BANK FOR INTERNATIONAL SETTLEMENTS

BIS Quarterly Review

March 2006

International banking and financial market developments

BIS Quarterly Review

March 2006

International banking and financial market developments

Special features

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

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.

Christian Upper

+41 61 280 8416
christian.upper@bis.org

Philip D Wooldridge

+41 61 280 8819
philip.wooldridge@bis.org

1. Overview: emerging markets soar to historical highs

Asset prices in emerging markets rallied to record highs early in the new year. Foreign investors snapped up emerging market bonds and equities, pushing indicators of valuations towards and in some cases beyond the upper end of their historical range. The steady improvement in many countries' fundamentals contributed to investors' enthusiasm for emerging market assets. Investors' heightened appetite for risk also appeared to be an important factor behind the rally.

In the major markets, investors were less exuberant. They seemed uncomfortable with current valuations in equity and corporate bond markets but at the same time uncertain in which direction to take a position. In the United States, interest rates, oil prices and corporate earnings all weighed on equity prices. In Japan, seemingly idiosyncratic events had market-wide repercussions, bringing a temporary halt in January to the rally on the Tokyo exchange. Shareholder-friendly actions such as leveraged buyouts continued to loom over corporate debt markets, but corporate spreads remained stable near their cyclical lows despite such event risk.

In government bond and swap markets, yields advanced despite mixed news on the economy as traders expected monetary policy to tighten further in the United States and Europe. In Japan, market participants expected the policy of quantitative easing to be abandoned earlier than previously anticipated as inflation rates turned positive.

Emerging markets rally on foreign inflows

Asset prices across emerging markets soared early in the new year. Bonds, equities and currencies all rallied strongly in January and February (Graph 1.1). This came on top of already impressive gains in 2005 and in many cases drove valuations close to or above their historical highs.

Emerging market equity prices soar …

Equities posted the largest gains. Almost all emerging equity markets had recorded double digit increases in 2005, led by Egypt, Colombia and Saudi Arabia, where prices had more than doubled. In many markets the rally accelerated in January before pausing in February. Asian equity markets were relative laggards, increasing by only about 4% in local currency terms over the first eight weeks of 2006, in contrast to 20% and 13% gains in eastern Europe

and Latin America, respectively. Asian equity prices, especially those in markets dominated by technology firms, dropped sharply on 18 January, following Intel's announcement of weaker than expected sales and a sell-off in Tokyo (see below), although they subsequently recovered.

For US dollar-based investors, gains on local currency investments in emerging markets were amplified by exchange rate movements. Emerging market currencies appreciated by more than 2% against the US dollar over the first eight weeks of 2006. Moreover, central banks in several countries continued to accumulate foreign exchange reserves, suggesting that the appreciation would have been even stronger in the absence of intervention.

In international bond markets, the reduction in spreads was concentrated on bonds with the highest yields, continuing the trend evident for the past few years. Spreads on dollar-denominated bonds issued by Latin American borrowers tightened by 70 basis points over the first eight weeks of 2006, compared to around 20 basis points for European and Asian issuers. Spreads did widen on occasion, such as on 12 January when uncertainty about the US economic outlook contributed to a flight to quality. However, such sell-offs were short-lived and spreads quickly tightened again.

… and bond spreads tighten

The rally in emerging markets was driven in large part by massive inflows of foreign capital. The Institute of International Finance estimates that net portfolio equity flows approached $60 billion in 2005, well above levels seen in previous years (Graph 1.2). Debt inflows exceeded $160 billion, including substantial investment in local currency debt. Available data suggest that foreign investors continued to channel substantial amounts to emerging markets in the early part of 2006.

Massive inflows of foreign capital

Investors' enthusiasm for emerging market assets stemmed in part from perceptions about the strength of fundamentals. Improvements in recent years in external positions, financial systems and fiscal and monetary policies have

Emerging markets

Bond spreads[1] Equity prices[2] Exchange rates[3]

Legend: Asia, Latin America, Europe

[1] JPMorgan Chase EMBI Global Diversified; sovereign stripped spread over government bond yields, in basis points; an index rebalancing in June 2005, following the restructuring of the Argentine debt, resulted in a structural break in the data for Latin America. [2] Morgan Stanley Capital International indices; in local currency; 31 December 2004 = 100. [3] Against the US dollar; a decline indicates a depreciation of the US dollar; 31 December 2004 = 100.

Sources: Datastream; JPMorgan Chase; BIS calculations.   Graph 1.1

Private capital flows to emerging markets

In billions of constant 2005 US dollars[1]

By instrument

- Loans
- Bonds[2]
- Equities[3]

By region

- Asia
- Europe
- Latin America
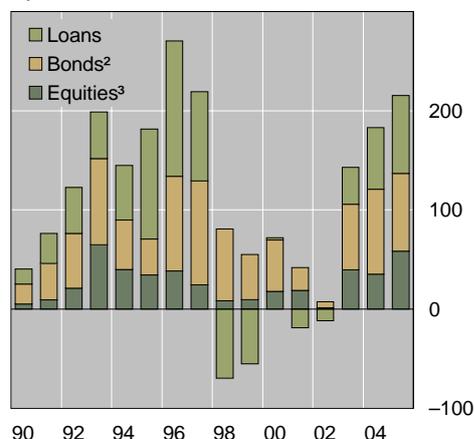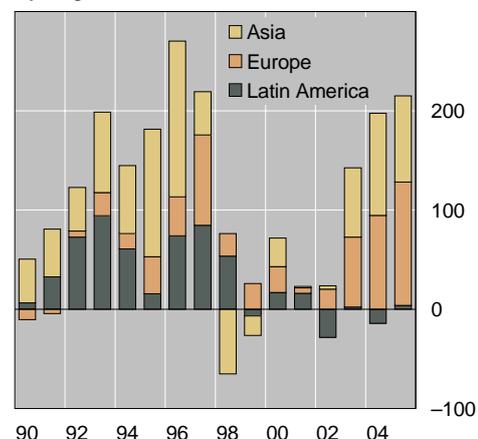
[1] Nominal amounts are converted to constant dollars using the US GDP deflator. [2] Non-bank lending.
[3] Excluding foreign direct investment.

Sources: IIF; national data; BIS calculations.   Graph 1.2

made many emerging markets more resilient to shocks, thereby reducing the risks associated with emerging market investments. Indeed, in 2005, sovereign rating upgrades by Moody's outnumbered downgrades by a ratio of about 3:1. Symbolic of the changed fortunes of emerging markets, Brazil and Argentina in December 2005 used part of their rapidly accumulating foreign exchange reserves to repay in full loans from the IMF totalling $25 billion.

The level and dispersion of spreads reach historical lows …

Nevertheless, investor demand for emerging market assets seems stronger than can be explained by the improvement in fundamentals alone; investors' appetite for risk appears to be just as important a factor. In early 2006, sovereign spreads were tighter than ever before, yet sovereign credit quality was not as high as it once had been. The centre panel of Graph 1.3 plots the spread of JPMorgan's EMBI Global Diversified against Standard & Poor's rating of the sovereigns comprising the index, where the credit ratings are averaged using the same weights as applied to the spreads. The index closed at 197 basis points on 24 February, about 100 basis points below the previous record low reached in mid-1997, around the onset of the Asian financial crisis. By comparison, the weighted average credit rating of issuers in early 2006 was still slightly below its mid-1997 level.

The decline in the average rating of sovereigns between 1997 and 2006 is illustrative of the improvement in lower-rated borrowers' access to international debt securities markets. For example, Ecuador, rated only Caa1 by Moody's and CCC+ by Standard & Poor's, raised $650 million in the international bond market in late 2005 (see "The international debt securities market" on page 31). This better access seems in turn to reflect investors' willingness to take on additional risk in their search for higher nominal yields.

Even after controlling for the rating of the issuer, spreads in early 2006 were at historical lows. The left-hand panel of Graph 1.3 plots the average spread of B, BB and BBB-rated sovereigns, after excluding the highest and

Emerging market bond spreads and credit ratings

At month-end

[1] JPMorgan Chase EMBI Global Diversified (EMBIGD); sovereign stripped spread over government bond yields, in basis points; prior to 1998, the index spread is approximated using data for individual sovereigns. [2] Trimmed average spread for B, BB and BBB-rated constituents of the EMBIGD; the highest and lowest spreads on any given date are excluded from the average. [3] Average rating is calculated using the same weights for individual sovereigns as applied to the spread. [4] Credit rating for all constituents of the EMBIGD; based on long-term foreign currency ratings from Standard & Poor's. [5] Difference between 90th and 10th percentiles; for spreads, in basis points; for ratings, in number of notches.

Sources: Datastream; JPMorgan Chase; Standard & Poor's; BIS calculations.   Graph 1.3

lowest spreads. In each rating category, the average spread in February 2006 was well below its mid-2005 level and even below the previous record lows reached in 1997.

In addition to the low level, the limited dispersion of bond spreads is equally suggestive of high appetite for country risk. The right-hand panel of Graph 1.3 plots the difference between the 90th and 10th percentile spreads and credit ratings for the thirty-odd sovereigns comprising the EMBI Global Diversified. In early 2006, sovereign spreads clustered together more closely than ever before. This raises questions about whether investors are discriminating sufficiently among borrowers. In fact, sovereign ratings remained widely dispersed, implying that there were important differences in the creditworthiness of the borrowers in the index.

... suggesting high appetite for country risk ...

To summarise, comparisons of emerging market spreads across time and with credit ratings suggest that investors' appetite for risk has helped to drive spreads to their current low levels. To be sure, such comparisons have their shortcomings. Credit ratings tend to be lagging indicators of creditworthiness, and the rating agencies may have changed their criteria over time, for example by giving greater consideration to liquidity risk and financial system strength after the Asian financial crisis. Also, the maturity and other characteristics of the index change over time. Nevertheless, to the extent that investors may have underpriced country risk, emerging markets could be vulnerable to a repricing.

... and increasing emerging markets' vulnerability to a repricing

Expectations of tighter monetary policy

Long-term yields in the major markets remained unusually low into the new year, despite increases in policy rates in the United States and the euro area. Although in recent months 10-year government yields have stayed above the lows reached in the summer of 2005, they have yet to surpass the highs reached in June 2004, prior to the first rate hike by the US Federal Reserve. On 24 February, the 10-year US Treasury yield stood at 4.6%, the yield on German bunds at 3.5% and the yield on 10-year Japanese government bonds at 1.6% (Graph 1.4).

<div style="float:left">Yield curves flatten in late 2005</div>

Yield curves continued to flatten in the final months of 2005. Declining inflationary pressures and a less upbeat outlook for growth in the United States led to a decline in the yields of 10-year Treasuries of roughly a quarter of a percentage point. In the euro area and Japan, government bond yields closely followed the US lead despite improved growth expectations (Graph 1.5). As long-term yields declined, short-term rates in the United States and the euro area edged upwards following rate increases by the Federal Reserve and the ECB. As a consequence, the widely watched spread between 10-year and two-year US Treasuries turned negative. The euro yield curve also flattened, but low policy rates prevented it from inverting.

In the past, an inversion of the yield curve had tended to predict an imminent recession, but this time market participants appeared to be more relaxed about the outlook for growth. Instead, low yields on long-term bonds were attributed primarily to a decline in the term premium, reflecting a lower inflation risk premium, and to strong purchases of Treasuries by foreign investors and pension funds.

Bond yields and term spreads
In per cent

Ten-year yields[1]   Term spreads[2]

United States
Germany
Japan

[1] Nominal government yields.   [2] Ten-year minus two-year yields.

Source: Bloomberg.   Graph 1.4

Macroeconomic news

United States / Euro area / Japan

- Surprises[1]
- Growth[2]
- Inflation[2]

[1] Difference between actual data and consensus forecasts, normalised by the mean and standard deviation of past surprises; observations are positioned in the month in which the actual data were released; for the United States, weighted average of the ISM survey, non-farm payrolls, retail sales and producer price and consumer price announcements; for the euro area, survey of the business climate in Germany compiled by the Institut für Wirtschaftsforschung (Ifo); for Japan, weighted average of the industrial production and machinery orders survey. [2] Rolling 12-month forecast, calculated as a weighted average of annual forecasts published by Consensus Economics; observations are positioned in the month in which the forecast was made; percentage change over the previous year.

Sources: Bloomberg; © Consensus Economics; BIS calculations.   Graph 1.5

Yields on the benchmark 10-year Treasury note reached their lowest point at 4.3% ahead of the CPI release on 18 January. Although core inflation came in as expected, this marked the beginning of an upward trend in US yields. Yields were supported by a string of positive news about economic activity in early February, which caused market participants to revise their expectations concerning the future path of policy rates. At the time of writing, they appeared to expect the Federal Reserve to raise rates to around 5% by mid-2006, with a slight possibility of easing towards the end of the year.

Dollar yields rise in early 2006 on revised expectations about monetary policy

On 9 February, the US Treasury reintroduced 30-year bonds, whose issuance had been discontinued in 2001. The auction revealed a high demand for the long bond, which was reflected in a yield slightly below that of the on-the-run 10-year note. Also, the share of indirect bidders was larger than anticipated, suggesting high demand by US institutional and foreign investors. An inversion of the very long end of the yield curve has also been observed in a number of other countries, most prominently the United Kingdom. It appears to be due mainly to a high demand for very long bonds by pension funds rather than an expected decline in trend growth several decades ahead (see box on page 7). Several governments have begun to take advantage of these favourable terms and issued bonds with maturities of up to 50 years.

In the euro area, yields closely followed the US market during the second half of January and rose by approximately one quarter of a percentage point to 3.5%. As in the United States, high issuance of government paper may have contributed to the increase in yields, although the effect is difficult to quantify. In February, yields were quite volatile, as releases showing lower than expected fourth quarter growth in Germany and France alternated with more

Euro yields follow dollar yields

Pension funds and the decline in long-term yields

The persistence of low long-term nominal yields in an environment of robust economic growth has puzzled many market participants and observers. Yields have been especially low at maturities beyond 10 years. One explanation sometimes offered is that demand from institutional investors, in particular pension funds, is exerting downward pressure at the very long end of the yield curve. This possibly reflects a feedback effect, whereby low interest rates encourage still more bond purchases by institutional investors. This box examines how such a feedback mechanism appears to operate in the United Kingdom – where ultra-long-term yields are extremely low – and the degree to which it might be present in other markets.

In the United Kingdom, 30-year government bonds (gilts) have for years traded at yields below those of 10-year paper, and 50-year gilts at even lower yields (see the left-hand panel of the graph below). It is commonly acknowledged that efforts by pension funds to reduce existing mismatches between the duration of their assets and that of their liabilities, through purchases of ultra-long-term bonds, have contributed to the fall in yields. But as yields have declined, pension funds' liabilities have risen, increasing further the demand for long-dated paper and triggering further declines in yields.

This feedback effect has been particularly pronounced in the gilt market for two reasons. First, UK Minimum Funding Requirement (MFR) Regulations and financial reporting rules specify that market yields are to be used to compute the present value of future pension benefits, thereby making pension funds' liabilities very sensitive to changes in yields.[1] Second, companies prefer to minimise fluctuations in the funded position of their pension plans because of the requirement that funding levels be reported on their balance sheets. Market participants, and in consequence companies, have in recent years become especially sensitive to the potential costs of underfunded plans, after companies experienced large losses on their equity portfolios in the early 2000s just when their liabilities were being boosted by the combination of an ageing workforce and increasing life expectancy. One way UK companies have sought to reduce the volatility of their pension plans' funding levels is to shift from equities into long-term bonds. Another way is by shifting away from defined benefit pension plans and towards defined contribution plans.

Government bond yields and term spreads

In per cent

Yields on UK long-term gilts
- 10-year
- 30-year
- 50-year

Term spreads[1]
- United States
- Euro area
- United Kingdom
- Switzerland
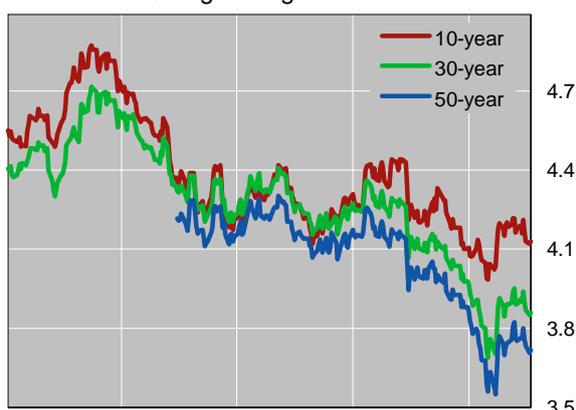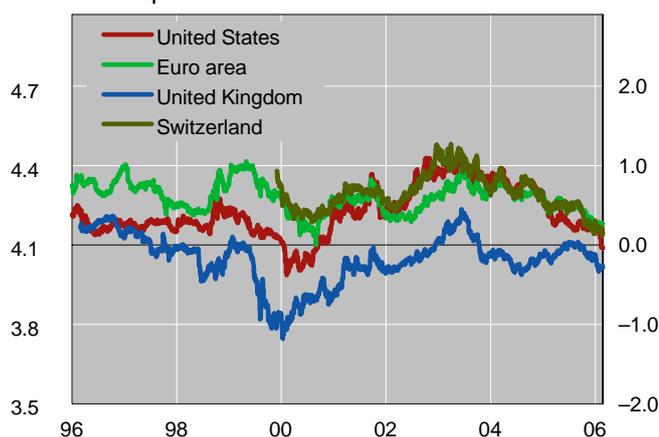
[1] Thirty- minus 10-year yield.

Source: Bloomberg.

_____

[1] The MFR Regulations use bond yields to discount benefits to be paid to current pensioners, and a weighted average of bond and equity yields for benefits of active workers close to retirement. The accounting standard FRS 17 prescribes the use of bond yields to discount benefits irrespective of the current status of the claimant.

In a number of markets outside the United Kingdom, ultra-long-term yields are also very low. Thirty-year government bond yields are close to or slightly below 10-year yields in the United States, the euro area and Switzerland (see the right-hand panel of the graph on the previous page). Are feedback effects also important in these markets? Some of the elements present in the United Kingdom are present in other countries, such as minimum funding requirements. However, other elements tend to moderate the short-term impact of interest rates on reported funding levels. For example, in the Netherlands, funding requirements are more stringent than in the United Kingdom. Yet, higher funding levels and the use of an interest rate fixed by statute rather than market yields to discount pension liabilities have so far permitted Dutch pension funds to operate with a relatively low asset duration of approximately six years (which roughly corresponds to the average duration of the euro area government bond market). In the United States, many corporate pension schemes are underfunded and future benefits are discounted using market rates. However, some smoothing of rates is allowed when valuing balance sheet assets and liabilities. Looking forward, differences between the UK and other systems may narrow, at least if proposals in the Netherlands and the United States that include a greater reliance on (unsmoothed) market rates to discount future benefit payments are implemented. It is possible that pension funds in these countries have already altered their behaviour in anticipation of some of these changes.

One way to reduce the importance of feedback effects is to increase the supply of long-term and ultra-long-term bonds, which can create countervailing pressures on the long end of the yield curve. Already governments and corporations have responded to the low level of long-term yields by increasing their issuance of 30- and 50-year bonds. However, there are limits to how much long-term debt governments and corporations can issue if they want to keep a balanced maturity structure of their liabilities.

positive news on industrial production and confidence. Yields on the benchmark 10-year Bundesanleihe declined by almost 10 basis points on 9 and into 10 February, but recovered most of their losses later on the 10th after speeches by ECB Governing Council members drew attention to the inflationary risks associated with high oil prices and credit growth. Market participants took this as a sign that the ECB would raise the minimum bid rate to 2.5% at the Council meeting on 2 March and further later in the year.

Yields on 10-year Japanese government bonds (JGBs) increased to 1.6% in mid-February on expectations that deflation had finally been overcome. Yields jumped by 4 basis points on 27 January after consumer price inflation moved more firmly into positive territory. They also rose on 10 February, after the Governor of the Bank of Japan indicated that inflation data would factor more prominently into future discussions of the appropriate policy stance. In the past, the Bank of Japan had indicated that a sustainable increase in consumer prices was a precondition for abandoning the policy of quantitative easing, although such a shift would not necessarily entail raising interest rates. At the time of writing, market participants seemed to expect quantitative easing to be abandoned early in the second quarter of 2006, although they believed that policy rates might remain low for some time to come.

