

Full restructuring (FR)

The full-restructuring clause was the standard contract term in the 1999 ISDA credit derivatives definitions. Under this contract option, any restructuring event qualifies as a credit event (and any bond of maturity up to 30 years is deliverable). The problems with this arrangement became clear in 2000, when the bank debt of Conseco Finance, restructured to include increased coupons and new guarantees, and thus not disadvantageous to holders of the previous debt, still constituted a credit event and triggered payments under the ISDA guidelines.⁴ Some banks delivered long-dated bonds to profit from buying discounted lower-priced bonds and receiving par value in return, which was perceived as a distortion of the CDS market.

Modified restructuring (MR, introduced in 2001)

In 2001, to limit the scope of opportunistic behaviour by sellers in the event of restructuring agreements that did not cause loss, ISDA published a modified restructuring clause. While restructuring agreements still counted as credit events, the clause limited the deliverable obligations to those with a maturity of 30 months or less after the termination date of the CDS contract. Under this contract option, any restructuring event (except restructuring of bilateral loans) qualifies as a credit event.

Modified-modified restructuring (MM, introduced in 2003)

In 2003, a further modification of the modified restructuring clause was introduced, in response to the perception on the part of some market participants (particularly in Europe) that the modified restructuring had been too severe in its limitation of deliverable obligations. Under the modified-modified restructuring term, the remaining maturity of deliverable assets must be shorter than 60 months for restructured obligations and 30 months for all other obligations.

No restructuring (NR)

A popular option is to exclude all restructuring events

Under this contract option, all restructuring events are excluded under the contract as “trigger events”. The advantage to this contract is that so-called “soft” credit events under restructuring that do not constitute a true loss for the protection buyers, but still might encourage opportunistic behaviour on their part, are ruled out. In August 2002, JPMorgan Chase announced that it would no longer include restructuring clauses in its non-sovereign CDS contracts used for hedging purposes (see CGFS (2003)). In addition, some of the most popular CDS indices in North America (for instance, the DJ.CDX.NA.IG and DJ.CDX.NA.HY indices)⁵ are traded under the no-restructuring definition.

⁴ For further discussion on the Conseco episode and its impact on the CDS market, and more broadly on ABS markets, see Box 4 in CGFS (2003) and Appendix 5 in CGFS (2005).

⁵ CDS indices first appeared in 2003 and have developed rapidly since. See Amato and Gyntelberg (2005).

Data source

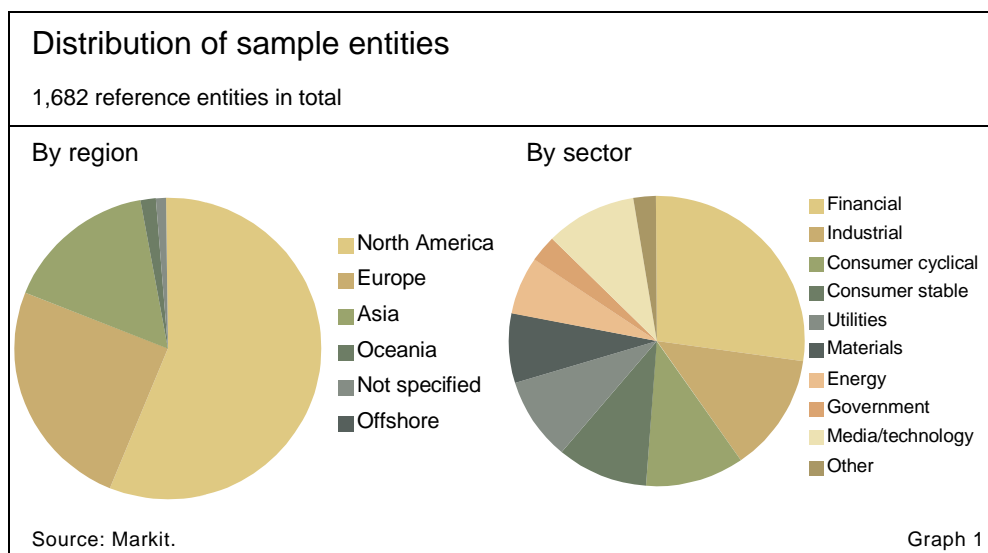
The main data source for this special feature is Markit, to which a network of leading market participants contribute price information across several thousand credits on a daily basis. Based on the contributed quotes, the company constructs daily composite quotes, which reflect the average CDS spreads offered by major market participants.⁶

While these prices are averages of market quotations rather than transaction-based, there are two main advantages of using them for our study. First, the data set covers a wide range of CDS contracts in terms of restructuring clauses, currency denomination and maturity. Whereas some of the contracts are not liquid in the market, the indicative quotes provide a broad picture of market activity and demonstrate how leading participants value the differences in contract arrangements. Second, the company also provides expected recovery rates used by contributors. Presumably those expected recovery rates reflect the view of contributors on the severity of expected losses if the reference entity defaults. As a result, spread differentials between contracts on the same entity can be decomposed into that part that is due to changes in expected recovery in case of a trigger credit event (eg default), and that part due to changes in the likelihood of such a credit event.