Yen yields rise on signs of an end to deflation

The impact of an anticipated policy shift on yields was in part offset by downward pressure from safe haven flows owing to sharp price movements in the stock market. For instance, yields on 10-year JGBs declined markedly on 13 February, as equities fell on concerns about high valuations. These countervailing influences on yields were also reflected in a rise in the implied volatility of options on JGB futures in January and February, although it remained far below the levels seen in 2004.

Trading system in Tokyo comes under strain

Equity prices in the major markets had a lacklustre start to the new year. After rallying in the final quarter of 2005, markets struggled to find direction in the early part of 2006, dropping sharply on some days, only to recover their losses on subsequent days. In the eight weeks to 24 February, the S&P 500 was up 3% and the TOPIX was unchanged (Graph 1.6). The DJ EURO STOXX eventually found some momentum, rising 8%.

<div style="float:left; width:25%;">

Uncertainty about earnings weighs on equities ...

</div>

Uncertainty about the outlook for corporate profits initially put downward pressure on prices. The 15% increase in oil prices between mid-December and mid-January contributed to this uncertainty, as did disappointing earnings reports from several prominent companies, including Yahoo!, Intel, Citigroup and General Electric. Investors' loss of confidence culminated in a 1.8% drop in the S&P 500 on 20 January, the largest daily decline since 2003. Many other markets fell in tandem with the S&P 500, although not as sharply.

Notwithstanding greater uncertainty, investors on balance remained optimistic about the prospects for the corporate sector, especially in Europe. Since mid-2005, analysts have raised their earnings forecasts for an increasing number of European companies (Graph 1.7). In the United States, the number of companies whose earnings forecasts were raised is no longer trending upwards, but nor is it declining. This helped to put a floor under equity prices.

... but implied volatility stays low

With the exception of Japan, the volatility in major equity markets in January and February did not result in much of an increase in implied volatility (Graph 1.8). Implied volatility remained close to its historical low, in the United States especially. Investors apparently viewed events during the period as temporary shocks and not as portents of a future increase in volatility. Moreover, indicators of risk appetite derived from the prices of equity index options suggest little change in investors' willingness to take on equity risk (Graph 1.8).

Equity prices and corporate spreads
End-week data

[1] In local currency; 31 December 2004 = 100. For the United States, S&P 500; for the euro area, DJ EURO STOXX; for Japan, TOPIX. [2] Investment grade credit default swap indices; on-the-run five-year spreads, in basis points.

Sources: Bloomberg; JPMorgan Chase; BIS calculations. Graph 1.6
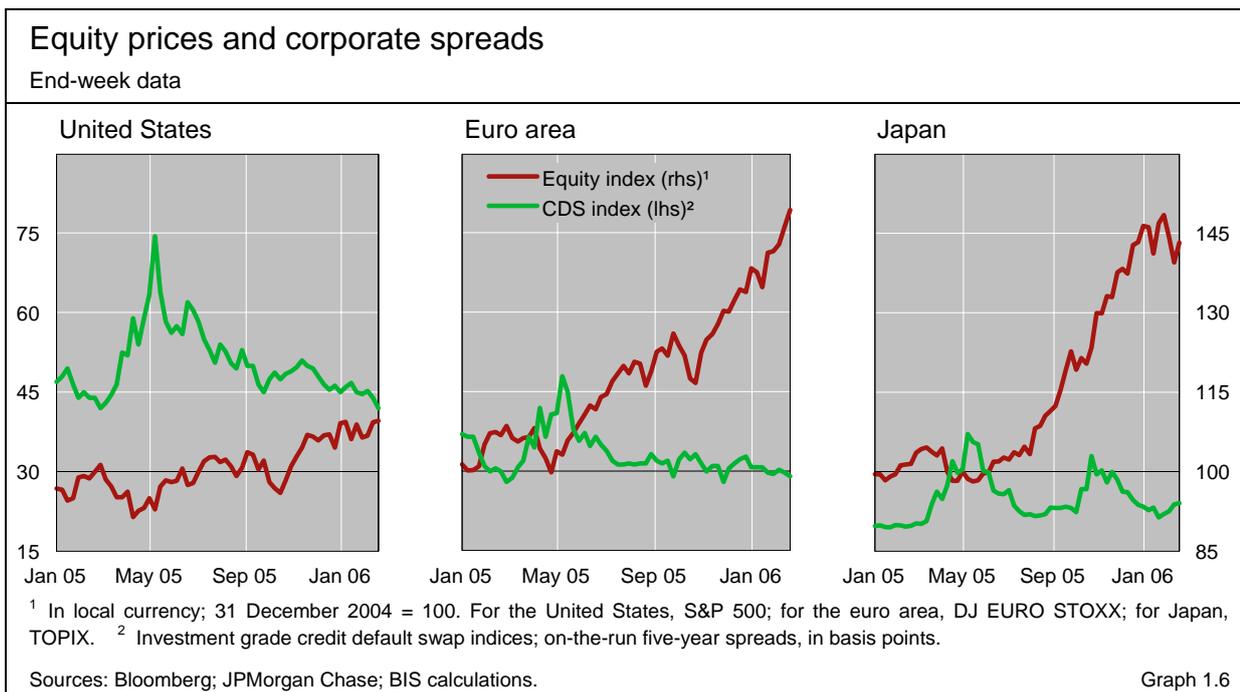
On the Tokyo Stock Exchange, volatility was amplified in January by disruptions to the normal functioning of the market. Allegations of securities fraud at the internet company Livedoor led to a sharp drop in the TOPIX in mid-January. When the sell-off began on 17 January, it was initially limited to the company under investigation; between the open and the midday break, the TOPIX in fact rose. However, in the afternoon of 17 January the sell-off spread to all Japanese companies, including blue chips such as Toyota, and the TOPIX ended the day down 2.3%. Selling pressure intensified the next day, and at one point the TOPIX was down almost 6%. The market rebounded towards the close on 18 January, ending the day down 3.5%.

One explanation for why a seemingly idiosyncratic shock had market-wide repercussions was that high valuations had sensitised investors to any negative news. The 40% run-up in the TOPIX in the second half of 2005 had greatly outpaced the increase in forecast earnings. As a result, the price/earnings multiple for the TOPIX rose from about 15 in June 2005 to almost 20 by the end of the year (Graph 1.7). Owing to such high valuations, investors became increasingly uncertain about the future direction of the TOPIX, as reflected in the upward trend in implied volatility (Graph 1.8).

Margin calls also appeared to exacerbate the sell-off in Tokyo. After the allegations, liquidity in Livedoor's shares evaporated; there were no buyers at the price determined by the exchange's limit on daily price changes. A number of leveraged investors thus sold other assets to meet their brokers' minimum collateral requirements. The resulting surge in sell orders, coupled with an increase in buy orders from investors attracted to the market by the sharp price decline, was more than the TSE's trading system could handle. In consequence, the exchange closed early on 18 January for the first time in its history. The possibility of an early closing may have contributed to the sell-off,

Earnings expectations and equity market valuations

Based on 12-month forward earnings

S&P 500   DJ EURO STOXX   TOPIX

Earnings revisions (rhs)[1]
P/E ratio (lhs)

[1] Diffusion index of monthly revisions in 12-month forward earnings per share, calculated as the percentage of companies for which analysts revised upwards their earnings forecast plus half of the percentage of companies for which analysts left their forecast unchanged; to adjust for analysts' systematic overestimation of earnings, the mean of the diffusion index over the 2000–02 period (S&P 500 = 43.8; DJ EURO STOXX = 40.8; TOPIX = 45.9) was subtracted from each monthly observation.

Sources: I/B/E/S; BIS calculations. Graph 1.7

Volatility and risk appetite in equity markets

Implied volatilities[1]

- S&P 500
- DAX 30
- FTSE 100
- Nikkei 225

Risk appetite indicators[2]

- Principal component[3]

[1] Volatility implied by the price of at-the-money call option contracts on stock market indices; monthly averages, in per cent. [2] Derived from the differences between two distributions of returns, one implied by option prices, the other based on actual returns estimated from historical data. [3] First principal component of risk appetite indicators estimated for the S&P 500, DAX 30 and FTSE 100.

Sources: Bloomberg; Chicago Mercantile Exchange; Eurex; London International Financial Futures and Options Exchange; BIS calculations. Graph 1.8

as investors reportedly rushed to place orders before the close. Nevertheless, the events surrounding Livedoor had only a short-lived impact on investors' optimism, and the Tokyo market rallied to new highs in late January.

Japanese equity prices were eventually reined in partly by the possibility that the Bank of Japan might end its quantitative easing policy sooner than previously expected. In the week after the monetary policy meeting of 8–9 February, the TOPIX fell by 3% as senior central bank officials expressed confidence in the outlook for the economy and inflation.

Corporate borrowing accelerates

Rapid pace of mergers and acquisitions ...

In credit markets, event risk, in the form of shareholder-friendly actions, continued to loom large. In recent months there has been no let-up in the rapid pace of mergers and acquisitions (M&As), including leveraged buyouts (LBOs). Acquisitions totalling $3.2 trillion were announced in 2005, up almost 30% from 2004 and the highest level since 2000 (Graph 1.9). More worryingly for credit investors, LBOs in 2005 reached their highest level since the buyout frenzy in the late 1980s – a frenzy which contributed to a sharp increase in corporate defaults soon afterwards. Furthermore, in contrast to the 1980s, the recent increase in LBO activity was not limited to the United States. Indeed, more than half of all deals involved firms outside the United States, mainly in Europe but also in Asia.

Partly as a result of the spate of acquisitions, corporate borrowing has accelerated in recent quarters. In the United States, net new borrowing by non-financial corporations rose to its highest level in four years (Graph 1.10). In Europe, bank lending to non-financial corporations rose by about 8% between

end-2004 and end-2005, although bond issuance remained subdued. In Japan, repayments exceeded new borrowing by the smallest margin in a decade.

The acceleration in M&A activity and corporate borrowing has had a relatively benign impact on corporate financing conditions to date. To be sure, events in the first half of 2005 had dampened somewhat investors' appetite for credit risk, in particular for US credit risk, and had contributed to a widening of corporate spreads from their cyclical lows (Graph 1.6). Nevertheless, investors' willingness to take on credit risk remained high, and in the early weeks of 2006 corporate bond and credit default swap spreads traded within a narrow range not far above their cyclical lows.

Investors' apparent confidence reflects, in part, perceptions that firms' financing activities had not noticeably undermined their creditworthiness. The pickup in borrowing was partly cyclical, driven by investment and working capital needs. In addition, it was accompanied by strong earnings growth. Moreover, some industries stand to benefit from further consolidation, especially in Europe and Japan, and so acquisitions could strengthen the financial position of companies in these industries. Furthermore, the premium over the target company's equity price in 2005 was more or less unchanged from the previous year and was well below the premium paid by companies at the peak of the last wave of deal-making. Finally, default rates stayed exceptionally low. Defaults fluctuated around 2% throughout 2005, defying most analysts' initial expectations of an increase (Graph 1.10).

Indications of pressure on corporate credit quality are emerging, however. For example, downgrades of non-financial corporations inched upwards as a percentage of all rating actions in 2005, not only in the United States but also in Europe (Graph 1.10).

Moreover, it is possible that M&A activity will not have such benign consequences for creditworthiness going forward. Private equity funds enjoyed

Mergers and acquisitions[1]
In billions of constant 2005 US dollars

Global transactions

Leveraged buyouts

[1] Announced value of all deals, including net debt; based on the date of the announcement and the residency of the target firm; nominal amounts are converted to constant dollars using the US GDP deflator.

Sources: Thomson Financial SDC Platinum; national data; BIS calculations.   Graph 1.9

Corporate credit quality

Borrowing[1,2]	Downgrades[1,3]	Defaults[4]

Borrowing[1,2]: United States, Euro area, Japan

Downgrades[1,3]

Defaults[4]: All corporates, Speculative grade
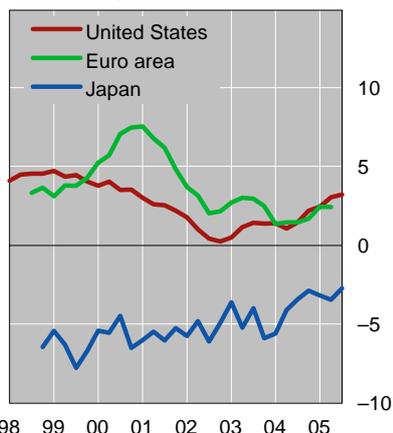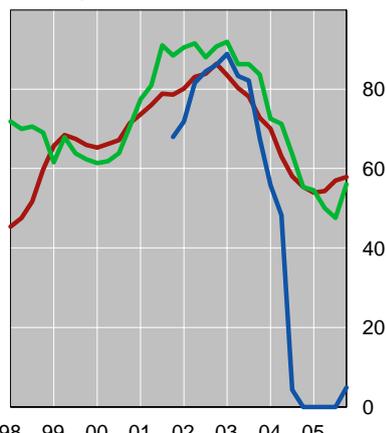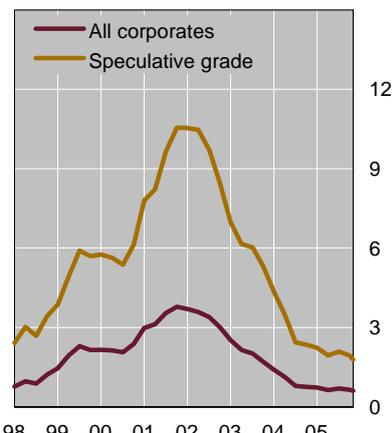
[1] Non-financial corporations. [2] Loans and securities other than shares, net of repayments, as a percentage of GDP; for the United States, credit market instruments. [3] As a percentage of all rating changes by Moody's; 12-month moving average. [4] Trailing 12-month issuer default rates, in per cent.

Sources: ECB; Moody's; national data; BIS calculations.   Graph 1.10

record inflows in 2005, with two funds alone raising more than $10 billion each. As these funds compete with companies for acquisitions, the premium paid is likely to rise. Hedge funds are also increasingly competing to take companies private, attracted by the high returns earned by private equity funds in recent years. Furthermore, the capital now available to private equity funds puts them in a better position to bid for companies previously thought to be too large to be an LBO target. Already in 2005, private equity investors concluded a handful of deals in excess of $10 billion, including the LBO of Danish telecoms company TDC in November for $12 billion. Finally, private equity investors have been ratcheting up leverage ratios.

Patrick McGuire

+41 61 280 8921
patrick.mcguire @bis.org

Nikola Tarashev

+41 61 280 9213
nikola.tarashev @bis.org

2. The international banking market

Total cross-border claims continued to expand in the third quarter of 2005, although at a somewhat slower pace than in the previous two quarters. Interbank activity accounted for over half the total rise in cross-border claims, with greater claims on non-banks in offshore centres also contributing. Credit to non-bank borrowers in the United States rose noticeably, driving a fifth consecutive quarter of strong growth in total claims on non-banks.

Major oil-exporting countries continued to recycle a portion of their oil revenues through BIS reporting banks. In addition, banks in Asia, including some central banks, deposited funds in banks abroad. Combined, these placements overshadowed greater lending to borrowers in emerging Europe and Asia-Pacific, and were behind an overall net outflow of funds from emerging markets.

The BIS consolidated banking statistics – which quantify the foreign exposures of internationally active commercial banks – have recently been enhanced. They now allow for a finer analysis of reporting banks' country and sectoral exposures, and contain new information on their derivatives and contingent exposures. The new data, reported on an ultimate risk basis, also allow for an estimate of banks' risk-weighted foreign claims.

Oil exporters' recycling of petrodollars continues

Total cross-border claims grew strongly for a third consecutive quarter, although at a slightly lower rate than in the previous two. Interbank activity, mainly in the euro area and Switzerland, accounted for slightly more than half of the $533 billion rise in BIS reporting banks' total claims in the third quarter of 2005. This pushed the outstanding stock of claims to $20.7 trillion and the year-on-year growth rate to 18.2%, the highest rate recorded in the BIS statistics since the third quarter of 1987.

Claims on the non-bank sector also grew robustly in the most recent quarter. Total claims rose by $247 billion, the fifth consecutive quarterly rise of $200 billion or more. A significant portion of this ($69 billion) was channelled to non-banks in offshore centres and Luxembourg, areas with considerable non-bank financial activity. New claims on non-banks in the United States also rose noticeably, as banks in Japan and the United Kingdom channelled $108 billion to these borrowers.

Total liabilities vis-à-vis oil-exporting countries

OPEC countries[1,2]

Non-OPEC oil exporters[1,3]

US dollar share[5]

Total liabilities (rhs)[4]
Banks in US (lhs)
Banks in UK (lhs)
Banks in euro area (lhs)

OPEC
Non-OPEC

[1] Lines represent individual reporting countries' share of BIS reporting banks' total liabilities. The drop in shares in the fourth quarter of 1983 is the result of the inclusion of new reporting countries.   [2] Excluding Indonesia.   [3] Angola, Egypt, Mexico, Norway, Oman and Russia.   [4] In billions of US dollars.   [5] US dollar-denominated share of total liabilities vis-à-vis oil-exporting countries, in per cent. These stocks are adjusted for valuation effects using constant 2005 Q3 exchange rates.   Graph 2.1

Petrodollars and Asian reserves drive outflow from emerging markets

The continued recycling of oil revenues, and deposit placements by banks in Asia-Pacific, were behind a net outflow of funds from emerging markets in the third quarter of 2005. Combined, these placements in BIS reporting banks more than offset greater lending to borrowers in Asia-Pacific and emerging Europe, leading to a $40 billion overall net outflow of funds from emerging markets.

A net outflow from emerging markets …

OPEC member states,[1] plus other, non-OPEC oil exporters,[2] deposited a combined $82 billion with BIS reporting banks in the third quarter, the largest quarterly placement by this group of countries recorded in the BIS statistics (Graph 2.1).[3] Deposits by residents of OPEC member countries totalled $46 billion and were primarily US dollar-denominated, leaving the US dollar share of reporting banks' total liabilities vis-à-vis OPEC member states relatively unchanged at 72%. Residents of non-OPEC oil-exporting countries, primarily Norway but also Mexico and Russia, placed an additional $36 billion in funds with BIS reporting banks. Overall, the US dollar share of total liabilities vis-à-vis non-OPEC oil exporters fell to 61% in the most recent quarter, from 62% in the previous quarter and close to 80% prior to end-2002 (Graph 2.1, right-hand panel).

The distribution of OPEC's petrodollar placements across banks located in individual reporting countries has, overall, remained relatively stable

---

[1]   Excluding Indonesia.

[2]   Angola, Egypt, Mexico, Norway, Oman and Russia.

[3]   See the December 2005 *BIS Quarterly Review* for a broader discussion of the recycling of petrodollars.

(Graph 2.1). Over the last 15 years, roughly 16% of BIS reporting banks' total liabilities to OPEC member countries have been reported by banks located in the United States. The share of petrodollars being placed in the United Kingdom has drifted down, from close to 35% in 1985 to near 25% in the most recent quarter. By contrast, as their oil revenues and foreign placements have expanded, residents of non-OPEC oil-exporting countries have increasingly channelled their deposits through banks in the United Kingdom. These banks' share of total liabilities to non-OPEC oil-exporting countries rose from 22% in 2002 to over 35% in the most recent quarter.

Residents of Asia-Pacific also increased their deposits in BIS reporting banks, leading to a net outflow of funds from the region. Banks in the United Kingdom and the United States channelled funds to the banking sector in China, Korea and Thailand, driving a $31 billion rise in claims on Asia-Pacific. However, placements in offshore centres and the United Kingdom, mainly by residents of China, India, Korea and Thailand, were even larger, fuelling the $3 billion net outflow from the region. This was in part the result of greater placements by Asian central banks, as the central banks of India, Korea and Thailand placed a combined $14 billion in foreign banks in the third quarter.

... and placements by Asian central banks

Elsewhere, on a net basis, funds continued to flow into emerging Europe and out of Latin America. In emerging Europe, EU member states and Russia accounted for virtually all of the $8 billion increase in net claims on the region, even as the cross-border deposits of the Russian central bank edged up by $2.2 billion. The net outflow from Latin America ($4.7 billion) was primarily the result of deposits placed in BIS reporting banks, mainly in the United Kingdom and the United States, by residents of Mexico. Much of this reflects an increase in Mexico's official reserves as the country's central bank placed $3.7 billion in foreign-headquartered banks in the third quarter.

An analysis of BIS reporting banks' foreign exposures

The BIS consolidated banking statistics – the most comprehensive source of aggregate data on internationally active banks' portfolio of foreign assets – have been enhanced as of the first quarter of 2005. The enhancements, discussed in detail in the September 2005 issue of the *BIS Quarterly Review*, allow for an improved evaluation of international lenders' exposure to country-specific credit and counterparty risks.[4]

Enhancements to the consolidated banking statistics ...

The new statistics closely match banks' risk management practices, and thus throw light upon a wide range of foreign exposures. The statistics now include a sectoral breakdown for total foreign claims, or the sum of cross-border claims and foreign offices' locally extended claims. Moreover, foreign claims on each sector are reported on an ultimate risk basis (UR basis), or

---

[4] These new consolidated banking statistics are intended to reflect the creditor's perspective. Banks' exposures are consolidated according to the location of their head office, and intragroup positions are netted out. See P McGuire and P Wooldridge, "The BIS consolidated banking statistics: structure, uses and recent enhancements", *BIS Quarterly Review*, September 2005, for a detailed description.

reallocated to the country and sector where the ultimate obligor resides. Previously, the statistics included a sectoral breakdown only for international claims reported on an immediate borrower basis (IB basis), ie allocated to the country and sector of the contractual counterparty.[5]

The new statistics allow for better estimates of banks' total foreign *exposure* because they now include information on banks' derivatives and contingent exposures. Foreign claims, which refer to items on the *assets side* of banks' balance sheets (mainly loan and securities claims in the context of the BIS statistics), are a subset of banks' total foreign exposure, which also includes derivatives as well as contingent liabilities, specifically credit commitments and guarantees.[6] Derivatives are reported at market value, while guarantees and credit commitments are reported at book value. Thus, only if the market value is not significantly different from book value would an aggregation of these items yield a measure of total derivatives and contingent exposures. These exposures totalled $7.5 trillion in the third quarter of 2005, compared to $17.7 trillion in loan and securities claims (UR basis).

Overall, foreign exposures are sizeable relative to reporting banks' total assets. Foreign claims (UR basis) accounted for almost 40% of the total assets reported on the balance sheets of internationally active banks headquartered in 10 of the BIS reporting countries.[7] Outstanding foreign claims amount to less than 20% of US, Australian and Italian banks' total balance sheet assets. By contrast, they amount to roughly 50% for UK banks, and to more than 60% for Belgian and Swiss banks. Across all of the 10 reporting countries, this ratio rises to almost 60% if banks' estimated foreign *exposures* are considered, ie their derivatives and contingent exposures are added to the numerator.

... shed light on banks' foreign exposures ...

Banks' investment in low-risk government debt

Assets carrying low credit risk play an important role in banks' portfolio management, and are often used as collateral in financial transactions. Thus, banks are naturally expected to absorb a significant share of the supply of low-risk government debt (ie debt issued by governments in industrialised countries), although estimates of their total demand for such debt are difficult to construct. The BIS securities and banking statistics, which provide estimates of

... holdings of government debt ...

---

[5] International claims comprise cross-border claims plus foreign offices' locally extended foreign currency claims.

[6] The contingent positions are reported on an ultimate risk basis. Guarantees are contingent liabilities arising from an obligation to pay to a third party when a client fails to perform some contractual obligation. Credit commitments are irrevocable obligations to extend credit at the request of a borrower. Derivative claims (ie positive market values) include forwards, swaps, options and those credit derivatives held for trading by the reporting bank (independent of whether these are booked as off- or on-balance sheet items). Credit derivatives not held for trading are reported as risk transfers by protection-buying banks, and as guarantees by protection-selling banks.

[7] This share drops by only about 6 percentage points if intra-euro area exposures are netted out from total foreign exposures. The 10 reporting countries concerned are Australia, Belgium, Canada, Finland, France, Italy, the Netherlands, Switzerland, the United Kingdom and the United States.

Bank claims on the public sector of industrialised countries
As of 2005 Q3

Estimated bank holdings of public debt, by vis-à-vis country[1]

Foreign claims (UR basis), by reporting country

Local claims (UR basis), by reporting country

CA = Canada; CH = Switzerland; DE = Germany; FR = France; JP = Japan; NL = Netherlands; UK = United Kingdom.

[1] The lines plot the ratio of domestic and international bank claims on the public sector to total public sector debt of the corresponding country or region; in per cent. The shaded areas stand for the total amount of domestic and international bank claims on the public sector in the corresponding country or region; in billions of US dollars. [2] Claims of BIS reporting banks, in billions of US dollars. [3] Claims on the public sector in industrialised countries in total foreign claims, in per cent. [4] Estimated local claims in all public sector claims on industrialised countries, in per cent.

Sources: ECB; Bank of Japan; Board of Governors of the Federal Reserve System; BIS.   Graph 2.2

outstanding government debt and reporting banks' international claims on the public sector (IB basis), can be used to shed light on this issue. Combined with national sources of data on domestic banks' claims on the government, they yield a rather imperfect but useful measure of banks' overall holdings of government debt, and help to highlight differences across reporting countries.

Overall, the estimates suggest that banks hold a significant amount of outstanding low-risk government debt (Graph 2.2, top panel). Specifically, banks (both foreign and domestic) have held slightly more than half of outstanding euro area government debt since end-1999, consistent with the prominent role banks play in euro area financial markets. Elsewhere, banks'

holdings of US and Japanese government debt are slightly below 20% of total outstanding stocks.[8]

A significant share of banks' holdings of highly rated government debt is purchased by banks headquartered outside the borrower's jurisdiction.[9] For instance, BIS reporting banks' foreign claims on the euro area, Japanese, UK and US public sectors stood at $1.7 trillion in the most recent quarter.[10] This accounted for roughly 30% of the banking sector's (ie foreign plus domestic banks') combined claims on the public sector in the euro area, Japan, the United Kingdom and the United States.

BIS reporting countries exhibit disparate propensities to hold low-risk claims on foreign public sectors (Graph 2.2, bottom left-hand panel). For example, nearly one third of Swiss banks' and almost 40% of Japanese banks' total foreign claims are claims on the public sector in industrialised countries. Combined, these reporting banks account for roughly 60% of the $1.9 trillion in all reporting banks' foreign claims on the public sector in industrialised countries (excluding intra-euro area). Swiss banks' large foreign claims on these borrowers can in part be explained by the small size of Swiss public debt (roughly $110 billion) relative to Swiss banks' total foreign claims on all sectors (almost $2 trillion). The large holdings by Japanese banks may in part reflect efforts to increase their holdings of assets with less credit risk.

The difference between foreign claims on the public sector (UR basis) and international claims (IB basis) on this sector can provide a rough estimate of reporting banks' local holdings of public sector debt, eg purchases of US

---

[8]   Banks' holdings of a country's government debt are estimated by adding BIS reporting banks' international claims on that country's public sector (central and local governments and publicly owned enterprises) to resident banks' local holdings of government debt. International claims on the public sector include both cross-border claims and local claims in foreign currencies, although the latter claims are likely to be small since the foreign currency component of industrialised countries' sovereign debt is negligible (less than 1%). There are differences across reporting countries in whether international claims on the public sector include claims on foreign official monetary authorities, and in whether they include claims on publicly owned enterprises. Domestic banks' claims on the US public sector, taken from national data sources, include holdings of (i) Treasury and agency securities by all commercial banks in the United States and (ii) loan and securities claims on local governments by large domestically chartered banks in the United States, but exclude holdings of mortgage-backed securities by the latter banks. Domestic banks' claims on the Japanese public sector include holdings of central and local government bonds by domestically licensed banks. Domestic banks' claims on the euro area public sector include loan and securities claims of euro area monetary and financial institutions (excluding the Eurosystem) on the general government sector. Total public sector debt, the denominator of these ratios, includes debt issued by central and other governments and central banks, and is taken from the BIS securities statistics.

[9]   For the purposes of this analysis, highly rated government debt is taken to be debt issued by governments in industrialised countries. The vast majority of this debt is rated AAA by Standard & Poor's, Italy and Japan being the major exceptions with sovereign ratings of AA–. Intra-euro area positions are excluded in all the calculations in this section related to *foreign* claims on the public sector in industrialised countries. This is motivated by the high degree of substitutability across the debt issues of different euro area sovereigns, as virtually all of these issues are denominated in euros and are accepted as collateral by the ECB.

[10]   This is probably an underestimate since the United States does not report a complete sectoral breakdown for its foreign claims (UR basis).

Treasury securities from foreign banks' offices in New York.[11] Note, however, that government-guaranteed credit and reverse repos, whereby banks accept government securities as collateral against short-term loans, can be sources of noise in these estimates.[12] With this caveat in mind, the estimates suggest that Canadian, Dutch, French and Swiss banks book the majority of their low-risk public sector claims in offices located in the country of the borrower (Graph 2.2, bottom right-hand panel). To the extent that claims are funded locally, the investment decision of these banks is likely to limit the currency mismatch on their balance sheets. Such an argument may apply to Japanese banks as well. Even though these banks hold an estimated 14% of their low-risk public sector claims in the issuer's country, a large share of these claims probably match foreign currency exposures in international financial hubs, eg US Treasury securities purchased in London to match US dollar liabilities of Japanese banks' offices in the United Kingdom.

Exposures to emerging markets

... and exposures to emerging markets

On an immediate borrower basis, BIS reporting banks' foreign claims on emerging markets constitute a sizeable portion of their overall foreign claims, and have fluctuated significantly during periods of market stress. As shown in Graph 2.3, periods of financial turbulence, such as the Asian crisis (1997) or the sovereign debt crises in Russia (1998) and Argentina (2001), were seen to induce dramatic swings in these claims. In the most recent quarter, foreign claims on emerging markets stood at $2.3 trillion, or 12% of reporting banks' total foreign claims (IB basis). However, expressing these positions on an ultimate risk basis provides a more accurate picture of banks' true exposure to emerging markets.

Claims on borrowers in emerging markets sometimes have third-party guarantors, leading to net risk transfers out of the borrowing country. A portion of foreign claims (mainly loan and securities claims, IB basis) on emerging markets is transferred to the major developed countries, as are claims on borrowers in international hubs of financial intermediation (eg London and offshore centres) (Graph 2.5, top panel). Measured on an ultimate risk basis, foreign claims on emerging markets stood at $2 trillion, or 11% of total foreign claims. Differences across reporting countries are apparent (Graph 2.4). For example, Austrian, Spanish and US banks' foreign claims on emerging markets

---

[11] International claims (IB basis) comprise cross-border claims and foreign offices' locally extended claims in foreign currency, while foreign claims (UR basis) consist of cross-border claims and foreign offices' locally extended claims in *all* currencies. However, the foreign currency component of international claims is probably small since less than 1% of industrialised countries' sovereign debt is issued in a foreign currency.

[12] Reverse repos tend to boost the level of foreign claims on the public sector if these claims are reported on an ultimate risk basis. In contrast, the loan side of the reverse repo transaction is reported vis-à-vis the sector of the counterparty if claims are reported on an immediate borrower basis.

## Foreign claims on selected emerging economies, by sector and type[1]

In billions of US dollars

Asia-Pacific / Russia / Argentina

Legend:
- Net risk transfers (rhs)
- Local claims (rhs)[2]
- International claims (rhs)[3]
- Short-term (lhs)[4]

[1] BIS reporting banks' consolidated foreign claims (IB basis).   [2] Foreign offices' local currency claims on local residents.   [3] Cross-border claims and foreign offices' local claims in foreign currencies.   [4] As a share of total international claims.
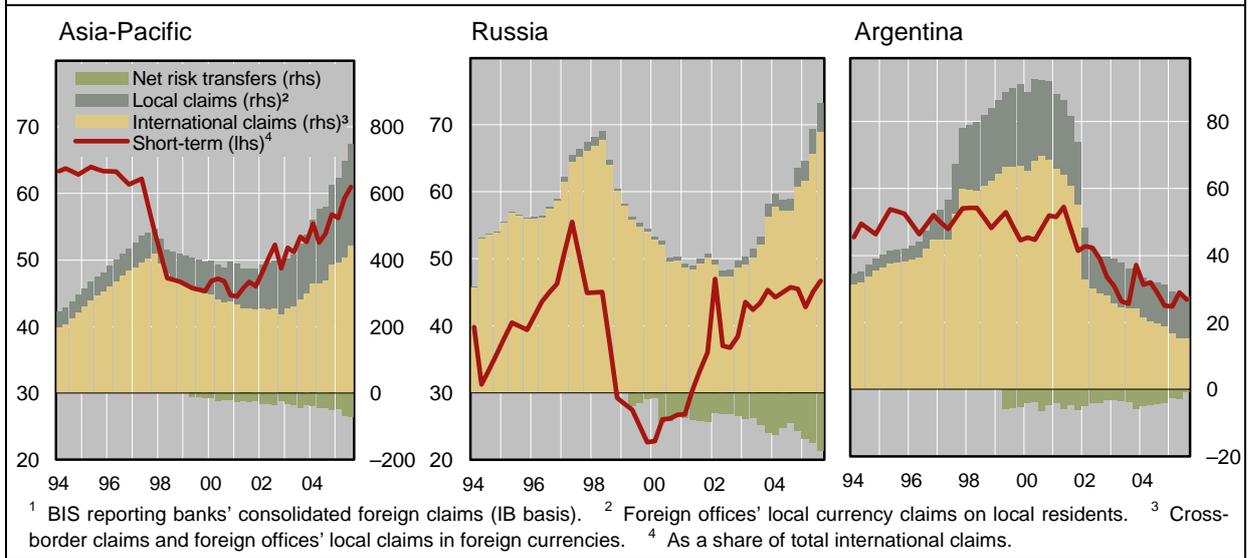
accounted for 43%, 27% and 29%, respectively, of their total foreign claims. By contrast, this share is below 10% for other major reporting countries.[13]

Within the universe of emerging markets, there seems to be only a tenuous relationship between reporting banks' propensity to transfer risk and aggregate measures of credit risk. Graph 2.5 (bottom panel) plots net risk transfers from selected emerging markets together with a rating of the corresponding sovereign. Net risk transfers (as a share of foreign claims) out of

Foreign claims (UR basis) on emerging economies, by region[1]

Legend:
- Latin America (rhs)[2]
- Emerging Europe (rhs)[2]
- Asia-Pacific (rhs)[2]
- Africa and Middle East (rhs)[2]
- Share (lhs)[3]

AT = Austria; BE = Belgium; CH = Switzerland; DE = Germany; ES = Spain; FR = France; JP = Japan; NL = Netherlands; UK = United Kingdom; US = United States.

[1] Reporting countries listed on horizontal axis.   [2] Includes loan and securities claims; in billions of US dollars.   [3] Foreign claims on emerging markets in total foreign claims, in per cent.   Graph 2.4

---

[13] Virtually all of Austrian and Spanish banks' foreign claims (loans and securities) on emerging markets are on borrowers in emerging Europe and Latin America, whereas US banks' foreign claims are split roughly equally between borrowers in Latin America and Asia-Pacific.

Net risk transfers by vis-à-vis country

From selected countries and regions

Bar chart with categories: UK, OFC, KY, Dev, SG, HK, IE, LU, BE, JP, IT, NL, CH, FR, US, DE, EA

Left axis scale: 20, 10, 0, −10, −20, −30, −40
Right axis scale: 200, 100, 0, −100, −200, −300, −400

Legend: □ Amount (rhs)[1] ■ Share (lhs)[2]

From emerging markets, by debtor country

Left axis: AA, A, BBB, BB, B, CCC
Right axis: 0, −5, −10, −15, −20, −25

Categories: TW, QA, CL, KR, HU, CZ, SK, CN, ZA, TH, PL, MX, HR, RU, RO, IN, PH, BR, TR, AR, VE

Legend: □ Net risk transfer (rhs)[2] ● Average rating (lhs)[3]

AR = Argentina; BE = Belgium; BR = Brazil; CH = Switzerland; CL = Chile; CN = China; CZ = Czech Republic; DE = Germany; Dev = developing countries; EA = euro area; FR = France; HK = Hong Kong SAR; HR = Croatia; HU = Hungary; IE = Ireland; IN = India; IT = Italy; JP = Japan; KR = Korea; KY = Cayman Islands; LU = Luxembourg; MX = Mexico; NL = Netherlands; OFC = offshore centres; PH = Philippines; PL = Poland; QA = Qatar; RO = Romania; RU = Russia; SG = Singapore; SK = Slovakia; TH = Thailand; TR = Turkey; TW = Taiwan (China); UK = United Kingdom; US = United States; VE = Venezuela; ZA = South Africa.

[1] In billions of US dollars.   [2] As a share of foreign claims of all reporting countries on that country, on an IB basis. A negative number implies a transfer away from the residents of a vis-à-vis country.   [3] Standard & Poor's foreign currency sovereign ratings as of January 2006.   Graph 2.5

countries in Asia-Pacific tend to be larger than those out of Latin America, even though the latter group of countries tend to have lower sovereign ratings.

By contrast, net risk transfers do tend to be smaller out of emerging markets in which reporting banks have a well established local business.[14] For example, Spanish banks extend 90% of their credit to Latin America via local offices while only 3% of this credit (IB basis) is transferred to a third party residing outside the region. By contrast, only 58% of these banks' credit to

---

[14] Regression analysis finds a statistically significant negative relationship between net risk transfers and locally extended credit as shares of total foreign claims. The result is based on a regression in which foreign exposures are disaggregated across major lender countries and the four emerging market regions. In addition, larger monetary amounts of net risk transfers and local credit are attributed larger weights in the regression.

Local claims and derivatives and contingent exposures, by vis-à-vis region[1]

| Asia-Pacific | Emerging Europe | Latin America |

AT = Austria; BE = Belgium; CH = Switzerland; DE = Germany; ES = Spain; FR = France; JP = Japan; NL = Netherlands; UK = United Kingdom; US = United States. The vertical axis measures derivatives and contingent exposures; the horizontal axis measures local loan and securities claims.

[1] Points represent reporting countries. Lines stand for the best linear fit in each panel.   Graph 2.6

emerging Europe is extended locally and the share transferred out of the region is higher, at 23%. This behaviour is mirrored by Belgian banks.[15] To be sure, there are exceptions to this general pattern, as exemplified by US banks, which have relatively large local positions in Asia-Pacific as well as large risk transfers out of the region.

Reporting banks' derivatives and contingent exposures to emerging markets are large, and seem to be concentrated in countries where banks have an established presence (Graph 2.6). At $582 billion in the third quarter of 2005, total derivatives and contingent exposures to emerging markets amounted to roughly 30% of reporting banks' total foreign claims (UR basis) on emerging markets. These exposures are larger vis-à-vis emerging markets in which banks have large local positions in loan and securities claims, indicative of banks exploiting economies of scope and providing client-oriented products on the basis of acquired market knowledge. This finding also suggests that derivatives and contingent exposures reinforce the concentration of reporting banks' exposures to particular segments of emerging markets.

Risk-weighted foreign exposures

Are internationally active banks' foreign claims (UR basis) large when measured on a risk-weighted basis? As discussed above, cross-border investment in highly rated government securities, which typically receives a relatively low risk weight, accounts for a significant portion (roughly 15%) of banks' foreign exposures. At the same time, exposures to riskier assets – to

---

[15] Roughly 76% of their claims on emerging Europe and some 2% of their claims on Latin America are extended from local offices, while 2% and 13% of these claims are transferred to third parties outside the respective regions.

some emerging markets, for example – can be large, and tend to increase total risk-weighted assets and thus require higher capital charges.

The refined sectoral breakdown in the new BIS consolidated banking statistics can be used to estimate, albeit imperfectly, how reporting banks' foreign claims (UR basis) might change when measured on a *risk-weighted* basis.[16] This is accomplished by assigning country- and sector-specific risk weights to claim positions on each vis-à-vis country. The standardised approach under Basel II guidelines provides an admittedly rough, but analytically convenient, framework for assigning these risk weights.