We use a sample of daily CDS prices for 1,682 reference entities over a sample period from 11 February 2003 to 3 June 2004.⁷ Our sample covers a wide range of entities in terms of geographical locations and sectors (Graph 1). We only include contracts with a maturity of five years because they are the

Quotes on both CDS prices and expected recovery rates

We use only contracts of five-year maturity written on senior obligations



⁶ Markit adopts three major filtering criteria in creating composite quotes: (i) an outlier criterion that removes quotes that are far above or below the average prices reported by other contributors; (ii) a staleness criterion that removes contributed quotes that do not change for a very long period; and (iii) a term structure criterion that removes flat curves.

⁷ The start is the date when ISDA published its new credit derivatives definitions, in which the four choices related to restructuring were clarified. Our sample coverage ends on 3 June 2004 because filtering criteria were changed thereafter.

Breakdown of CDS quotes				
	FR	MR	MM	NR
Total number of quotes	260,351	248,453	59,032	58,098
By region ¹				
Asia	53,934	3,868	72	317
Europe	118,972	18,931	58,066	1,716
North America	81,518	218,506	240	55,220
Oceania	4,490	4,987	32	0
Offshore	506	1,143	104	435

¹ The numbers do not add up to the total because there are some quotes without regional information. Table 1

most liquid. In addition, we only include those CDS contracts written on senior obligations to avoid the bias due to differences in seniority. In total, we collect more than 625,000 CDS spread quotations, which are concentrated on entities in the rating classes single-A (about 33%) and triple-B (about 41%).

Table 1 summarises the distribution of CDS quotes across the four types of contractual terms. Apparently the full restructuring and modified restructuring contracts have been more popular types, partly because they were introduced earlier as standardised contracts in the market. A further regional breakdown shows that full restructuring has been the prevailing contract form in Europe and Asia. Similarly, the other three contract forms, which were introduced into practice at a later stage to address the restructuring issue, have had differing degrees of popularity across regions. For instance, the modified-restructuring and no-restructuring terms have been mainly adopted for entities based in North America. By contrast, the modified-modified restructuring contract term, which was first issued in July 2003, has so far been widely accepted in Europe only.

We calculate the pairwise price differences between any two CDS contracts that are written on the same entity, in the same currency of denomination and on the same day, but differ only in the types of restructuring clauses. This comparison allows us to control for other factors that could move CDS prices. Moreover, we remove the top and bottom 1% of the pairwise differentials in calculating means to avoid any undue influence from extreme observations.⁸ At the end of the filtering process, we are left with about 200,000 pairwise spread differences (Table 2, first row).

Hypotheses and empirical results

Though the CDS restructuring clauses differ along many dimensions (see Fitch (2004)), we expect that their principal impact on CDS spreads will be through a varying degree of payout due to restructuring. As discussed in the box on page 95, this impact can broadly be attributed to two types of effects. First, the

⁸ Another reason to remove those observations is because they are likely to be linked with hidden upfront payments, which are not reported in the database but tend to cause substantial bias in empirical results.

CDS spread differences				
	FR–MR	MM–MR	FR–NR	MR–NR
Number of observations	98,833	14,511	34,431	52,232
Mean ¹				
Percentage difference (%)	2.77*	1.33*	7.49*	4.25*
Level (basis points)	3.36*	1.42*	7.65*	4.68*
Median ²				
Percentage difference (%)	3.06*	1.22*	7.52*	4.33*
Level (basis points)	1.70*	0.65*	4.58*	2.60*
λ^3	1.00	1.35	0.38	–0.30

¹ * shows that the mean is different from zero at a significance level of 95% based on the t-test.
² * shows that the median is different from zero at a significance level of 95% based on the sign rank test. ³ Defined as the ratio between the percentage change in expected losses-given-default and the percentage change in CDS spreads.

Table 2

clause can change the probability of receiving a protection payment because of different definitions of trigger events. Second, the clause can affect the value of protection in the event of restructuring due to variations in the flexibility of the delivery option.