Using this framework, the mapping from a borrowing country's sovereign rating to risk weights for claims on its public and banking sectors is relatively straightforward.[17] In contrast, the risk weights applied to BIS reporting banks' exposure to the non-bank private sector in each borrowing country must be estimated. Banks should use external corporate ratings in assigning risk weights on a borrower by borrower basis if they use the standardised approach. However, such fine data are not available at the aggregated level of the BIS consolidated banking statistics. And simply using the sovereign rating of the country where the corporate borrower resides would lead to a downward bias in risk-weighted exposures since, in most countries, the sovereign rating represents an unofficial ceiling on corporate ratings in that country. Thus, the borrower-specific information available in the syndicated loan statistics (see box on page 28) is used to proxy for the average corporate rating in individual countries. That rating is then translated into an average risk weight for the non-bank private sector in each borrowing country using the mapping in the Basel II guidelines.[18]

Applying these risk weights reduces the overall size of foreign claims on an ultimate risk basis. Reporting banks' largest claims are on highly rated borrowers – banks and sovereigns in the advanced countries – while their exposures to lower-rated borrowers, which can carry a risk weight greater than 100%, are fairly limited. In particular, roughly 80% of BIS reporting banks' total exposures to the public sector ($3.2 trillion) and to the banking sector

Reporting on an ultimate risk basis ...

... allows for estimation of risk-weighted assets

---

[16] This analysis excludes derivatives and contingent exposures.

[17] This analysis is based on the simplified version of the standardised approach in Basel II and Standard & Poor's sovereign rating for end-September 2005 for over 125 countries. Exposure to these sectors in unrated countries is given a risk weight of 100%. Unrated countries account for only 4% of total foreign claims (UR basis) on all borrowers, and only 6% of total foreign claims (UR basis) on emerging markets.

[18] Specifically, for each borrowing country, the syndicated loan data are first used to estimate the share of borrowers without a corporate credit rating. This share is then applied to each reporting country's exposures to the non-bank sector in the borrowing country, and assigned a risk weight of 100%. The remaining share is given a risk weight which corresponds to the average rating of those corporates in the borrowing country which do have an external rating. Since the information on the borrower's rating is often missing, the risk weight applied to the non-bank private sector in most emerging markets is very close to 100%. This approach will tend to understate the risk weight in countries where only highly rated borrowers participate in the syndicated loan market. Conversely, it will tend to overstate the risk weight in countries where mortgage and other collateralised lending is a significant portion of foreign exposures. For these reasons, the analysis below focuses primarily on the public and banking sectors.

($5.1 trillion) are concentrated in the euro area, Japan, the United Kingdom and the United States. Most of these claims receive a zero or 20% risk weight under Basel II, and are behind the overall contraction (of 46%) in reporting banks' total foreign claims (UR basis) when measured on a risk-weighted basis.

The same tendency is evident, albeit less strongly, within reporting banks' emerging market portfolios. Overall, banks' foreign claims on emerging economies expressed on a risk-weighted basis are 82% of their total foreign claims (UR basis) on these borrowers. There are differences in the degree of contraction in claims across reporting countries, as well as across sectors and borrowing countries. As shown in Graph 2.7, Australian, Belgian and Irish banks' emerging market portfolio contracts by roughly 30% on a risk-weighted

Foreign claims (risk-weighted and UR basis) on emerging economies

AT = Austria; AU = Australia; BE = Belgium; CA = Canada; CH = Switzerland; CL = Chile; DE = Germany; ES = Spain; FI = Finland; FR = France; GR = Greece; IE = Ireland; IN = India; IT = Italy; JP = Japan; NL = Netherlands; NO = Norway; PT = Portugal; SE = Sweden; SG = Singapore; TR = Turkey; TW = Taiwan (China); UK = United Kingdom; US = United States.

[1] Calculated by applying risk weights to the foreign claims of banks headquartered in a particular reporting country. The risk weights vary by vis-à-vis country and by sector, and are based on the standardised approach under the Basel II guidelines.   Graph 2.7

basis. In contrast, French, German and UK banks see a somewhat smaller contraction.[19]

Banks' claims on emerging market public sectors contract the most when expressed on a risk-weighted basis. Foreign claims on the public sector in China, the Czech Republic, Hungary, Korea, Malaysia, Mexico, Poland and Taiwan (China) – all investment grade countries – totalled $239 billion, more than half of reporting banks' total foreign claims on emerging market public sectors. These claims receive a risk weight of 50% or less, leading to a 46% contraction in exposure to this sector on a risk-weighted basis. In contrast, exposure to the banking sector, which has a higher risk weight than public sector exposures, in emerging markets contracts by roughly one quarter.

---

[19] The estimate for banks headquartered in the United States is particularly poor because as much as 45% of these banks' foreign claims are not allocated to a particular sector. These unallocated claims were risk-weighted in the same way as claims on the banking sector in the borrowing country.

Developments in the syndicated loan market

Blaise Gadanecz

Stable market conditions in the fourth quarter of 2005

After the slowdown in the third quarter, activity in the international syndicated loan market stabilised at the end of the year. New facilities totalling $583 billion were signed in the fourth quarter, representing a 15% increase over the previous period, but roughly equivalent to the volume observed a year before. On a seasonally adjusted basis, signings rose by 5%.

In industrialised countries, financing related to mergers and acquisitions was buoyant in the fourth quarter. Such signings totalled $168 billion, a new high following the exceptional activity in the first three quarters of 2005 (see the Overview section, page 11). In the fourth quarter, Libor spreads on such loans increased, and the telecoms[①] sector arranged some of the largest amounts.

There are signs that conditions on loans granted to US borrowers have started to tighten. Although maturities extended slightly, the share of secured loans (based on loan amounts) rose to 13% after staying stable at 9–10% for the first three quarters of 2005. Moreover, US borrowers' average Libor spreads rose in the fourth quarter in most sectors, in most rating categories, and also for unrated borrowers. Conversely, Euribor spreads on loans arranged for western European borrowers remained stable or decreased.

Record borrowing by Russian energy firms

Lending to emerging markets soared to $75 billion, boosted by exceptionally strong borrowing by Russian energy firms. That included $20.6 billion in loans to support corporate actions in the industry (purchase of Sibneft by Gazprom, acquisition of a 10.7% stake in Gazprom by Rosneftgaz). The average pricing (spread plus fees) of Russian oil and gas loans remained low by historical standards in the fourth quarter, at 156 basis points. However, average maturities shortened significantly, to 2.3 years, well below their average length (observed since 2002) of approximately four years.

The effect of local bank lending on the pricing of loans to emerging markets

Is the participation of local banks in emerging market country syndicated loans associated with lower loan pricing? Nini (2004) documents that loans granted to emerging market borrowers in

Signings of international syndicated credit facilities

Total signings (USD billions)
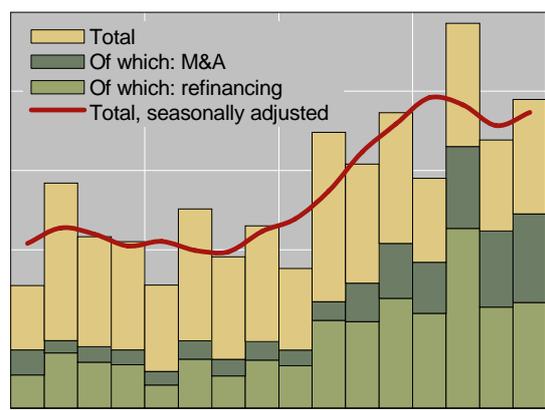
Weighted[1] average maturities (years, lhs) and pricing[2] (bp, rhs), United States and western Europe
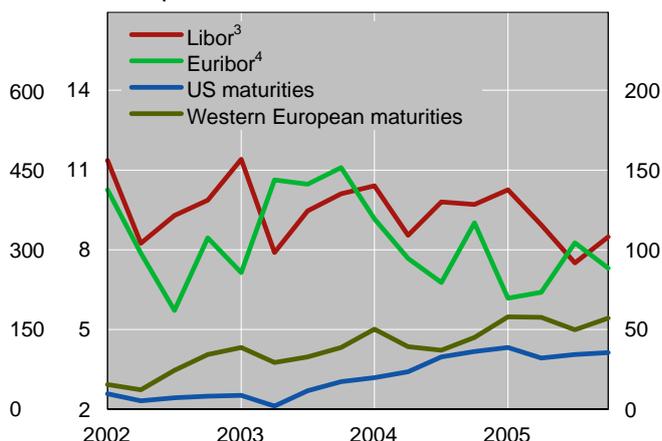
[1] By facility sizes. [2] Spreads plus fees. [3] US dollar-denominated facilities with Libor pricing granted to US borrowers. [4] Euro-denominated facilities with Euribor pricing granted to western European borrowers.

Sources: Dealogic Loanware; BIS.

_____

[①] Not included in the syndicated loan statistics compiled by the BIS for the fourth quarter of 2005 is the £18.5 billion facility arranged for Telefónica, the Spanish phone carrier, to finance the acquisition of UK mobile operator O$_2$. The loan had been funded but not yet signed at the time of writing.

which local banks participate are significantly cheaper – by about 50 basis points – than those without local participation, suggesting that local banks play an important role in reducing information asymmetries.[2] This box takes the analysis further by (i) focusing on the actual shares retained by various types of banks, (ii) distinguishing between junior and senior banks and (iii) separately analysing bank residence versus ultimate ownership. We show that, after controlling for risk, higher loan shares retained by senior arranger banks of the same group nationality as the borrower are associated with lower loan pricing. Altogether, the results confirm the role of local banks in influencing the pricing of loans to emerging market countries, and this effect is especially evident through locally owned banks' certification role as senior arrangers.

In a syndicated loan, several banks form a group to lend to the same borrower. The syndicate is typically formed around one or more senior arranger banks – often the borrower's relationship banks – which receive a fee on the entire loan amount to take the responsibility for negotiating the terms, marketing the credit and allocating it to all the participants, including themselves.[3] To determine their participation, junior banks – not involved in negotiating the deal and having less information about the borrower – often rely on the reputation of and due diligence performed by the senior banks during the evaluation of the borrower's creditworthiness. This is especially important in emerging markets, where there is less publicly available information about borrowers (eg in the form of ratings) than in industrialised countries. The share of each loan retained by senior arranger banks can, in some cases, be considered as a proxy for the extent of the certification activities performed by the senior arrangers.[4]

The effect of loan share retention on pricing by various types of banks was analysed in a regression framework. The pricing, measured by Libor spreads,[5] of a large sample of syndicated loans granted to emerging market borrowers between 1993 and 2005 was regressed on loan share retention, controlling for micro- and macroeconomic factors commonly found in the loan pricing literature.[6] The results are reported in the table overleaf.

In the case of senior arrangers of the same *group nationality* as the borrower, there is a significant and negative relationship between loan spreads and retained shares. The coefficient of –40.7 (first column of the table) suggests that each per cent of the loan amount retained by a senior arranger of the same group nationality as the borrower is associated with a discount of 40 basis points, after controlling for risk. Interacting the retained share with the fees charged on the facility (column 2) suggests that some discount is also apparent in the fee structure in relation to share retention by local senior arrangers. Columns 3 and 4 show that there is no significant association between loan pricing and retention by senior arrangers of the same *residence* as the borrower. Other specifications (not reported) show that there is no significant relationship either between local share retention and loan pricing when banks of all seniorities are grouped together. When the model is estimated for the various groups of emerging market countries, the results appear to be driven mainly by the developing Asia-Pacific and eastern European regions. The results are also robust to the estimation of the model for individual years.

To conclude, after controlling for risk, higher loan shares retained by senior arranger banks of the same group nationality as the borrower are associated with lower loan pricing. This could reflect certification by these locally owned banks, possibly thanks to better information that they might have about the borrower. Alternatively, the result may also reflect directed or relationship lending, competition or mispricing. The findings do not hold for banks with the same residence as the borrower, arguably because locally owned banks may have more insider knowledge of the borrower than local subsidiaries of foreign banks.

_____

[2] G P Nini, "The role of local banks in promoting external finance: a study of syndicated lending to emerging market borrowers", Board of Governors of the Federal Reserve System, *International Finance Discussion Paper*, no 820, September 2004.   [3] See B Gadanecz, "The syndicated loan market: structure, development and implications", *BIS Quarterly Review*, December 2004.   [4] See, for instance, G B Gorton and G G Pennacchi, "Banks and loan sales: marketing non-marketable assets", *Journal of Monetary Economics*, 35, June 1995, pp 389–411.   [5] The results are robust to the inclusion of fees in loan pricing.   [6] Microeconomic factors such as loan maturity, size, borrower sector and guarantees were included, along with macroeconomic ones prevailing in the borrower's country at the time of signing – inflation, GDP growth, corruption index, domestic credit expansion, current account balance and sovereign ratings. An indicator of global liquidity – measured as the GDP-weighted average of real interest rates in major industrialised countries at the time of signing – was also used as an independent variable. The results obtained on these controls are standard and not discussed here in detail: the effect of maturity on loan pricing is uncertain because of non-linearity, loan size is negatively associated with spreads, and secured loans and acquisition facilities are more expensive; unfavourable macroeconomic conditions, such as a high level of perceived corruption, or a high sovereign default probability, are associated with higher loan pricing and vice versa.

The effect of fund provision by local banks on loan pricing				
Dependent variable: Libor spread	Share retained by senior arranger(s) of matching group nationality		Share retained by senior arranger(s) of matching residence	
[macro and micro controls not reported]				
Share retained	−40.7** (17.6)	−39.0 (31.4)	6.7 (16.2)	22.2 (30.9)
Share retained x fees		−1.7*** (0.6)		−1.7*** (0.6)
Share retained x total number of banks in syndicate		1.7 (2.2)		0.4 (2.1)
Number of arrangers	−1.9* (1.0)	−2.1** (1.1)	−3.0*** (1.1)	−3.2*** (1.2)
Adj R^2	0.51	0.51	0.44	0.44
N	1,076	1,076	1,247	1,247

Note: Standard errors in parentheses. ***, ** and * denote significance at the 1%, 5% and 10% levels, respectively. The possible endogeneity of loan share retention was not controlled for in this regression.

Sources: IMF, *International Financial Statistics*; IMF, *World Economic Outlook*; Dealogic; Transparency International; author's calculations.

Jeffery D Amato

+41 61 280 8434
jeffery.amato@bis.org

3. The international debt securities market

Global gross issuance of international bonds and notes increased by 25% in the fourth quarter of 2005, and was 4% higher than the average during the previous nine months. This is a departure from past experience, as the last few months of the year have traditionally been among the quietest on the international debt issuance calendar. For the year as a whole, borrowers issued a record amount of bonds and notes in the international market, with gross issuance up by 16% over 2004 and 120% higher than the average over the period 1995–2004 (Graph 3.1).

Global net issuance of bonds and notes more than doubled in the fourth quarter, rising from $237 billion to $572 billion. In particular, net issuance grew significantly amongst US, euro area and emerging market borrowers. Net issuance also grew rapidly for the year as a whole: by 17% globally and by 26% in emerging market countries. Despite relatively high global GDP growth in 2005, the ratio of net issuance to global GDP was at its second highest level ever. Japan was one notable soft spot in the international debt securities market last year, with net issuance of bonds and notes totalling only $8.5 billion in 2005.

Borrowing by emerging market countries remained strong, capping a record-breaking year in which gross issuance rose by more than 50%.

Annual gross and net issuance of international bonds and notes
In trillions of US dollars; gross refers to announced issuance

Sources: IMF; Dealogic; Euroclear; ISMA; Thomson Financial Securities Data; BIS.   Graph 3.1
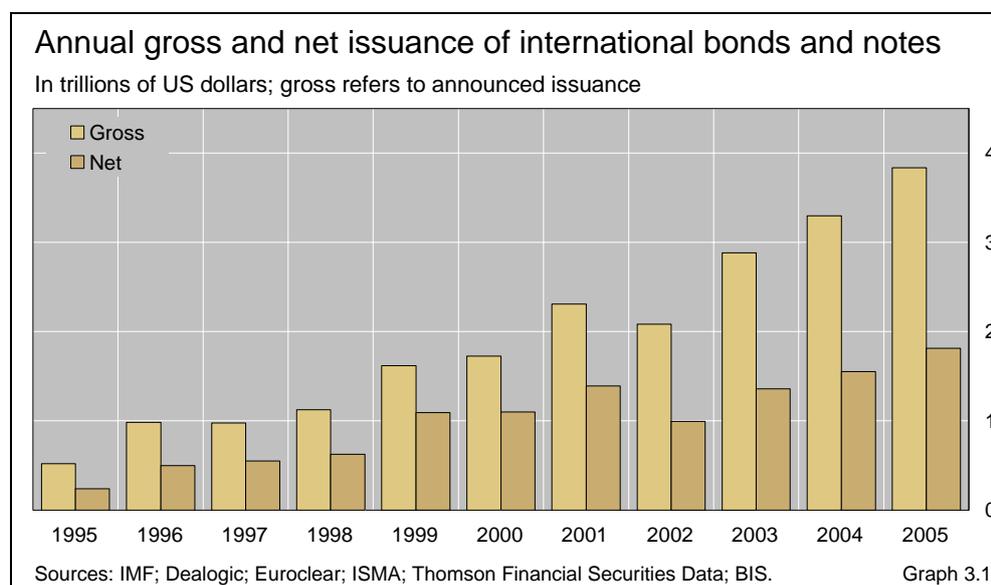
Emerging market borrowers evidently took advantage of very favourable financing conditions throughout most of the year, including the narrowing of spreads to new historical lows (see the Overview). Following a lacklustre third quarter, issuance by euro area entities in the international market increased by almost 50% on a quarterly basis. US borrowers were also unusually active, with gross issuance of bonds and notes rising by 20%. High-yield issuance in developed economies declined during the quarter, despite spreads holding steady throughout the period.

Record-breaking year for emerging market borrowers

Borrowers in emerging market countries completed a record amount of issuance, on a gross basis, in the international bond and note markets in 2005. Gross issuance was $231 billion for the year, while net issuance totalled $96 billion (Tables 3.1 and 3.2). In the fourth quarter, gross and net issuance of bonds and notes were up by 5% and 87%, respectively. The robustness of this segment of the market is all the more surprising given that many issuers had already met their borrowing requirements for the year; in fact, some countries were expected to have already achieved their borrowing targets for 2006 by the end of last year.

<div style="float:right">Net borrowing by emerging markets almost doubles …</div>

The financing environment faced by emerging market borrowers has continued to be very positive, with secondary market spreads holding steady around record lows during the period. The surge in issuance and the decline in spreads have been driven by what many perceive to have been a marked decline in the structural macroeconomic risks in these countries (see the Overview). For instance, the ratings on 13 emerging market sovereigns were raised by at least one of the three major rating agencies between 1 October 2005 and 31 January 2006.[1] In addition, there has been little sign that the risk appetite of investors for emerging market bonds has waned.

<div style="float:right">… as financing conditions remain favourable</div>

From a regional perspective, gross issuance of all international debt securities (bonds and notes plus money market instruments) increased on a quarterly basis in Africa and the Middle East, emerging Europe and Asia-Pacific, but declined in Latin America; net issuance increased in all regions except Africa and the Middle East (Graph 3.2).[2] Sector-wide developments in emerging market countries experienced a reversal from the previous quarter, with governments and financial institutions increasing both their gross and net borrowing of international debt securities, while corporates scaled back theirs.

The largest deal from emerging markets in the fourth quarter came out of the Africa and Middle East region: a $3.5 billion US dollar-denominated two-year bond by PCFC Development. Other large issues from the region included

<div style="float:right">Large deals from the Middle East …</div>

---

[1] Of the countries receiving ratings upgrades, two were in Africa and the Middle East (Oman and Saudi Arabia), three in Asia (China, Kazakhstan and Korea), five in emerging Europe (Bulgaria, Lithuania, Russia, the Slovak Republic and Turkey) and three in Latin America (Brazil, Mexico and Venezuela).

[2] Excluding the Republic of Argentina's repackaged issues totalling $15.7 billion from the first quarter of 2005.

Gross issuance in the international bond and note markets

In billions of US dollars

	2004	2005	2004	2005			
	Year	Year	Q4	Q1	Q2	Q3	Q4
Total announced issues	3,296.9	3,836.3	822.3	1,076.9	979.5	791.7	988.1
Bonds	1,782.7	2,045.0	434.9	595.8	516.9	427.8	504.4
Notes	1,514.2	1,791.3	387.4	481.0	462.6	363.9	483.8
Floating rate	1,254.5	1,470.7	327.9	335.5	412.0	273.6	449.7
Straight fixed rate	1,985.1	2,323.9	483.2	724.9	561.0	511.7	526.3
Equity-related[1]	57.4	41.7	11.2	16.5	6.5	6.5	12.1
US dollar	1,153.1	1,322.3	284.1	315.8	300.6	329.0	376.9
Euro	1,596.6	1,832.0	389.7	568.9	533.8	301.3	428.0
Yen	111.2	114.8	25.9	30.6	27.0	30.8	26.4
Other currencies	436.0	567.2	122.6	161.6	118.2	130.6	156.8
Developed countries	3,008.3	3,447.7	751.9	953.9	888.6	701.4	903.9
United States	773.6	835.7	182.3	214.6	168.4	206.1	246.6
Euro area	1,469.4	1,792.4	364.8	532.4	519.7	297.9	442.4
Japan	62.0	56.3	9.9	13.9	13.3	19.0	10.2
Offshore centres	39.2	50.4	13.5	11.4	13.3	12.4	13.3
Emerging markets	152.4	230.9	35.1	83.3	49.4	47.8	50.3
Financial institutions	2,684.9	3,173.1	688.3	841.7	815.2	677.3	838.8
Private	2,279.5	2,744.7	592.1	696.6	682.7	605.8	759.5
Public	405.4	428.4	96.2	145.1	132.5	71.5	79.3
Corporate issuers	269.9	239.4	75.0	58.6	56.8	48.2	75.9
Private	232.7	208.5	60.9	55.1	43.9	40.2	69.2
Public	37.2	30.9	14.0	3.4	12.9	7.9	6.6
Governments	245.0	316.5	37.3	148.3	79.3	36.1	52.8
International organisations	97.1	107.3	21.8	28.3	28.2	30.1	20.7
Completed issues	3,300.5	3,817.2	864.3	1,016.4	1,022.0	768.5	1,010.3
Memo: Repayments	*1,747.6*	*2,003.8*	*439.8*	*521.5*	*512.3*	*531.1*	*438.8*

[1] Convertible bonds and bonds with equity warrants.

Sources: Dealogic; Euroclear; ISMA; Thomson Financial Securities Data; BIS.   Table 3.1

the State of Israel's euro-denominated bond for €750 million ($891 million), its largest issue since April 2004 in the international debt securities market, and an $850 million US dollar-denominated bond from National Bank of Abu Dhabi PJSC. The Lebanese Republic (classified in the BIS statistics as an offshore centre) was able to complete a US dollar-denominated bond for $750 million on 18 October, despite a rise in political tension in the region around the time of the deal.

… and Russia   Russian entities completed several deals in the fourth quarter, leading the way in the substantial increase in issuance from emerging Europe. Much of the issuance from Russia was by financial firms. The largest deals were completed by the financing arm of a large energy producer, Gaz Capital SA, and the financial firm VT Bank for Foreign Trade Capital SA. Elsewhere in emerging Europe, the Republic of Turkey issued a US dollar-denominated bond for

Main features of net issuance in the international bond and note markets
In billions of US dollars

	2004	2005	2004	2005				Stocks at end-Dec 2005
	Year	Year	Q4	Q1	Q2	Q3	Q4	
Total net issues	1,552.9	1,813.4	424.4	494.8	509.6	237.4	571.6	13,995.4
Floating rate	634.4	677.1	193.5	98.5	242.8	45.4	290.4	3,974.5
Straight fixed rate	924.7	1,155.9	235.3	398.6	272.0	200.5	284.9	9,698.0
Equity-related	–6.2	–19.6	–4.4	–2.2	–5.1	–8.5	–3.8	322.8
Developed countries	1,434.2	1,661.5	396.5	461.1	476.5	192.9	531.1	12,423.7
United States	225.3	267.8	61.8	63.9	47.9	42.1	113.8	3,444.6
Euro area	779.1	939.0	222.2	283.3	317.4	56.5	281.8	6,100.1
Japan	17.4	8.5	0.4	4.9	–2.4	5.0	1.0	264.0
Offshore centres	19.5	27.1	9.0	2.8	8.6	8.6	7.1	174.1
Emerging markets	76.4	95.9	21.6	29.0	15.3	18.0	33.6	861.8
Financial institutions	1,305.1	1,576.9	365.0	394.1	447.4	223.3	512.1	10,513.3
Private	1,095.3	1,387.1	316.3	318.0	370.4	212.7	486.0	8,951.9
Public	209.9	189.8	48.7	76.1	76.9	10.6	26.1	1,561.4
Corporate issuers	73.5	64.6	42.7	14.3	14.1	–3.1	39.5	1,517.6
Private	55.7	63.2	34.7	22.4	6.9	–4.8	38.7	1,286.5
Public	17.8	1.4	8.1	–8.1	7.1	1.6	0.8	231.0
Governments	151.4	143.0	19.4	84.5	39.0	–0.7	20.3	1,428.7
International organisations	22.9	28.9	–2.7	2.0	9.3	17.9	–0.2	535.8

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

$750 million in November and a €350 million ($409 million) bond in early December. Later that month, Moody's raised the Republic of Turkey's long-term foreign currency rating from B1 to Ba3.

From Asia-Pacific, the largest deals were completed by the Republic of Indonesia: two US dollar-denominated bonds, one for $900 million with a 10-year maturity and one for $600 million with a 30-year maturity. But the largest total amount of issuance from the region during the quarter, on both a gross and a net basis, was from South Korea, led by a government issue. On 26 October, two days after Fitch upgraded the Republic of Korea from A to A+, the government completed a two-tranche deal: one tranche was a 10-year euro-denominated bond for €500 million ($601 million) and the other a 20-year $400 million US dollar-denominated bond.

Even though gross issuance in Latin America fell in the fourth quarter, net issuance more than doubled to $8.2 billion. Brazil and Venezuela, with net issuance of $2.3 billion and $2.9 billion, respectively, posted the largest gains.[3] Moreover, the region was the source of two significant events in international debt markets during the period. First, Brazil and Argentina fully repaid their IMF loans in December. Second, Ecuador returned to the international capital markets for the first time since its default in 1999. On

Ecuador returns to the international capital markets

---

[3] In early February 2006, Standard & Poor's raised the government of Venezuela's rating from B+ to BB–.

International debt securities issuance by emerging market entities[1]
In billions of US dollars

Gross issuance, by nationality of issuer

- Africa & Middle East
- Emerging Europe
- Latin America & Caribbean
- Asia-Pacific

Net issuance, by nationality of issuer

Gross issuance, by sector of issuer

- Corporate issuers
- Financial institutions
- Governments

Net issuance, by sector of issuer
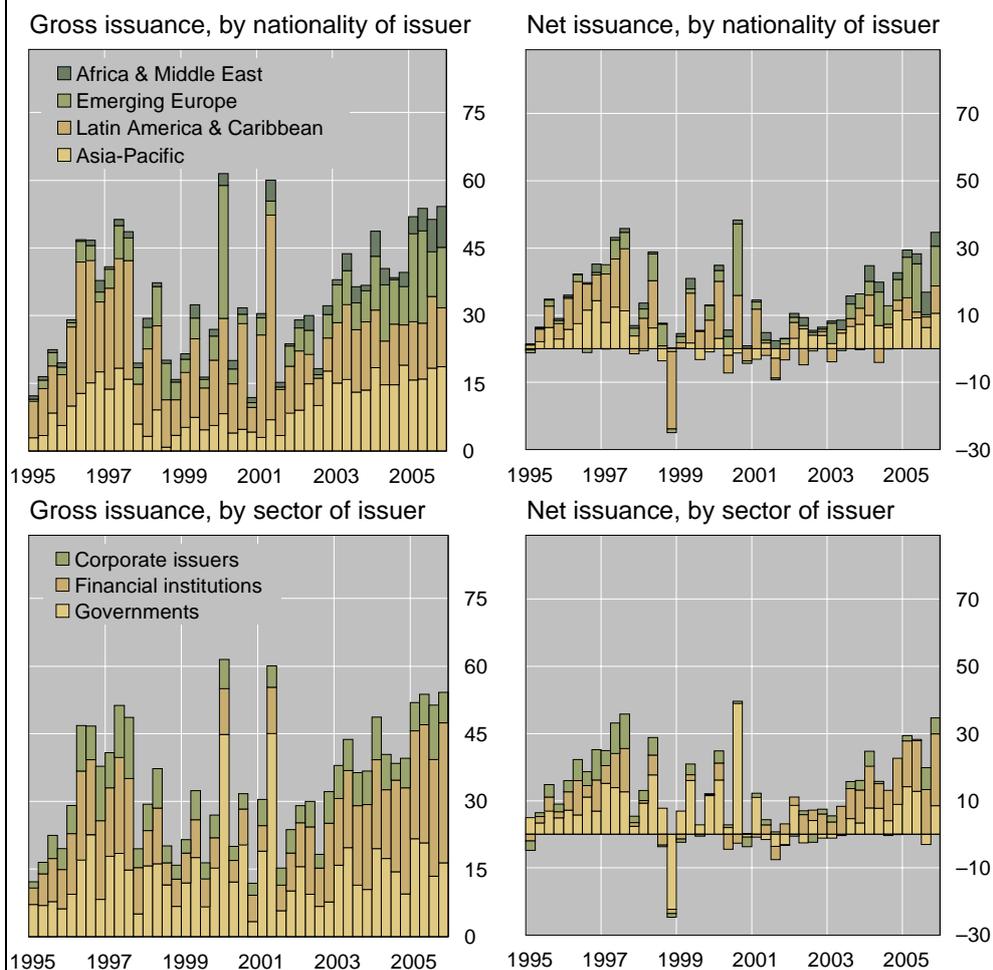
[1] Excluding issuance by the Republic of Argentina in the first and second quarters of 2005.

Sources: Dealogic; Euroclear; ISMA; Thomson Financial Securities Data; BIS.   Graph 3.2

12 December, the government completed a 10-year US dollar-denominated bond with a face value of $650 million and a coupon of 9.375%. A significant portion of the issue was purchased by the government of Venezuela. While Ecuador's economy has benefited from high oil prices – Ecuador is the fifth largest producer of oil in Latin America – there are several potential risks to the government's fiscal situation surrounding the fiscal responsibility law, tax reform and the national pension fund.

Local currency issuance falters

Record year in local currency issuance ends on a soft note

In the fourth quarter of 2005, issuance of international debt securities in local currencies by emerging market entities fell for the first time in six quarters (Graph 3.3). Supply brought to the market totalled $837 million and consisted of 11 issues. Nevertheless, 2005 was an important year for this segment of the market, with total issuance of $6.3 billion far outstripping all previous years since 1995.

International debt securities issuance in local currency[1]

[1] Announced issuance by nationality of issuer in millions of US dollars. [2] Excluding issuance by the Republic of Argentina in the first quarter of 2005. [3] Adjusted for Argentina; monthly averages, in basis points.

Sources: Dealogic; Euroclear; ISMA; Thomson Financial Securities Data; BIS.   Graph 3.3
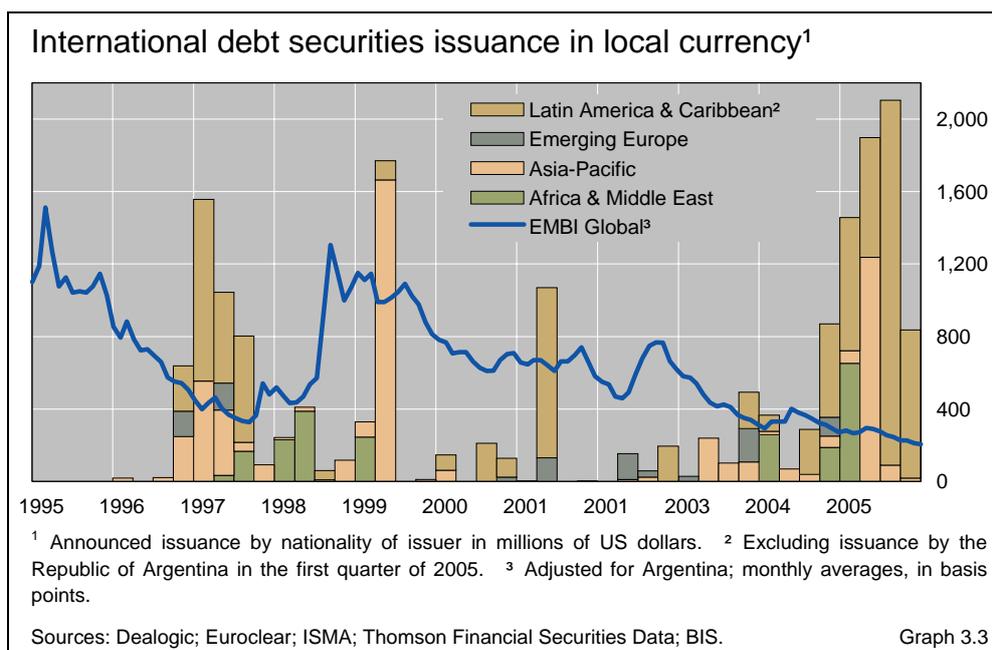
Latin American entities continue to be the main force behind the resurgence in local currency issuance from developing countries in the international debt securities market. As shown in the graph, local currency deals out of this region totalled $4.2 billion in 2005, with the next most active region being Asia-Pacific, with $1.4 billion in issuance. The government of Brazil and Latin American financial institutions have been key players. In the most recent quarter, the Republic of Colombia brought the largest local currency issue to the market, a 10-year bond in the amount of 569 billion pesos ($250 million). Much of the remaining local currency issuance was by the Brazilian banks Banco Bradesco SA and Banco Votorantim SA.

Unusually busy fourth quarter for US issuers

Gross issuance by US entities increased for the second consecutive quarter, following several previous periods in which the presence of US issuers in the international market had been relatively muted. Gross issuance of bonds and notes rose from $206 billion to $247 billion in the fourth quarter; judged on a year-over-year basis, gross issuance increased by 8% to $836 billion. The recent figures stand in sharp contrast to past seasonal patterns, as US gross issuance is typically about 10–15% lower than the yearly average in the fourth quarter (see this chapter of the *BIS Quarterly Review*, September 2005). Net issuance rose by a much larger percentage in the fourth quarter, almost threefold to $114 billion.

US issuance rises again …

The agencies were once again the most active issuers from the United States, accounting for 36% of US gross issuance. Nonetheless, there were some sharp differences in the borrowing activity across them. In particular, Freddie Mac continued to expand its participation in the international market in the fourth quarter, with gross and net issuance increasing by 45% and 212%, respectively (Graph 3.4). The agency accounted for almost 25% of total net borrowing by US entities during the quarter. By contrast, Fannie Mae continued

… led by several deals from Freddie Mac

US agencies' issuance of international bonds and notes

In billions of US dollars

Gross[1]

- Fannie Mae
- Federal Home Loan Banks
- Freddie Mac

Net

[1] Announced issuance.

Sources: Dealogic; Euroclear; ISMA; Thomson Financial Securities Data; BIS.   Graph 3.4
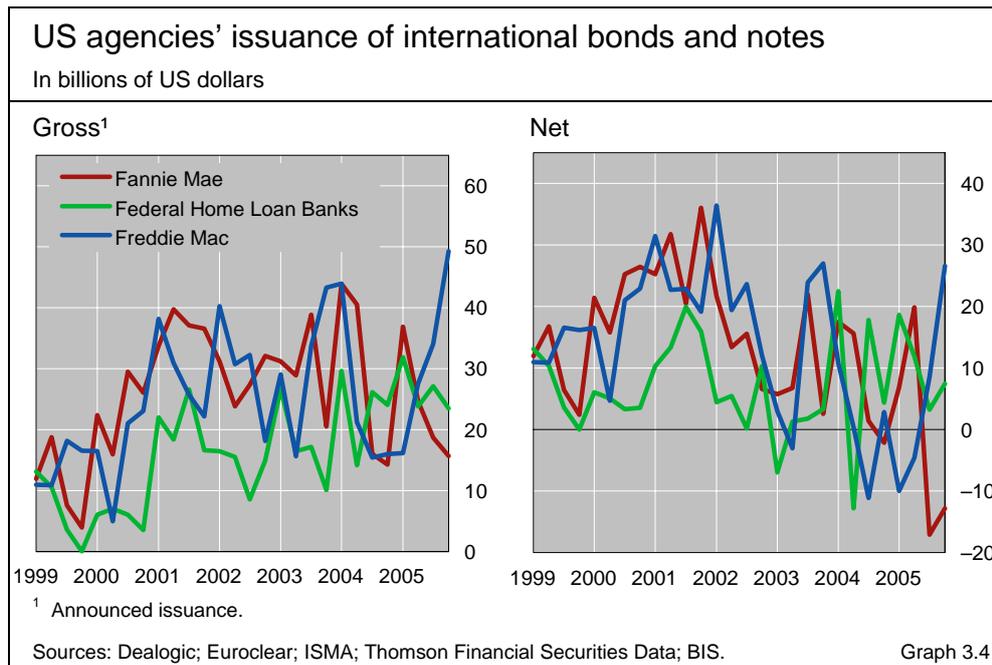
to retreat from the international bond market, with net issuance of –$12.8 billion. This was probably the result of Fannie Mae continuing to scale back its mortgage portfolio in the fourth quarter, even after meeting a capital surplus requirement for the end of September which had been imposed by the Office of Federal Housing Enterprise Oversight.

Supporting the large increase in issuance by Freddie Mac during the quarter were several deals in excess of $1 billion that spanned the maturity spectrum from 1.5 years to 30 years. For instance, Freddie Mac issued four medium-term notes with a face value of $4 billion each. The maturities of these notes ranged from two years (launched at a spread of 24.5 basis points over US Treasuries) to 10 years (at a spread of 36.5 basis points).

The risk of an adjustment to the US dollar seems to have had little negative impact on dollar-denominated bond issuance in the international

Currency shares in gross issuance of international bonds and notes

In per cent

By US nationals

By euro area nationals

By other nationals

- US dollar
- Euro
- Other currencies

Sources: Dealogic; Euroclear; ISMA; Thomson Financial Securities Data; BIS.   Graph 3.5
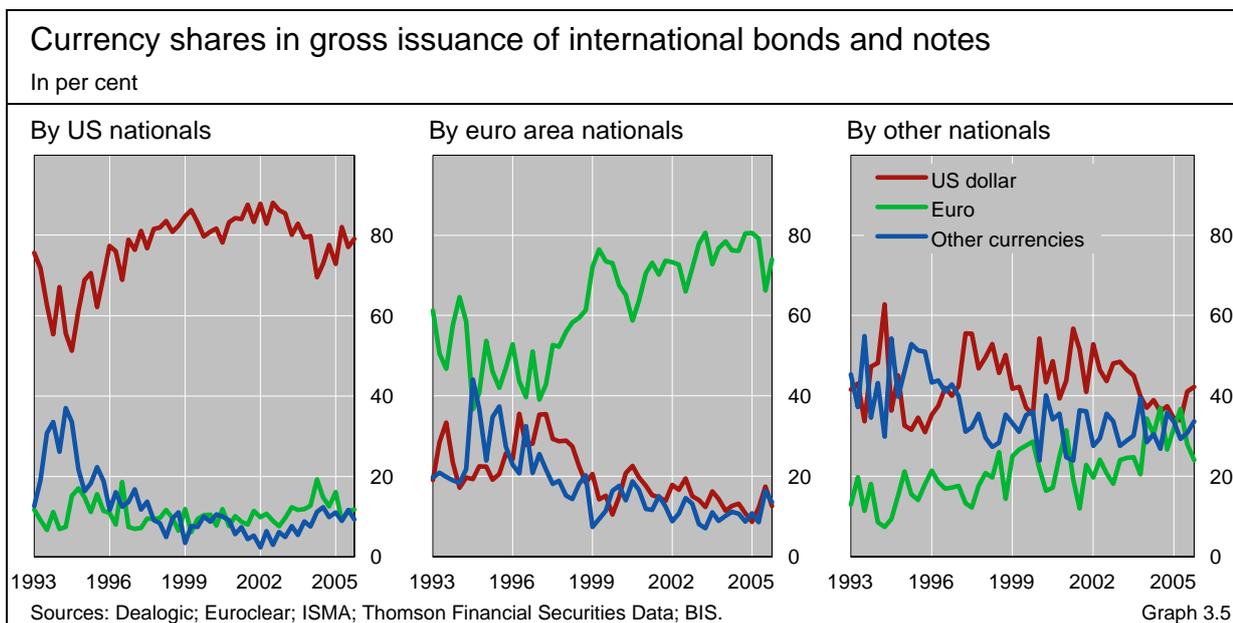
market. The share of issuance in US dollars held fairly steady throughout 2005. In the fourth quarter, the proportion of bonds and notes denominated in US dollars issued by US entities actually rose slightly, from 77% to 79%; the fraction issued by nationals from other countries excluding the euro area was unchanged, while the fraction of issuance in US dollars by euro area entities declined somewhat in the midst of a strong rebound in the issuance of euro-denominated bonds and notes by euro area nationals (Graph 3.5). One factor potentially favouring the demand for US dollar issuance in recent months was that government bond yields continued to be higher in the United States than in the euro area.