This framework offers an intuitive insight on the relationship among the spreads of the four contract types. First, under the no-restructuring (NR) term, protection buyers get no compensation at all for their credit losses upon restructuring. The narrower scope of the protection suggests that its spread should be lower. Second, in the three contract terms that include restructuring as a credit event, protection buyers are equally likely to receive protection payments. However, the amount of expected payout varies with the value of the cheapest-to-deliver option. As discussed above, among these three contract forms, full-restructuring contracts (FR) are the most flexible and modified restructuring contracts (MR) the least. Therefore, the spreads of the four contract terms should satisfy the following relationship: FR>MM>MR>NR.

The framework also suggests differences across contracts in the relation between spread differentials and expected losses. Given that the probability of a credit event should be similar for the three restructuring-inclusive contracts on the same entity (FR, MR and MM), any difference in CDS spreads should be driven by the difference in conditional expected losses. Thus, defining a contribution measure (λ) as the ratio between changes in expected losses-given-default and changes in CDS spreads (see the box), we expect this measure to be roughly equal to one for the pairwise spread differentials FR vs MR and MM vs MR. By contrast, spread differentials between these three contracts and the no-restructuring form are the combined results of different default probabilities and different expected losses. Thus, when switching to or from contracts with the no-restructuring clause, we expect the contribution of expected losses to a change in spreads to be substantially smaller than one (perhaps even negative).

A clear ordering of expected spreads by contract

The impact of restructuring clause arrangements on the pricing of credit default swaps: a theoretical perspective

The price of a credit default swap can be derived easily in the risk neutral framework. Following Duffie's (1999) simplified analysis, the risk-free rate (r_t) is assumed to be constant over time.^① Define $q(t)$ as the risk neutral default probability for the underlying asset at time t , and, accordingly, $S(t)=1-\int_0^t q(s)ds$ as the risk neutral survival probability until time t . A credit default swap consists of two legs. The protection buyer agrees to make periodic premium payments (the annual rate is p) until the contract matures (at time T) or a credit event occurs. In return, the protection seller agrees that, once a credit event occurs, he will pay the difference between the face value (one unit) and the market value of the underlying asset, which is also known as the loss-given-default (LGD).

In an efficient market, the present value of the two legs should be equalised so that no arbitrage opportunity exists. That is,

$$\int_0^T e^{-rt} S(t) p dt = \int_0^T e^{-rt} q(t) \cdot LGD dt \quad (1)$$

The left-hand side of the above equation represents the present value of CDS premium payments,^② and the right-hand side the present value of protection payments. Equation (1) implies that, when the risk-free rate is exogenously given, the price of a CDS is determined by two factors, ie the risk neutral default probability and expected losses. Assuming that the probability of default (q_t) is constant over time (or equivalently that it represents the average probability of default over the contract period), it can be easily shown that

$$\frac{dp}{p} = \frac{dLGD}{LGD} + \frac{p}{q \cdot LGD} \cdot \frac{dq}{q} \quad (2)$$

Equation (2) suggests that the change in the CDS premium is attributable to changes in either risk neutral default probabilities or expected losses. In practice, changes in risk neutral default probabilities could reflect the variation in both physical default probabilities and investors' risk attitude, and changes in expected losses can result from differences in exit strategies, bankruptcy procedure, the characteristics of reference obligations and their valuation method.

To examine the relative importance of the default probability effect and the expected losses effect, we can define a measure (λ) as the ratio between variation in expected losses and changes in CDS spreads, that is

$$\lambda = \frac{dLGD / LGD}{dp / p} \quad (3)$$

This measure gives an intuitive indication of how much of the movement in the CDS premium can be explained by the variation in expected losses. Obviously, when a trigger event is equally likely to occur in two contracts, the price difference should roughly reflect the differing degree of expected losses (ie $\lambda = 1$).^③

^① Allowing the risk-free interest rate to be stochastic does not change the analytical results. ^② While in a standard contract the premium is paid on a regular basis (usually quarterly), the fact that accrued CDS premium needs to be paid by the protection buyer upon default implies that it is appropriate to use the continuous form valuation conditional on the survivorship of the reference entity. ^③ For a simulation of the possible impact of restructuring terms on CDS pricing, see O'Kane et al (2003).

Calculating spread differentials across contracts

We test the above hypotheses using price quotes on the four types of contracts for a wide range of entities, and the recovery rate linked to each quotation.^⑨ We calculate four pairwise spread differentials: FR vs MR, MM vs MR, FR vs NR and MR vs NR. We focus on the percentage difference in spreads, since from a theoretical perspective (see the box) this measure

^⑨ Recovery rates used by contributors typically vary between 30% and 45%, but can be as low as 5% under extreme situations (eg when the entity is close to default).

should be directly linked to the difference in the value of the delivery option when the trigger events are identical. As a supplementary indicator of the pricing impact, we also report differences in spread levels.

Pairwise spread differentials

The general pattern of the four pairwise spread differentials is consistent with our predictions. First, those contracts excluding restructuring from the definition of credit events charge lower spreads than the other three contracts. For example, the premium of an NR contract is on average 7.5% lower than that of an FR contract. When expressed as the difference in levels, the premium is on average 7.7 basis points lower.

No-restructuring clauses reduce the premium by as much as 7% ...

Second, the sign of the spread differentials among the three contracts that include restructuring as a credit event reflects the differing degrees of restriction on deliverable obligations. On average, a full-restructuring contract (FR) is priced 2.8% (3.4 basis points) higher than a modified-restructuring contract (MR), and the modified-modified restructuring contract (MM) is priced in between the two. All of the price differences between contract types, while not particularly large economically, are statistically significant.

Third, the magnitude of the contribution measure (λ) for the pairs FR vs MR and MM vs MR (based on expected recovery rates) suggests that the valuation of those contract terms largely reflects the distinct value of the “cheapest to deliver” option (rather than variations in the likelihood of a trigger event). The percentage differences in premia are virtually identical to those in expected losses for the FR-MR pair, and very close for the other pair. By contrast, the contribution of recovery values to price differentials is much smaller when comparing the no-restructuring to other contracts, consistent with our expectation that variations in the probability of trigger events have an important role in explaining these price differences.

... and change the likelihood of a credit event

So far we have abstracted from the possibility that the pricing impact of restructuring terms might differ with the characteristics of reference entities, including their ratings, industry classifications and geographic locations. Such differences may arise for various reasons, discussed below. In the following subsections we examine price differentials across each of these three dimensions.

Is there a rating effect?

Credit ratings could affect pricing differentials in a number of ways. For instance, risk-averse investors might be more likely to invest in highly rated entities, increasing the sensitivity of spreads to uncertainties in protection coverage. We would also expect to see a rating effect were the likelihood of using restructuring as a default strategy, or the percentage change in expected losses (due to maturity restriction on deliverable obligations), to differ materially by rating class.

We divide the sample of premia differences into four rating groups, corresponding to entities rated by Moody's as Aaa or Aa, A, Baa and high-yield (Ba to C). As shown in Table 3, there appears to be little evidence of a separate rating effect on spread differentials. First, the spread differentials

Rating class per se has little influence on contract effects

Average spread differentials by rating, sector and region ¹								
Percentage difference								
	FR–MR		MM–MR		FR–NR		MR–NR	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
By rating								
Aaa/Aa	2.20*	2.82*	0.37*	0.43	7.21*	6.91*	4.23*	3.79*
A	2.84*	3.03*	1.04*	1.02*	7.69*	7.56*	4.65*	4.55*
Baa	2.57*	2.89*	1.33*	1.07*	7.54*	7.62*	4.85*	4.74*
Speculative grade ²	3.81*	3.93*	2.11*	1.89*	7.23*	7.19*	2.77*	2.90*
By sector								
Industry	2.94*	3.19*	1.63*	1.37*	7.63*	7.65*	4.30*	4.42*
Financial	2.07*	2.52*	−0.60*	−0.35*	6.92*	6.97*	4.01*	3.96*
Government	2.87*	3.36*	−0.25	0.00	7.30*	7.22*	3.83*	3.85*
By region								
North America	2.62*	2.85*	−1.57*	−0.68*	7.31*	7.39*	4.19*	4.30*
Europe	3.97*	4.04*	1.39*	1.25*	10.55*	10.79*	6.28*	6.50*
Japan ³	12.67*	15.53*	–	–	15.52*	17.25*	6.64*	10.19*

¹ * shows significance of the test statistics at 95% as in Table 2. ² Refers to Moody's credit ratings from Ba to C. ³ Yen-denominated CDSs only.

between contracts still have the correct sign across rating classes. Second, the relative measure of price difference exhibits virtually no change when segmented by credit rating.

The absence of a rating effect suggests that restructuring is an equally likely choice for a financially distressed firm regardless of credit quality. Nor do rating-based “clienteles effects” appear to influence the pricing of contract terms.

Sectoral effect

We next test for a sectoral effect by grouping the sample entities into three major groups: industrial, financial and government sectors. The statistical results show no obvious sectoral effect (Table 3). A further breakdown of the industry sector into nine subsectors does not change the findings.¹⁰ One small exception is that the MM–MR spread differentials for government and financial entities are extremely close to zero and statistically insignificant in the former sector. The difference in the market valuation of the delivery option between these two contracts appears to be much less prominent for entities in these two sectors. We hope to explore this anomaly further in future research.¹¹

¹⁰ The nine subsectors are communications, communications and technology, consumer cyclical, consumer stable, energy, industrial, material, technology and utilities.