Proportion of US fixed rate issuance drops amidst curve flattening

The slope of the yield curve is potentially one factor that determines the relative amount of fixed and floating rate bond supply observed in the market. In fact, with the slope of the US Treasury curve continuing to flatten in the

Fixed rate bond issuance and the yield curve
In per cent

¹ Announced issuance of international bonds and notes. ² Difference between 10-year and three-month government bond yields. ³ Slope of yield curve based on US Treasury yields.

Sources: Dealogic; Euroclear; ISMA; Thomson Financial Securities Data; BIS   Graph 3.6
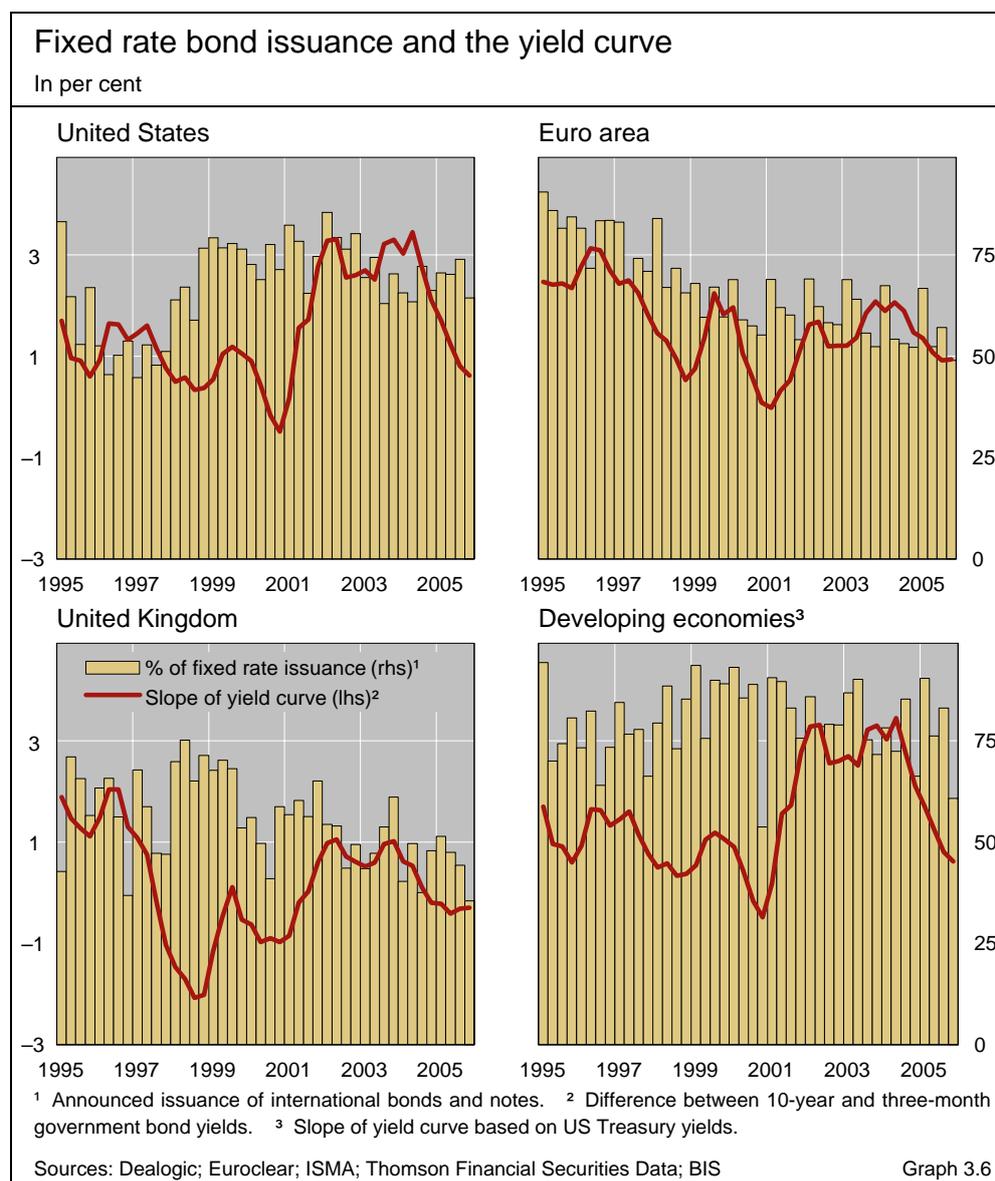
fourth quarter, the fraction of straight fixed rate international bond issuance by US entities fell from 74% to 64% (Graph 3.6). The fraction of fixed rate issuance also dropped sharply in developing countries along with the decline in the slope of the US Treasury curve. The percentage share of fixed rate issuance in total global issuance of international bonds and notes fell from 65% to 53% (Table 3.1).[4]

<div style="float:left; width:25%;">

Several factors affect the choice of fixed vs floating rates

</div>

Looking back over the past couple of years, however, the fraction of US fixed rate issuance has been fairly stable, even though the US Treasury curve has been flattening over this longer period as well. For instance, the difference between 10-year and three-month Treasury yields has fallen from a recent high of 3.5% in the second quarter of 2004 to 0.7% in the fourth quarter of last year. Standard term structure models imply that term premia on longer-maturity bonds have been at extraordinarily low levels, which suggests that issuers could have obtained relatively cheap financing by issuing longer-dated fixed rate paper. But several factors determine the fraction of fixed rate bond supply observed in the market, of which the slope of the yield curve is only one. The bargaining positions of borrowers in the international bond market will depend upon the conditions they face in domestic bond markets, as well as for other forms of financing. Moreover, it is not obvious a priori whether issuers or investors should have stronger preferences about exposure to interest rate risk on a given security. This will depend upon the comparative advantage, including cost, to borrowers versus investors in hedging this risk.

Rebound in euro area issuance

Fivefold increase in euro area net issuance, driven mainly by Germany

After a very weak third quarter, gross issuance of international bonds and notes by euro area entities rebounded strongly in the fourth quarter, rising from $298 billion to $442 billion. As with issuance in the United States, euro area issuance in the international market tends to be much lower in the second half of the year. Most euro area governments, for instance, attempt to front-load their borrowing in the first part of the calendar year.[5] Since redemptions by euro area entities in the fourth quarter were relatively small, there was an almost fivefold increase in net issuance. This was propelled by significant jumps in all of the large euro area countries, with net borrowing rising by a factor of 24 in Germany, seven in France and three in Spain (see Table 15B in the Annex); net issuance in Italy increased from –$9.7 billion to $27.3 billion. Smaller economies in the region also experienced tremendous growth in net issuance.

There are several possible factors that might explain the large amount of euro area issuance in the fourth quarter. One could be an attempt by borrowers to secure funding before the anticipated rate hike by the ECB on 1 December

---

[4] By contrast, the yield curve steepened slightly in the euro area and United Kingdom, yet the proportion of fixed rate issuance by entities in these economies also fell during the fourth quarter (see Graph 3.6).

[5] Valuation effects do not account for much of the change in issuance expressed in US dollars: the exchange rate of the euro vis-à-vis the dollar depreciated by only 2% during the quarter.

and the possibility that financing conditions would become less favourable as a result. Alternatively, it may simply be one of several signals that have surfaced recently indicating that a stronger recovery in the euro area economy is under way.

The largest issue in the international market in the fourth quarter was completed by the government of Italy for €6 billion ($7.2 billion). Smile 2005 Synthetic BV, a Dutch special purpose vehicle, issued a six-tranche €6.8 billion collateralised loan obligation secured on a pool of euro-denominated loans issued by bank ABN Amro. The bulk of the deal was placed in the most senior tranches (€6.3 billion), which were rated AAA/Aaa by the three major rating agencies. The Class A1 tranche was launched at a spread of 14 basis points over three-month Euribor.

UK issuance surges, Japanese borrowing fades

Amongst other developed economies, borrowers from the United Kingdom were particularly active in the international debt securities market in the fourth quarter. Gross borrowing by UK entities was up by 40%, with net borrowing almost doubling (Graph 3.7). The vast majority of UK issuance was by financial institutions, including two large multi-tranche issues by Gracechurch Mortgage Funding plc and Holmes Financing (No 9) plc for $7.9 billion and $6.5 billion, respectively. Net issuance also rose significantly in Australia and Canada. By contrast, net issuance fell by 94% in Switzerland and 80% in Japan.

UK borrowers end a strong year on a high note …

Indeed, the fourth quarter ended a very soft year for Japan in the international bond market. Net issuance of international bonds and notes by Japanese entities was only $8.5 billion in 2005; this compares with $215 billion from Germany, $268 billion from the United States and $280 billion from the United Kingdom. Almost 80% of net borrowing by Japanese issuers in the international market in 2005 was attributable to financial institutions, with

… while Japanese issuance remains weak

International issuance by nationals of selected countries[1]

In billions of US dollars

¹ Gross announced and net issuance of bonds and notes.

Sources: Dealogic; Euroclear; ISMA; Thomson Financial Securities Data; BIS.   Graph 3.7

Issuance of non-investment grade international bonds[1]

In billions of US dollars

- Other developed countries
- United Kingdom
- Euro area
- Japan
- United States

[1] Issues rated BB+/Ba1 or lower.

Sources: Dealogic; BIS.   Graph 3.8

nearly all of the remainder due to corporates. The largest issuers were the financial arms of Toyota, Bank of Tokyo Mitsubishi and Resona Bank Ltd.

Cooldown in high-yield market

<div style="float:left; width:25%;">

High-yield issuance falls in Q4 to end a roller-coaster year

</div>

Gross issuance of high-yield international bonds and notes by entities in developed economies fell in the fourth quarter by 39%, although the drop in issuance was not as large as in the second quarter of 2005 at the time of ratings downgrades in the US auto sector (Graph 3.8). The cooling-off in the primary market occurred despite secondary market spreads remaining range-bound during the period. For 2005 as a whole, high-yield issuance fell by 32% from 2004, but was higher than in any other previous year.

In the euro area, however, high-yield issuance rose in the fourth quarter, and in 2005 was only 14% below the record level of the previous year. Growth in the European high-yield market was sparked by the advent of the euro in 1999, and the market expanded significantly in 2003. Amongst the deals completed by euro area entities in the fourth quarter was a three-tranche deal by TUI AG, a German travel services company, in the amount of €1.3 billion ($1.53 billion). Two of the tranches were rated BB/Ba2 and the other B1 by Standard & Poor's and Moody's. Wind Acquisition Finance SA, an Italian firm, issued two bond tranches, one denominated in euros for €825 million ($976 million) and the other in US dollars for $500 million. Both tranches were rated B–/B3 by Fitch and Moody's.

Marian Micu

+41 61 280 9279
marian.micu@bis.org

Christian Upper

+41 61 280 8416
christian.upper@bis.org

4. Derivatives markets

Trading on the international derivatives exchanges declined during the fourth quarter of 2005. Combined turnover (measured by notional amounts) in fixed income, equity index and currency contracts fell by 4% quarter-on-quarter to $344 trillion (Graph 4.1). As in the previous quarter, this was mainly due to seasonal factors, which tend to depress activity in the interest rate segment towards the end of the year. The year-on-year rate of growth remained unchanged at 22%.

In the interest rate segment, solid growth in turnover of derivatives on short-term euro interest rates ahead of the ECB's policy rate hike on 1 December 2005 partly compensated for weaker activity in the US and Japanese markets. Turnover in stock index contracts rose by 14% quarter-on-quarter to a record $39 trillion, with growth being concentrated in contracts on Japanese and US stock indices. The volume of exchange-traded currency contracts increased by 8% to $3.3 trillion. Trading in commodity derivatives increased slightly during the final quarter of 2005, as a large rise in the turnover of contracts on precious metals was offset by reduced activity in energy derivatives.

Turnover of exchange-traded futures and options
Quarterly data, in trillions of US dollars

By contract type

- Long-term interest rate
- Short-term interest rate
- Stock market index

By currency

- Yen
- Euro
- US dollar

Sources: FOW TRADEdata; Futures Industry Association; BIS calculations.   Graph 4.1
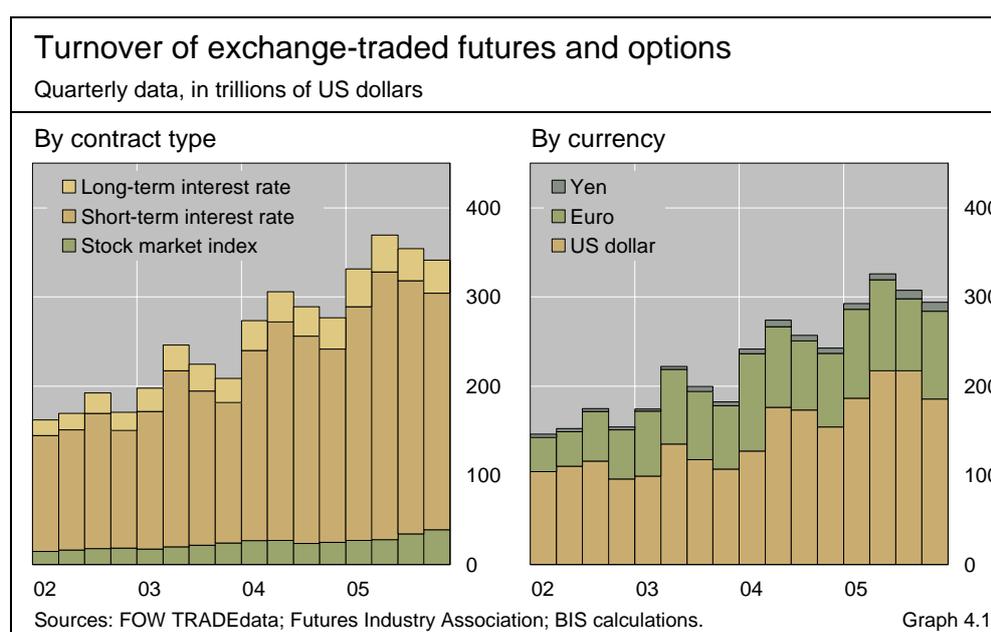
ECB tightening lifts trading in Euribor contracts

Trading in the interest rate segment on the international derivatives exchanges declined by 6% quarter-on-quarter, but this was entirely due to seasonal factors, whose pattern is examined in more detail in the box on page 45.

Trading volumes of futures and options on short-term interest rates were uneven across the major markets. Turnover in contracts on euro money market rates rose by 28% to $72 trillion, whereas volumes in dollar- and yen-denominated contracts fell by 18% and 8%, respectively (Graph 4.2). Even so, with a turnover of $158 trillion, the dollar segment still remains more than twice as large as that of the euro. Trading in derivatives on short-term Japanese rates amounted to $4 trillion, well behind turnover in contracts on sterling rates ($22 trillion).

Activity in futures and options on three-month Euribor traded on Euronext.liffe soared as signs of strengthening economic activity in the euro area led market participants to revise their expectations of future short-term interest rates. While a rate hike by the ECB had seemed far off in early October, it appeared more likely as new data came in. The shift in expectations did not coincide with a marked increase in uncertainty, as is shown by the relatively mild rise in implied volatility (Graph 4.3), but it did induce traders to readjust their positions. As a consequence, turnover in Euribor futures and options rose to $27 trillion in October and $29 trillion in November, although it fell short of the record turnover of $32 trillion recorded in June.

Trading quickly tailed off after the ECB raised the minimum bid rate of its main refinancing operations to 2.25% on 1 December. The move had been fully anticipated, but there was less clarity about whether it was a one-off or the beginning of a gradual tightening cycle as in the United States during the previous year and a half. This uncertainty did not translate into higher trading volume than is usual in the final month of the year.

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
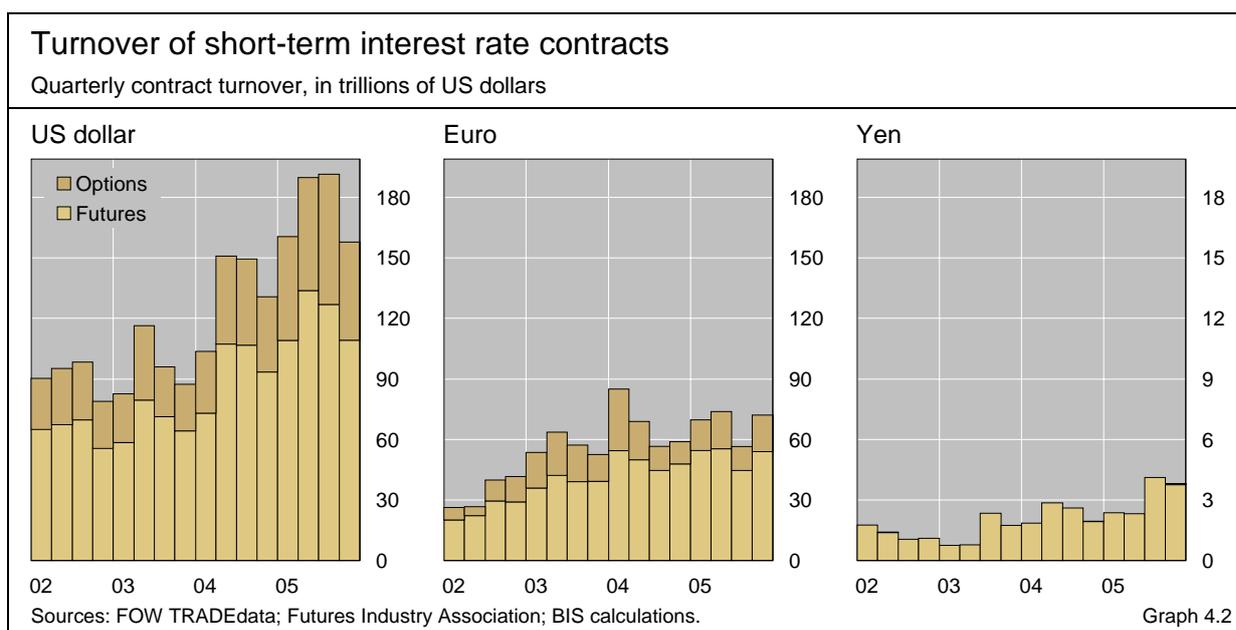
Seasonality in interest rate derivatives activity

Trading on the international derivatives exchanges is subject to seasonal fluctuations that complicate the interpretation of turnover and open interest. Such seasonal effects appear to be strongest in the interest rate segment, which in 2005 accounted for approximately 90% of both turnover and open interest (measured by notional amounts) of all financial derivatives. By contrast, they are statistically insignificant in the market for futures and options on stock indices. This box presents estimates of the seasonal factors affecting activity in exchange-traded interest rate derivatives that should facilitate the interpretation of the data published in the *BIS Quarterly Review*.

The analysis is based on the *X-12-ARIMA* approach developed by the US Census Bureau, which is widely used in statistical agencies across the world. This method decomposes a series in a sum of moving averages and autoregressive terms and accounts for trends, cycles and seasonal components.[1] The estimations use quarterly data for the period 1993 Q4–2005 Q4.