¹¹ Packer and Suthiphongchai (2003) find that the pricing of sovereign CDSs generally differs from the pricing of those written on corporate or bank entities, and the pricing difference exhibits a striking asymmetry by rating class.

Regional effects

By contrast, there is some evidence of regional effects in the price impact of contractual terms. Namely, spread differentials across contracts for entities from North America (mostly from the United States) are smaller than those for their European counterparts, which in turn are smaller than those on Japanese obligations (Table 3).¹²

Lenient contract terms are priced more dearly in Japan and Europe ...

The regional effects may reflect differing valuation methods between the markets. The degree of regional fragmentation in the adoption of the four contract types, as discussed in the previous section, might allow different pricing practices.¹³ If true, the above results are consistent with European and Japanese markets applying bigger adjustment factors for default probabilities and expected losses than their North American counterparts.

Another possibility is that, for structural reasons, there may be a greater risk in Japan and Europe of moral hazard on the part of protection buyers, who also act as creditors to the reference entities and can trigger a “soft” credit event. An increasing likelihood of such opportunistic behaviour could yield a bigger impact of contractual arrangements on CDS spreads in those regions. For instance, some market observers have suggested that the full-restructuring contract, by far the most popular contract form in Japan, might allow for a particularly great risk of moral hazard given the dominance of bilateral loans in Japan’s credit markets (Fitch (2004)).

... perhaps due to moral hazard

The moral hazard hypothesis is modestly supported by a decomposition of changes in default probabilities and expected recoveries. For example, the implied change in default probability when switching away from no-restructuring contracts to those allowing for a payout upon restructuring is highest for Japanese entities, followed by European ones. Though this finding is consistent with moral hazard accounting for regional differences in spread differentials across contract, it does not rule out the market segmentation hypothesis discussed above.

Convergence of pricing practices?

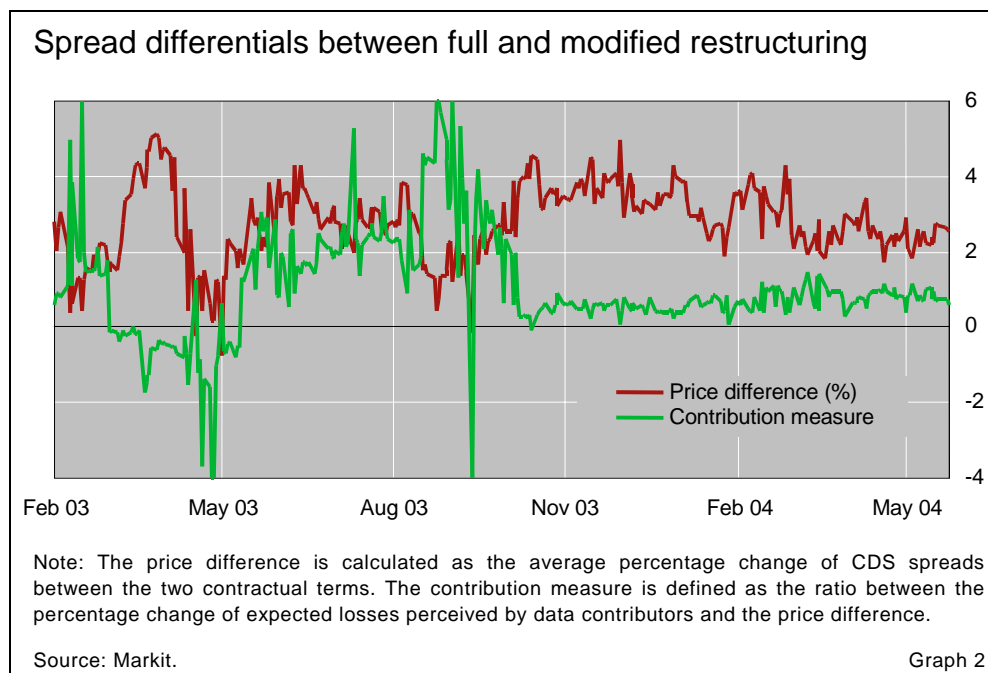
The valuation of contractual terms evolved over the sample period. Graph 2 plots on a daily basis the average of the percentage differences in spread between the full-restructuring (FR) and modified-restructuring (MR) contracts, as well as the contribution measure as defined above. Several interesting observations stand out.

First, spread differentials between the contracts have become more stable over time. The range of price differences narrowed from 1–5% in 2003 to 2–4% in the first half of 2004. Similar patterns are also observed by region, and for the other three pairwise spread differentials. While this could reflect the

Spread differentials have stabilised ...