Selected estimates of seasonal factors as a percentage of average total activity for each quarter are presented in the table. All factors are statistically significant and exhibit relatively similar seasonal patterns. Activity tends to be higher in the first half of the year, followed by a decline in the third and the fourth quarters. For short-term interest rate contracts, turnover peaks in the second quarter (6.8%), whereas for long-term interest rates the seasonal peak is reached in the first quarter (7%). The largest decline occurs in the last quarter for both short- (–12.2%) and long-term (–8.9%) interest rate contracts. Open interest reaches its seasonal peak in the first quarter for both short- and long-term contracts. The fourth quarter decline in derivatives activity may be related to an increase in investors' need for liquidity to meet year-end cash flow obligations or to reduced position-taking in order to "lock in" previous returns. In both cases, traders may reduce positions in derivatives.[2] Similarly, the surge in activity in the first two quarters may be associated with an increasing demand for interest rate risk hedging as international issuance of bonds and notes peaks in these quarters.[3]

Seasonal factors in interest rate derivatives activity[1]

| | Average seasonal factors | | | | | | | | F-test for the presence of seasonality[2] | |
| | Turnover | | | | Open interest | | | | | |
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Turnover	Open interest
Total short-term	3.1	6.8	0.7	–12.2	3.9	3.6	1.8	–10.6	15.5	14.1
By instrument										
Futures	2.1	7.1	0.6	–11.2	2.4	2.2	0.2	–5.2	18.2	10.8
Options	4.3	5.9	1.2	–13.6	–0.9	7.8	4.3	–13.4	8.9	13.3
Total long-term	7.0	2.9	–2.1	–8.9	6.2	1.9	2.3	–12.9	17.1	19.4
By instrument										
Futures	7.3	2.4	–1.9	–8.9	4.3	0.1	2.2	–7.6	18.9	10.6
Options	6.0	5.5	–4.2	–9.2	10.9	6.0	0.8	–24.4	7.9	13.6

[1] Additive factors as a percentage of average activity for each quarter. The sample period is 1993 Q4–2005 Q4.   [2] F-tests show statistically significant seasonality at the 0.1% level for all cases.

_____

[1] For a detailed documentation of this method, see US Census Bureau, *X-12-ARIMA Reference Manual*, Final Version 0.3 (Beta), Washington DC, January 2006.   [2] See M D Griffiths and D B Winters, "The turn of the year in money markets: tests of the risk-shifting window dressing and preferred habitat hypothesis", *Journal of Business*, vol 78, no 4, 2005, pp 1337–63.   [3] See J D Amato and J Sobrun, "Seasonality in international bond and note issuance", *BIS Quarterly Review*, September 2005, pp 36–39.

Seasonal factors in short-term interest rate derivatives turnover[1]

Euro
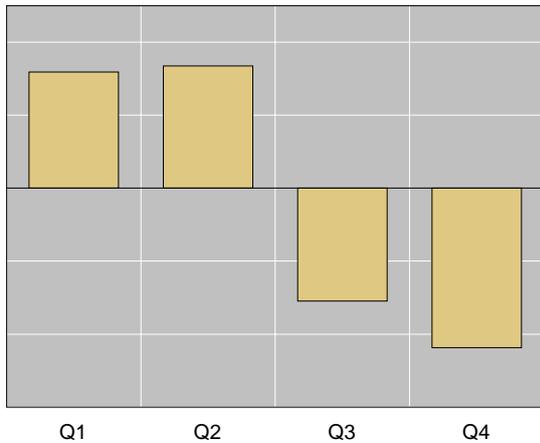
US dollar
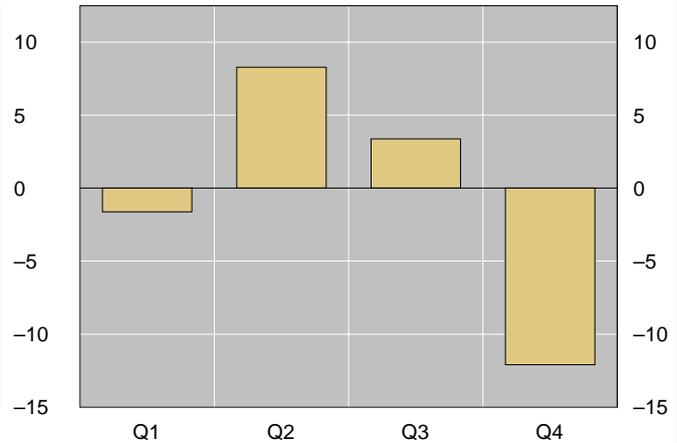
[1] Additive factors as a percentage of average turnover for each quarter. The sample period is 1993 Q4–2005 Q4.　　　　Graph A

There are some noticeable differences in the seasonal patterns across currencies, in particular in the first half of the year. For example, the turnover of derivatives on short-term US dollar interest rates tends to be higher in the second and the third quarter, while turnover in euro contracts peaks during the first two quarters (see Graph A). The pattern for Japanese contracts is not statistically significant. These differences may possibly be determined by differences in issuance calendars of corporate and government securities.

The influence of seasonal factors on turnover in short- and long-term derivatives contracts is presented in Graph B. The figures show that some of the sharp swings in activity may be due to seasonal effects. These findings suggest that quarter-on-quarter changes in interest rate derivatives should be interpreted with care, by distinguishing between movements in the trend and the seasonal component.

Seasonally adjusted interest rate derivatives turnover

Quarterly changes, in per cent

Short-term
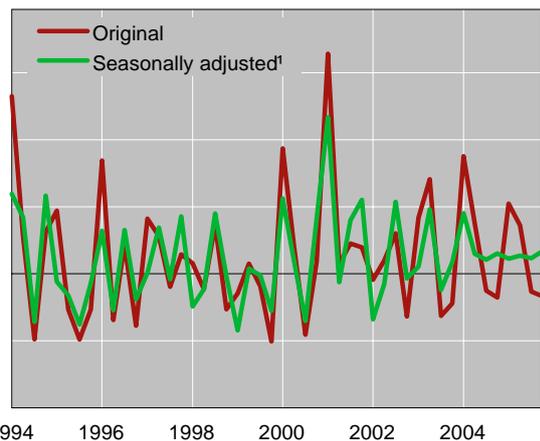
Long-term
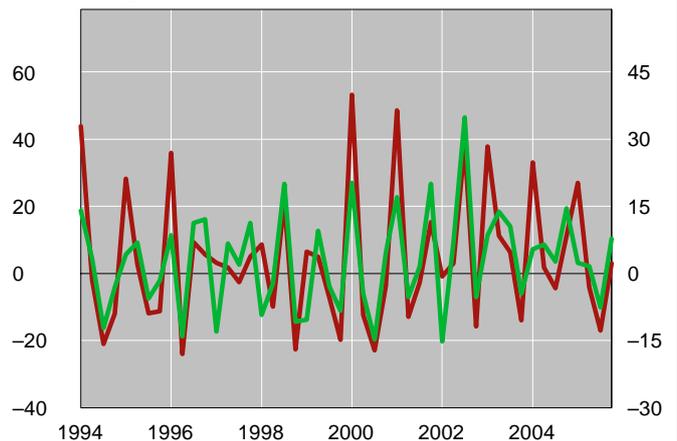
[1] Using the US Census Bureau's *X-12-ARIMA* procedure with additive factors.　　　　Graph B

In the United States, the Federal Reserve maintained its policy of stepwise tightening as it became clear that economic activity had emerged relatively unscathed from the fallout of Hurricane Katrina. While the rate increases at the FOMC's November and December meetings were fully anticipated, there was much less certainty about the level of interest rates at which tightening would

… and the United States …
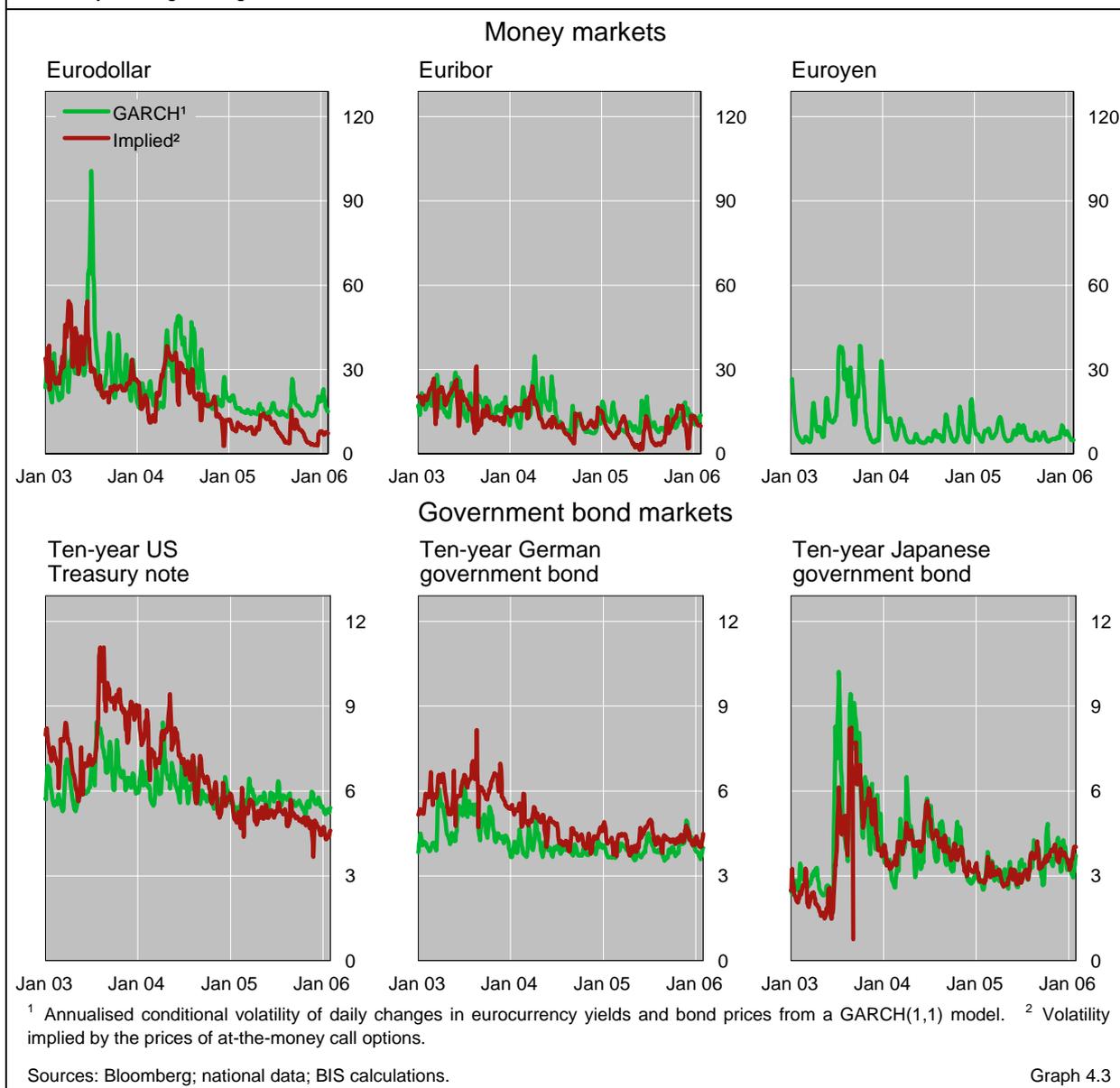
end. This was reflected in solid turnover of $43 trillion, after an exceptional $73 trillion in the previous quarter.

... but not Japan

In Japan, the scenario of an early rate hike appeared more remote in the light of divergent opinions about whether deflationary forces were ebbing enough to allow consideration of an end to the policy of quantitative easing. Towards the end of the year, the view prevailed among market participants that quantitative easing would not be abandoned until the second half of 2006 and that interest rates might remain low for an even longer period. Thereafter, the anticipated time of a policy shift moved forward, but this did not affect trading in the fourth quarter of 2005. In the absence of a prospective rate increase, trading in contracts on three-month euroyen fell back to $1.4 trillion in October (after $1.6 trillion in September) and weakened further later in the year.

Turnover of government bond contracts

Quarterly contract turnover, in trillions of US dollars

US dollar	Euro	Yen

Sources: FOW TRADEdata; Futures Industry Association; BIS calculations.   Graph 4.4
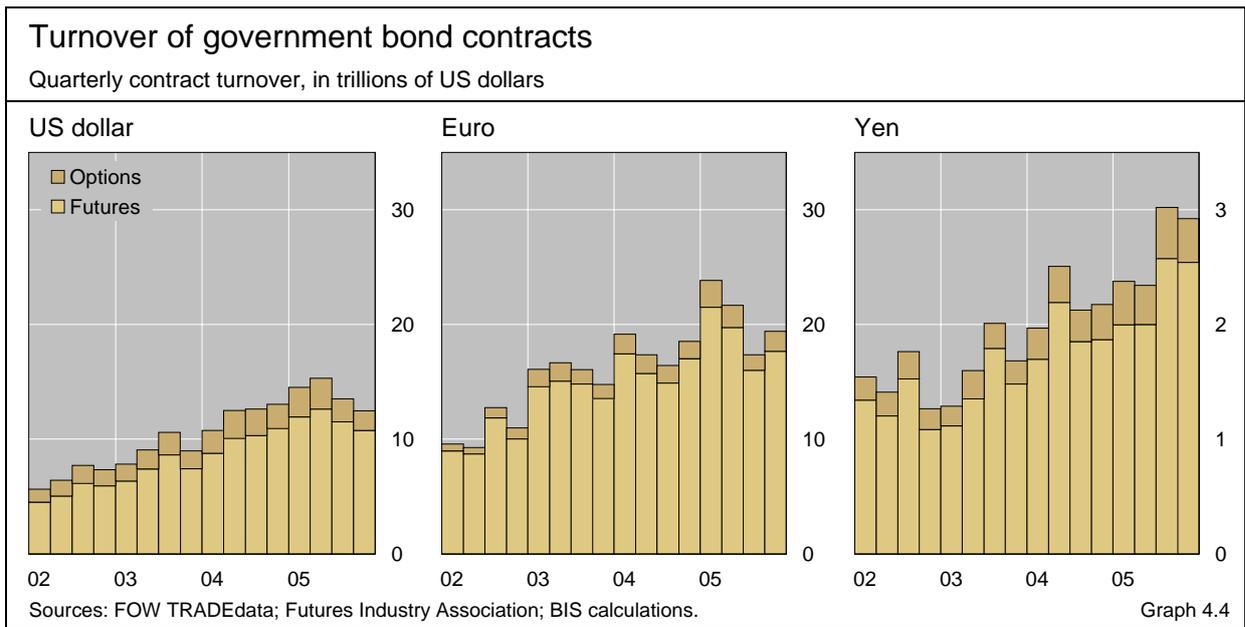
Activity in futures and options on government bonds remained stable at $37 trillion in the fourth quarter (Graph 4.4). Turnover rose by 12% in the euro area, mainly reflecting increased activity in the two-year schatz and the five-year bobl contracts. In the United States, turnover declined by 8%.

Solid growth in stock index derivatives

Trading volumes in derivatives on stock indices rose to an all-time high of $39 trillion in the last quarter of 2005, 14% above the level reached during the previous three months.

The growth in activity was particularly strong in Japan, where turnover in the fourth quarter exceeded the level of the previous period by 59%. The increase was concentrated on a few days in early December, as a five-year high of the Nikkei added to investors' concerns about the sustainability of the valuations of Japanese firms. Turnover remained high as equity prices dropped in the wake of a trading error on 8 December, but quickly tailed off towards the middle of the month.

Trading in US stock index derivatives rebounded by 26% in the final quarter of 2005 despite languishing stock prices. The US market thus regained its long-held position as the world's largest market for this type of product, which had been taken over by Korea in the third quarter (see *BIS Quarterly Review*, December 2005).

Trading in stock index derivatives remained flat in the other main markets. In Korea, turnover in KOSPI 200 futures and options stalled at $12 trillion, as valuation gains offset a 13% decline in the number of contracts traded. Turnover in index derivatives on euro area stocks also stagnated (at around $5½ trillion), even though European equities outperformed stocks in the United States.

Japanese demand for gold drives activity in commodity markets

The number of commodity contracts traded on the international derivatives exchanges (data on notional amounts are not available) increased in the last quarter of 2005 by about 4%, driven mainly by a 47% rise in futures and options on precious metals. Turnover in contracts on non-precious metals and agricultural commodities rose by 7% and 6% respectively. The only exception to the general trend was energy derivatives (–11%), where activity reverted to normal levels after having been lifted to unusual highs by hurricane-related damage to US oil infrastructure.

Surge in derivatives on precious metals

The soaring turnover in derivatives on precious metals reflected mainly active trading in Japan, where investors appear to have used precious metals futures to diversify their portfolios as the yen declined. Total turnover in gold futures traded on the Tokyo Commodity Exchange doubled in the fourth quarter, while activity in silver and platinum contracts increased by roughly one third each. Trading in derivatives on precious metals in the United States increased by a more moderate 10%. The rise in trading volume coincided with an upsurge in prices of precious metals and, towards the end of the quarter, a pickup in volatility (Graph 4.5). Turnover in gold futures on the Commodity Exchange in the United States fell by one third in December while activity in options continued to increase, presumably because traders tried to protect themselves as they became more concerned about the risks to gold prices. In Japan, by contrast, turnover in gold futures continued to rise in December.

The rapid increase in turnover in precious metals derivatives did not lead to a corresponding rise in positions. Open interest increased in slightly in Asia but declined in the United States. This may suggest that investors traded mainly on short-term price movements but were relatively cautious about increasing their longer-term exposure to precious metals.

Gold price and market sentiment indicators

Probability distributions of gold against the dollar[1]

Gold price and futures turnover

[1] The risk neutral probability density functions are estimated using a cubic spline interpolation method. Data employed for the estimation are indicative quotes of a market-maker in London on at-the-money, implied volatility, the risk reversal and the strangle. The maturity of the options is constant and equal to one month.   [2] In thousands of contracts traded on the Tokyo Commodity Exchange in Japan and the Commodity Exchange in the United States.   [3] In US dollars per ounce.

Sources: JPMorgan Chase; Commodity Futures Trading Commission; BIS calculations.   Graph 4.5

Activity in energy derivatives declined in the fourth quarter from the hurricane-related peak in the summer. The largest drop in activity was recorded in Asian markets (−13%), followed by North American (−12%) and European exchanges (−4%). Lower trading activity may have been driven by a downward reassessment of growth in global oil demand. The quiescence in derivatives markets for oil may also indicate smaller incentives for speculation on a bearish futures market and decreasing hedging demands as volatility declined. Nevertheless, in the second half of December, the downward trend in derivatives activity for energy markets seems to have been reversed as oil prices and the risk premium on crude oil futures picked up.

Marc Klau

+41 61 280 8319
marc.klau@bis.org

San Sau Fung

+41 61 280 8536
sansau.fung@bis.org

The new BIS effective exchange rate indices[1]

The BIS effective exchange rate (EER) indices have been expanded and updated. The new indices cover 52 economies based on a consistent methodology, and reflect recent developments in global trade by using time-varying weighting patterns. The newly calculated indices have been made available to the public on the BIS website.

JEL classification: F10, F31.

An effective exchange rate (EER) provides a better indicator of the macroeconomic effects of exchange rates than any single bilateral rate. A nominal effective exchange rate (NEER) is an index of some weighted average of bilateral exchange rates. A real effective exchange rate (REER) is the NEER adjusted by some measure of relative prices or costs; changes in the REER thus take into account both nominal exchange rate developments and the inflation differential vis-à-vis trading partners. In both policy and market analysis, EERs serve various purposes: as a measure of international competitiveness, as components of monetary/financial conditions indices, as a gauge of the transmission of external shocks, as an intermediate target for monetary policy or as an operational target.[2] Therefore, accurate measures of EERs are essential for both policymakers and market participants.

Since 1993, the BIS has maintained EERs for 27 economies, both for research support for BIS publications and meetings of central banks, and for shorter-term analysis and market monitoring. The original weighting system of the EER indices was based solely on 1990 trade flows.[3] The rapid developments in the global trade arena over the last decade, however, have made it necessary to expand the coverage and review the trade weights. This special feature first describes the main points of the new BIS EER indices,

---

[1] The views expressed in this article are those of the authors and do not necessarily reflect those of the BIS. The authors are highly indebted to Stephan Arthur and Philippe Hainaut for their support. This article has benefited from comments by David Archer, Claudio Borio, Már Gudmundsson, Robert McCauley and Frank Packer.