¹² One exception is the MR–MM spread differentials, but the estimate for North American entities may not be reliable because there are very few matched observations.

¹³ Zhu (2004) finds evidence of different responsiveness of CDS spreads to changes in credit conditions between the US market and the European market.



... consistent with more uniform valuation methods

improvement of credit conditions in the market, it is more likely to indicate the convergence of the valuation of contractual terms among market participants.

Second, our contribution measure (λ), the ratio between variation in expected losses and changes in CDS spreads, has also stabilised. Before October 2003, although the average measure over time was very close to one, it was quite volatile. Thereafter, the measure fluctuated less and gradually converged to one. The pattern is consistent with the market gradually becoming more efficient in pricing the delivery option, and market participants adopting a more uniform valuation method for contract terms.

It is worth recalling that the convergence in valuation methods may take several years. Both FR and MR contracts were introduced before 2003, yet in their first two years the market showed clear evidence of greater disagreements on the value of contract terms and on the sources of relative valuation.¹⁴ In addition, the contribution measure still shows relatively greater volatility for pairwise spread differentials that include the MM and NR contracts, which were introduced later than the FR and MR contracts.

Conclusion

In this article we have found evidence supporting the view that contractual terms matter in the pricing of CDSs, specifically those terms covering restructuring-related credit events. The difference is around 7 basis points on average for the two most divergent contracts. But even finer degrees of distinction in the specification of restructuring-contingent states appear to be priced. Associated quotes on expected recovery are consistent with the view that the cheapest-to-deliver option is the principal factor driving most of the spread differentials.

¹⁴ For a further discussion of market practice during that period, see BIS (2003), pp 112–13.

We also detect a trend over the sample period towards a more uniform valuation of contractual terms. Nonetheless, we still see some evidence of a regional effect in the pricing impact of contract terms. Widely divergent popularities of different contract types across regions, as well as different characteristics of regional markets, may have resulted in a degree of market segmentation that allows for distinct valuation. We hope to shed light on the individual and collective significance of time series effects, regional distinctions and the estimated recovery values in future research.

References

Amato, J and J Gyntelberg (2005): "CDS index tranches and the pricing of credit risk correlations", *BIS Quarterly Review*, March, pp 73–87.

Bank for International Settlements (2003): *73rd Annual Report*, Basel.

Basel Committee on Banking Supervision (2004): *International convergence of capital measurement and capital standards: a revised framework*, Bank for International Settlements, June.

Committee on the Global Financial System (2003): "Credit risk transfer", *CGFS Working Group Report*, no 20, January.

——— (2005): "The role of ratings in structured finance: issues and implications", *CGFS Working Group Report*, no 23, January.

Duffie, D (1999): "Credit swap valuation", *Financial Analysts Journal*, January–February, pp 73–87.

Fitch Investors Service (2004): "Credit events in global synthetic CDOs: year-end 2003 update", *Fitch Credit Products Special Report*, June.

O’Kane, D, C Pedersen and S Turnbull (2003): "The restructuring clause in credit default swap contracts", *Lehman Brothers Fixed Income Quantitative Credit Research Quarterly*, vol 2003-Q1/Q2, pp 45–59.

Packer, F and C Suthiphongchai (2003): "Sovereign credit default swaps", *BIS Quarterly Review*, December, pp 79–98.

Zhu, H (2004): "An empirical comparison of credit spreads between the bond market and the credit default swap market", *BIS Working Papers*, no 160.

Recent initiatives by Basel-based committees and the Financial Stability Forum

For the first three quarters of 2004, the endorsement of the new capital adequacy framework (Basel II) and issues related to its implementation were the dominant themes. The last quarter, however, was characterised by more diverse releases by the various Basel-based committees. Table 1 provides a selective overview of the most recent initiatives.

Basel Committee on Banking Supervision

BCBS publishes paper highlighting key elements of “know-your-customer” risk management ...

In October, the Basel Committee on Banking Supervision (BCBS) issued a paper on the importance of banks managing their “know-your-customer” (KYC) risks on a global consolidated basis. Entitled *Consolidated KYC risk management*, the paper is a complement to a 2001 paper, *Customer due diligence for banks*, and examines the critical elements for the effective group-wide management of KYC risk. The paper emphasises the need for a consistent global approach whereby banks apply the principles of sound KYC risk management both at the head office and at all branches and subsidiaries. Such an approach is based on four essential elements: (i) customer acceptance, (ii) customer identification, (iii) ongoing monitoring of higher-risk accounts, and (iv) risk management. While the standards have been widely adopted as a benchmark for good practice by financial institutions, in many jurisdictions legal restrictions that impede effective cross-border sharing of information still need to be removed to facilitate consolidated KYC risk management processes.

... and issues further recommendations on impact of IFRS on regulatory capital

In December, following earlier press releases on the potential impact of the implementation of international financial reporting standards (IFRS) on regulatory capital, the BCBS issued a release encouraging national supervisors to consider an additional set of related issues. Some recommendations cover the regulatory capital treatment of gains and losses on available-for-sale instruments under IAS 39. The Committee also recommends that caution be exercised if national supervisors allow partial recognition of unrealised gains on both own-use and investment properties in Tier 2 capital. In the context of exposure measurement, the Committee also suggests that the exposure amount of an asset for risk weighting purposes should be defined as no less than the amount by which regulatory capital would be reduced in the event of a

full write-off. Finally, the Committee announced that it will continue to consider the potential effects of the use of fair value option accounting under IAS 39.

As part of another follow-up to the revised capital adequacy framework (Basel II), the BCBS announced that several member countries had decided to conduct national impact studies or field tests based on Basel II during 2004 or 2005. Unlike the quantitative impact studies (QIS)¹ conducted before the release of Basel II in June 2004, these exercises do not represent a joint effort of the Committee. The main motivation behind these national efforts is the fact that, since the release of the revised framework, banks' ability to estimate the parameters for the more advanced approaches of Basel II has improved significantly. In addition, certain analyses conducted by the Committee after the last QIS had been based on approximations, due to a lack of more accurate data.

Several BCBS member countries to conduct national impact studies on Basel II

Committee on the Global Financial System

In January, the Committee on the Global Financial System (CGFS) issued a report that highlights several of the characteristics of structured products, challenges for rating agencies in this area, and implications for central banks and investors. Entitled *The role of ratings in structured finance: issues and implications*, the report was prepared by the CGFS Working Group on Ratings in Structured Finance and seeks to identify and explain methodological differences between the rating of structured finance instruments and of more traditional credit products. In addition, it explores the various methodological and organisational challenges involved in rating structured finance products. Documenting the Working Group's findings, the report complements earlier work by the CGFS and the Joint Forum.²

CGFS publishes a report on the role of ratings in structured finance ...

Also in January, the Committee published a report entitled *Stress testing at major financial institutions: survey results and practice*, which summarises the findings of a survey on stress tests undertaken by banks and securities firms. The report reviews what financial institutions perceive to be the main risk scenarios (based on the type of stress tests they are running), explores some of the structural aspects of stress testing and examines how practices have evolved since the 2001 CGFS survey on stress tests.³ The results of the survey indicate that stress tests based on movements of interest rates and credit events were the most dominant types of tests performed, with the majority of tests focusing on markets in more than one region. The report concludes that, while stress testing is becoming an integral part of the risk

... and also issues survey results on micro aspects of stress testing

¹ The main purpose of the QIS was to gather information in order to assess whether the Committee had met its goal with regard to the revised framework.

² See Committee on the Global Financial System, *Credit risk transfer*, 2003, and Joint Forum, *Report on credit risk transfer*, 2004 (discussed below).

³ See Committee on the Global Financial System, *A survey of stress tests and current practice at major financial institutions*, 2001.

Main recent initiatives by Basel-based committees and other bodies

Press releases and publications over the period under review

Body	Initiative	Thematic focus	Release date
BCBS	Consolidated KYC paper	<ul style="list-style-type: none"> Importance of banks' managing "know-your-customer" risk on a global consolidated basis Complement to earlier BCBS report <i>Customer due diligence for banks</i> Identifies key elements for effective management of KYC risk throughout a banking group 	October 2004
	Press release on capital treatment of certain items under international financial reporting standards (IFRS)	<ul style="list-style-type: none"> Impact on regulatory capital Points for national supervisors to consider when implementing IFRS 	December 2004
	Basel II: national quantitative impact studies announced	<ul style="list-style-type: none"> Post-release estimation advances as motivation for national field tests on impact of Basel II Not a joint effort of the BCBS, but based on a common template 	
CGFS	<i>The role of ratings in structured finance: issues and implications</i>	<ul style="list-style-type: none"> Characteristics of structured products Challenges for rating agencies and other market participants Implications for central banks 	January 2005
	<i>Stress testing at major financial institutions: survey results and practice</i>	<ul style="list-style-type: none"> Review of major risks perceived by financial institutions Examines evolution of stress testing practices 	
CPSS	<i>Statistics on payment and settlement systems in selected countries – Figures for 2003</i>	<ul style="list-style-type: none"> Annual release of country-specific and comparative tables 	October 2004
	<i>Recommendations for central counterparties (CCPs)</i>	<ul style="list-style-type: none"> Risk management standards for CCPs Recommendations and implementation methodology 	November 2004
	<i>Payment systems in Sri Lanka</i>	<ul style="list-style-type: none"> Red Book series publication 	December 2004
Joint Forum ¹	Report on credit risk transfer (CRT)	<ul style="list-style-type: none"> Degree of risk transfer achieved by instruments/transactions Agents' understanding of risks involved Concentration risk due to CRT 	October 2004

¹ The Joint Forum was established in 1996 under the aegis of the Basel Committee on Banking Supervision (BCBS), the International Organization of Securities Commissions (IOSCO) and the International Association of Insurance Supervisors (IAIS).

Sources: www.bis.org; www.fsforum.org.

Table 1

management frameworks of financial institutions and works as a complement to other risk management tools like value-at-risk, a number of challenges remain. The report also notes that there is an interest in developing better stress tests incorporating loan portfolios.

Committee on Payment and Settlement Systems

In October, the Committee on Payment and Settlement Systems (CPSS) released its annual publication of statistics on payment and settlement systems in the 13 member countries.⁴ The report contains detailed tables on various aspects of payment systems for each individual country as well as a number of comparative tables which document a variety of issues such as the relative importance of cashless payment instruments or the features of selected interbank funds transfer systems.

CPSS releases annual statistics on payment and settlement systems ...

In November, the CPSS and the Technical Committee of the International Organization of Securities Commissions (IOSCO) released a report that sets out comprehensive standards for risk management of a central counterparty (CCP), an entity that interposes itself between counterparties in financial transactions. While a well managed CCP reduces the risks faced by its participants, it also presents a potential threat to the goal of financial stability since it exposes the securities settlement system to increased levels of concentration risk. Entitled *Recommendations for central counterparties*, the report features 15 headline recommendations and accompanying explanatory text, covering the major types of risks CCPs face such as counterparty credit risk, liquidity risk, settlement bank risk, custody risk, operational risk and legal risk. The report also includes a methodology for assessing the implementation of the recommendations.

... and joint IOSCO report on central counterparty risk management standards

In December, as one of its periodic reference works on payment systems in various countries, the CPSS published a "Red Book" for Sri Lanka. Payment systems in Sri Lanka have undergone significant reforms over the last few years. These include the introduction of an RTGS system in 2003 and the successful launch of a government securities settlement system in 2004. This national report offers a detailed documentation of the key importance of properly functioning payment systems for enhancing the stability of the financial system.

Red Book for Sri Lanka published

Joint Forum

In response to a request by the Financial Stability Forum (FSF), in October the Joint Forum's Working Group on Risk Assessment and Capital published a report entitled *Credit risk transfer*. The report focuses on three issues highlighted by the FSF: whether instruments and transactions accomplish a clean transfer of risk, the degree to which market participants understand the risks involved, and whether credit risk transfer activities are leading to undue

Joint Forum releases report on credit risk transfer

⁴ See Committee on Payment and Settlement Systems, *Statistics on payment and settlement systems in selected countries – Figures for 2003, 2004*.

concentrations of credit risk. It concludes that credit derivatives have achieved a relatively good risk transfer record to date. Market players seem to be largely aware of the risks concerned, and the concentrations of credit risk pose no immediate threat to financial stability.

Financial Stability Forum

FSF roundtable on challenges from implementation of IFRS identifies key issues

The FSF, in conjunction with the International Accounting Standards Board and the International Federation of Accountants, held a roundtable in October to identify issues and challenges arising in the adoption and implementation of IFRS and international standards on auditing. The participants, including national authorities with responsibility for financial reporting, accounting and auditing associations, accounting and auditing standard setters, market participants, international regulatory bodies and development agencies, focused on the following issues in particular: (i) the importance of well developed accounting and auditing regulatory frameworks to ensure effective implementation of standards; (ii) implications for the breadth of implementation of IFRS reporting arising from the complexity of the standards, the need for translations, and variations in the demand for financial information across different firm types (such as small and medium-sized enterprises); (iii) the need to balance the volume and frequency of changes to the standards against a desire for a stable platform to facilitate implementation; (iv) the lack in some jurisdictions of capacity for rapid and complete implementation; (v) the challenges associated with achieving commonality in the application of standards in the absence of consistent interpretation from standard setters and enforcers, and, related to that, the appropriate posture for enforcers in the first years of application of the new standards; and (vi) the importance of effective communication between reporters and end users of financial information to minimise volatility in the adoption period.

Attendees welcomed the willingness of the FSF and the coorganisers to arrange a similar gathering, once the new standards have been introduced, to review developments.