[2] Singapore, for example, uses the EER as an operational target, where foreign exchange intervention is used to control the exchange rate; see MAS (2001).

[3] See the list in Appendix I. For a methodological explanation, see Turner and Van't dack (1993). Prior to 1993, the BIS calculated EER indices for the G10 countries based on a different methodology; see Koch (1984).

including the expansion of the coverage to 52 economies, the adoption of time-varying trade weights, and statistical adjustments for China's trade that take account of Hong Kong SAR's[4] significant role as an entrepôt for the mainland, as well as the partial reporting of trade between China and Taiwan, China[5] due to transhipment via Hong Kong. In the next section, the article examines the impact of these changes on the EER indices of a few selected currencies and compares the updated indices with the BIS's previous calculations, as well as with national calculations. The feature ends with a brief conclusion.

For the first time, the BIS will make the EER indices and the associated weights available to the public through its website on a regular basis (see www.bis.org/statistics/eer.htm).

Methodology

Weighting scheme and its limitations

The weighting scheme adopted is based on Turner and Van't dack (1993). The NEER is calculated as the geometric weighted average of a basket of bilateral exchange rates, and the REER is the NEER adjusted with the corresponding relative consumer prices.[6] The weights are derived from manufacturing trade flows[7] and capture both direct bilateral trade and third-market competition by *double-weighting* (see the box for details).[8]

The weighting scheme is trade-based and captures direct and third-market competition …

This trade-based weighting methodology has its theoretical underpinnings in Armington (1969), and implicitly assumes that there is only one type of good differentiated by country of origin, with a constant elasticity of substitution. Ideally, the weights are such that a change in cross rates has no effect on a country's key macroeconomic aggregates as long as the real effective exchange rate remains constant (Gudmundsson (forthcoming)). However, there are at least two reasons why the weights so derived are only an approximation of "ideal" EER weights.

First, given the high degree of international product differentiation, the elasticity of substitution between imports from different economies may vary. Therefore, fluctuations of different foreign currencies may not have the same

---

[4] Hereinafter referred to as Hong Kong.

[5] Hereinafter referred to as Taiwan.

[6] For a detailed discussion on the choice of deflator, see Chinn (2005).

[7] Manufactures are defined as goods under SITC (revision 3) classification 5 to 8. Trade data are obtained from the UN Commodity Trade Statistics Database (UN Comtrade), OECD International Trade by Commodity Statistics and the Directorate General of Budget, Accounting and Statistics, Taiwan.

[8] Note that this is not the only methodology for EER calculations. An alternative trade-based approach which is similar in essence but different in the arithmetic is used by the IMF and the Bank of England (see, for example, Bayoumi et al (2005) and Lynch and Whitaker (2004)). See also Appendix II for a comparison of the different methodologies.

An explanation of double-weighting[1]

This box sets out formally the double-weighting scheme used in the BIS EER calculation. Consider the EER basket of economy j, and the weight it puts on economy i. There are k foreign markets and h foreign producers. Economy j trades bilaterally with i; in addition, j's exports compete with i's exports and all other exports of h in k markets. Thus, to capture the impact of the relative exchange rate changes between i and j, the weights in an EER basket need to reflect import competition, direct export competition and third-market export competition. Algebraically, the weight of i (w_i) in the EER basket of j can be expressed as:

(1)　　　Import weight　　　$w_i^m = m_j^i / m_j$

(2)　　　Export weight　　　$w_i^x = \left(\dfrac{x_j^i}{x_j}\right)\left(\dfrac{y_i}{y_i + \sum_h x_h^i}\right) + \sum_{k \neq i}\left(\dfrac{x_j^k}{x_j}\right)\left(\dfrac{x_i^k}{y_k + \sum_h x_h^k}\right)$

(3)　　　Overall weight　　　$w_i = \left(\dfrac{m_j}{x_j + m_j}\right)w_i^m + \left(\dfrac{x_j}{x_j + m_j}\right)w_i^x$

where:　x_j^i (m_j^i)　= economy j's exports to (imports from) economy i

　　　　x_j (m_j)　= economy j's total exports (imports)

　　　　y_i　　　= home supply of domestic gross manufacturing output of economy i

　　　　$\sum_h x_h^i$　= sum of exports from h (excluding j) to i

The import weight (expression (1)) captures the competition among i and other exporters to j. The more dependent j is on imports from i, the stronger the effects of i's exchange rate variations are on j's economy and thus i should weigh more heavily in j's EER basket. In a sense, the import weight measures the *relative* importance among the different economies that j imports from, and this does not depend on the size of the domestic producers of j. Hence, the import weight takes the form of a simple bilateral share and y_j does not enter the equation.

The export weight (expression (2)) is "double-weighted" and can be decomposed into direct export competition and third-market competition. The first term on the right-hand side of the expression measures the direct competition between j's exports to i and the domestic manufactures in i's market. Unlike the import weight, which is a simple bilateral import share, the direct export weight is a bilateral export share multiplied by a measure of the openness of economy i. Intuitively, when i is an important market for j's exports (measured by x_j^i / x_j), and/or when i is relatively less open to trade (ie i supplies domestically a large proportion of manufactures – measured by $y_i / (y_i + \sum_h x_h^i)$, – and j's exports face stronger competition with i's domestic manufactures in i's market), then i should take more weight in j's EER basket.

The third-market competition is captured by the second term in the right-hand side of expression (2). Consider all other markets k in which i and j compete with each other: from j's perspective, if k is an important market for j's exports (measured by x_j^k / x_j), and/or if i's exports account for a large share of k's market (measured by $x_i^k / (y_k + \sum_h x_h^k)$), this would imply that i is a more important competitor to j in the third markets and as a consequence should weigh higher in j's EER basket.

The overall weight is then constructed by weighting the import and export weights with the relative size of total imports and exports in j's total trade (expression (3)).

_____

[1]　This box draws on Turner and Van't dack (1993).

impact on the variables of interest (eg relative demand or domestic prices) for given weights.[9]

Second, because of the one-good assumption, the weights derived with aggregated trade data disregard the varying elasticities of substitution between different types of goods, as well as the different price and income elasticities of demand for these goods. Hence, the BIS estimates of the EERs may not sufficiently capture the exchange rate effects on relative demand or prices for products differentiated by type. This may not be a major concern if the economies compete in terms of a similar mix of manufactures (eg among advanced economies), but would be questionable if the exports were not substitutes for each other (eg goods produced by advanced and emerging economies).

International vertical specialisation is a specific case where products of different origins are not necessarily competing. The most notable example of this is in East Asia, where the supply chain is such that certain countries (eg Japan or Korea) export high-tech components to other countries (mainly China) for assembly, and the final products are subsequently exported outside the region.[10] One should therefore be aware that trade weights ignoring vertical specialisation may be biased for certain purposes in at least the following ways. First, weights derived from gross value trade data do not necessarily reflect the value added from different origins at the different stages of production, nor do they consider the ultimate location of the demand for the intermediate goods. Hence, the relative importance of different trading partners may be misassigned in some EER baskets. Second, for economies at the end of the production chain, some imports (components) and exports (final goods) become complements. The response of imports and exports to exchange rate changes would be different from that traditionally analysed.[11] Third, vertical specialisation may further vary the elasticities of substitution between goods (especially labour-intensive manufactures) from different origins.

Another limitation of the methodology is that trade in commercial services has been ignored. Like manufactures, services from different economies are differentiated and competing, and an effective exchange rate index that also includes services trade would better gauge overall competitiveness, particularly for small and open economies. However, the availability of bilateral services trade statistics is limited, so that it is difficult to account consistently for

---

[9] See Spilimbergo and Vamvakidis (2000).

[10] An adjustment for vertical specialisation is almost impossible because standard trade data are recorded in gross value rather than value added terms. Even if trade data with a detailed breakdown by product are available (thereby enabling the distinction between components and final manufactured goods on aggregate), it is impossible to single out what proportion of the final products to a *particular* destination contains the components from which *particular* origin.

[11] That is, in general, an appreciation of the local currency does not necessarily lead to a decrease in exports and an increase in imports.

services trade across all economies.[12] As a result, the BIS indices only consider manufacturing trade. A few organisations have included some simplified form of services trade in calculating the EER weights. For example, the Bank of England utilises the bilateral services trade data from the UK Office for National Statistics (Lynch and Whitaker (2004)). The IMF includes trade in services by assuming that it is geographically distributed in exactly the same manner as that in manufactured goods,[13] and for some economies also includes tourism services (Bayoumi et al (2005)). The Reserve Bank of New Zealand's TWI (trade-weighted index) weights the selected currencies partly by their trade shares and partly by their GDP, the latter designed to pick up some trade in services and intangibles (Hargreaves and White (1999)). The Hong Kong Monetary Authority calculates a measure of the REER based solely on services trade (Ha and Fan (2003)).

For the reasons above, effective exchange rates should not be taken as a sufficient summary statistic of competitiveness. A full assessment of the macroeconomic effects would in principle call for a disaggregated international macroeconomic model that takes into account at least all the caveats mentioned.[14] The limitations of the measure notwithstanding, trade weight-based measures of EERs still serve as useful indicators.

Basket expansion

New BIS EER basket is expanded ...

The new BIS EER basket has been broadened to include 52 economies, to reflect the rising importance of the emerging market economies in Asia, central and eastern Europe and Latin America (see the list in Appendix I). Based on this basket, the EER indices ("broad indices") for all 52 economies are now calculated using a consistent methodology. In addition, as a result of the basket expansion, the representativeness of the existing indices is much improved and the 52 economies account for 93% of total world trade in 2004.

... with broad and narrow indices available

The broad indices are available from 1994; prior to that date, some exchange rate, price and/or trade data were limited, and some of the current countries in the sample did not exist. The existing EER indices for 27 economies, based on a reduced basket, will be maintained. The indices are referred to as "narrow indices" and are available from 1964.[15]

---

[12] The OECD publishes statistics on trade in services for 28 economies (27 OECD member countries and Hong Kong) from 1999. However, the geographical coverage is not as extensive as for merchandise trade.

[13] This considers only the aggregate extent of services trade relative to total trade for each economy, rather than using actual bilateral services trade flows.

[14] The Multilateral Exchange Rate Model (MERM) of the IMF was an attempt to do this, but the MERM index has not been published since 1992.

[15] It is common practice for some central banks to make different sets of EER indices available. For example, the Federal Reserve publishes three series of EERs of the US dollar – the broad index (with a basket of 26 economies), the major index (with a basket of seven major currencies – the euro, Canadian dollar, yen, pound sterling, Swiss franc, Australian dollar and Swedish krona) and the other important trading partners (OITP) index (with a basket of the residual 19 currencies not in the major index). The ECB computes the so-called EER-12, EER-23 and EER-42, the number suffix corresponding to the size of the basket. The Bank of

There are three specific issues concerning the treatment of the euro area. First, for both the broad and the narrow baskets, a set of EER indices for the euro area as a single entity is calculated, and they can be used as indicators (eg on competitiveness) for the euro area as a whole.[16] Second, the euro area is taken as an entity in computing the EER indices for other economies, and intra-euro area competition is ignored. Third, a set of EER indices for each euro area country is also individually available; these indices do, however, take intra-euro area competition into account.

Treatment of the euro area

Although the broad basket is more representative than the narrow one, neither should be regarded as the "better" measure, and which one to study depends on the context. The narrow indices may better gauge the competitiveness among advanced countries (for example, if their products have similar elasticities of substitution, as discussed in the previous subsection).[17] The broad indices, on the other hand, give a more global picture by taking the emerging market economies into account. As a result, they would be more useful in analyses of issues such as the sustainability of the external trade balances.

Different purposes of broad and narrow indices

Another consideration in the construction of the baskets is that some countries may have experienced episodes of extremely high inflation. The sharp depreciation associated with their currencies, were they to be included in the basket, would dominate the short-term movements of the *nominal* EERs of other currencies and make such movements too erratic for assessments of competitiveness. The effects on the index could be significant even if the weights of these high-inflation countries are small. To partially account for this, Mexico is excluded from the calculation of the *narrow nominal* EERs. In addition, the broad indices start from 1994, when the episodes of very high inflation for countries like Brazil and Turkey were coming to their end.

Accounting for currencies of high-inflation countries

Time-varying weights

To accommodate the rapidly changing trade patterns (notably the emergence of some Asian and Latin American economies over the last decade) and to better represent the corresponding effects of exchange rate changes, we adopt time-varying weights in the new EER calculations. More specifically, for the broad indices, we assign the three-year average trade weights of 1993–95, 1996–98, 1999–2001 and 2002–04 to the corresponding periods, and then construct "chain-linked" indices. This last set of weights is also used to calculate EERs for the latest period until the next set of three-year trade data (ie 2005–07) becomes fully available, when the indices will be revised with their

Use of time-varying weights ...

England maintains a Sterling ERI (exchange rate index) and a Broad ERI with a basket of 15 and 24 currencies respectively in 2003 (see Appendix II for further details).

[16] A "theoretical" euro exchange rate based on a weighted average of the legacy currencies is used as a proxy for the euro prior to 1999. See Buldorini et al (2002).

[17] Spilimbergo and Vamvakidis (2000) estimate the manufacturing export equations for 56 countries for a period of 26 years, and find that on average the explanatory power can be significantly improved by using partitioned REERs (grouped by OECD and non-OECD countries), instead of standard REERs, as explanatory variables.

corresponding weights.[18] Consistent with the broad indices, we have also implemented time-varying weights starting from 1990 on the narrow indices, based on three-year averaging. However, the 1990–92 weights remain in place prior to 1990.[19]

One benefit of using time-varying weights rather than a static updating of the base period is that this procedure not only incorporates recent changes in trade patterns, but also better reflects the contemporaneous situation over all past periods. The resulting indices give a more accurate picture of medium- to long-term exchange rate movements by taking into account the varying importance of different trading partners at different times.[20] Moreover, the use of a three-year average smooths out potentially aberrant year-to-year variations in trade. Some central banks (eg the Federal Reserve and the Bank of England) and international organisations (eg the OECD) have similarly implemented time-varying weights in their EER calculations, with weights usually updated yearly.

Trade data adjustment related to China and Hong Kong

A substantial portion of China's external trade takes place in the form of re-exports via Hong Kong, and official trade statistics of China and its trading partners do not consistently take this into account.[21, 22] Relative to "genuine" (ie domestic demand/supply driven) trade flows, trade weights derived without a correction would assign an incorrect relative importance to China and to Hong Kong in the baskets of all currencies. More precisely, in an unadjusted Chinese renminbi EER basket, Hong Kong would be overweighted and all other trading partners underweighted; in an unadjusted Hong Kong dollar EER basket, China would be overweighted and all others underweighted. In addition, for all other EER baskets in general, China would be underweighted and Hong Kong would be overweighted. As a consequence, the EERs so calculated would be a less powerful indicator of the macroeconomic effects of exchange rate changes, as they would not necessarily reflect the ultimate demand driving these trade flows. Aside from the EERs of the renminbi and the

---

[18] See Appendix I for the most recent set of weights used in the calculation of the broad indices.

[19] This is in part due to the limited availability of consistent trade data, but also in consideration of the view that the loss of accuracy was unlikely to be significant (trade patterns evolved relatively slowly at that time).

[20] However, a statistical drawback of chain-linked EER indices is that any changes in the weighting pattern would permanently affect the levels of the indices, even when the exchange rates and the weights revert to their initial levels.

[21] Re-exports are defined as "foreign goods exported in the same state as previously imported … directly to the rest of the world" (United Nations (1998)). In 2004, Hong Kong's merchandise re-exports to and from China amounted to US$ 109 billion and US$ 146 billion respectively. Even allowing for the re-export markup, these trade flows are significant relative to China's total imports of US$ 561 billion and exports of US$ 593 billion in the same year.

[22] Similar concerns can also be posed for Singapore, which serves as an entrepôt for Malaysia and Indonesia. The lack of bilateral re-export data, however, prevents us from carrying out a parallel adjustment. This is also partly justified by the fact that Singapore's merchandise re-export trade is of a smaller scale than that of Hong Kong.

Hong Kong dollar, a misassignment of weights is not a concern for other currencies as long as both the renminbi and Hong Kong dollar move in parallel. But it would matter were the renminbi and the Hong Kong dollar to diverge significantly from each other; the likelihood of this has increased since the Chinese authorities adopted the new exchange rate regime in July 2005.

Detailed bilateral re-export data enable us to correct for the role of Hong Kong as an entrepôt of mainland China.[23] In calculating the EER basket weights, the portion of trade between China and a third economy via Hong Kong, which is often recorded as trade with Hong Kong by raw trade statistics, is assigned back to the appropriate economies. This is feasible since re-export data for Hong Kong are available with a breakdown by *both* the origin and the final destination. Correspondingly, the Hong Kong dollar EER weights relate only to Hong Kong's domestic exports (ie local manufactures) and retained imports (ie imports for domestic consumption).

... has been adjusted using available statistics ...

Certain issues deserve attention in the adjustment procedure. First, Hong Kong traders often apply a pure markup (without the value added associated with labour or capital) to the goods they re-export. This has been corrected using survey data of the average re-export markup.[24] Second, some trade between China and Taiwan takes place in the form of transhipment via Hong Kong, and this is reported by neither economy's official trade statistics.[25] An estimate of cross-strait trade is available,[26] and without any other alternative we take this as an implementable measure.

... with special attention to re-export markup and transhipment

With these adjustments, the resulting EERs for China and Hong Kong, and potentially for other currencies, are more representative of the final trade patterns and hence of the competitiveness of the corresponding economies. Looking ahead, though, the role of Hong Kong as an entrepôt of the mainland could diminish considerably, given the rapid development of Chinese ports around Shanghai and Shenzhen. This would also tend to reduce the significance of the adjustment.

Comparison of EER indices[27]

What is the impact of the above methodological refinements on the EER indices? We illustrate this with the recent evolution in the NEERs of the US

Impact of refinement on:

---

[23] Fung et al (forthcoming) give a systematic account of the adjustment procedures and their implications. Re-export data are available in *Annual Review of Hong Kong External Merchandise Trade*, published by the Hong Kong Census and Statistics Department.

[24] A survey on average re-export margin (with goods originating from China and from the rest of the world) is conducted annually by the Hong Kong Census and Statistics Department, and the data were obtained directly from the Department.

[25] The difference between re-export and transhipment is that the latter is not cleared by the customs and does not normally involve a change in the ownership of the goods. Transhipment may explain the discrepancy of trade statistics between China and Taiwan.

[26] Published in *Cross-Strait Economic Statistics Monthly*, Mainland Affairs Council, Taiwan.

[27] See Appendix III for a graphical illustration of the new REERs of all 52 economies.

dollar, euro and yen, and by comparing the different series with the respective official calculations. In addition, in order to assess the effect of adjustment for entrepôt trade related to China, we also look at the renminbi indices.

NEERs for the US dollar, euro and yen

The BIS broad indices for the dollar, euro and yen closely track the corresponding official series of the US Federal Reserve, the ECB and the Bank of Japan respectively, while the narrow and the old indices seem to show more divergence (Graph 1). For these currencies, much of the difference between the old and new series can be explained by the expansion in the basket, although the updating of trade weights also has some effect.

US dollar ...

Looking at the US dollar over the period early 2002 to end-2004, the nominal depreciation implied by the broad index is around 10 percentage points smaller than that implied by the old index (Graph 1, left-hand panel). This is due to the enlargement of the EER basket (eg the inclusion of China and other emerging economies)[28] and, conditional on the original basket, the updated weights (eg the decreased weight on Japan). Since most non-Japan Asian currencies showed limited appreciation vis-à-vis the US dollar during this period, an increase in their weights in the broad dollar index would imply a smaller effective depreciation of the dollar.

... euro ...

Similarly, the differences between the broad and narrow measures of the euro (Graph 1, centre panel) can be explained by the inclusion of China in the broad basket. With the renminbi closely linked to the US dollar, the euro indices that put a higher weight on China would imply a bigger nominal effective appreciation of the euro.

Nominal effective exchange rates of the US dollar, euro and yen (1999–2005)[1]

Monthly averages; 2000 = 100

[1] The euro area is treated as a single entity.

Sources: ECB; Bank of Japan (BOJ); Board of Governors of the Federal Reserve System; BIS.   Graph 1
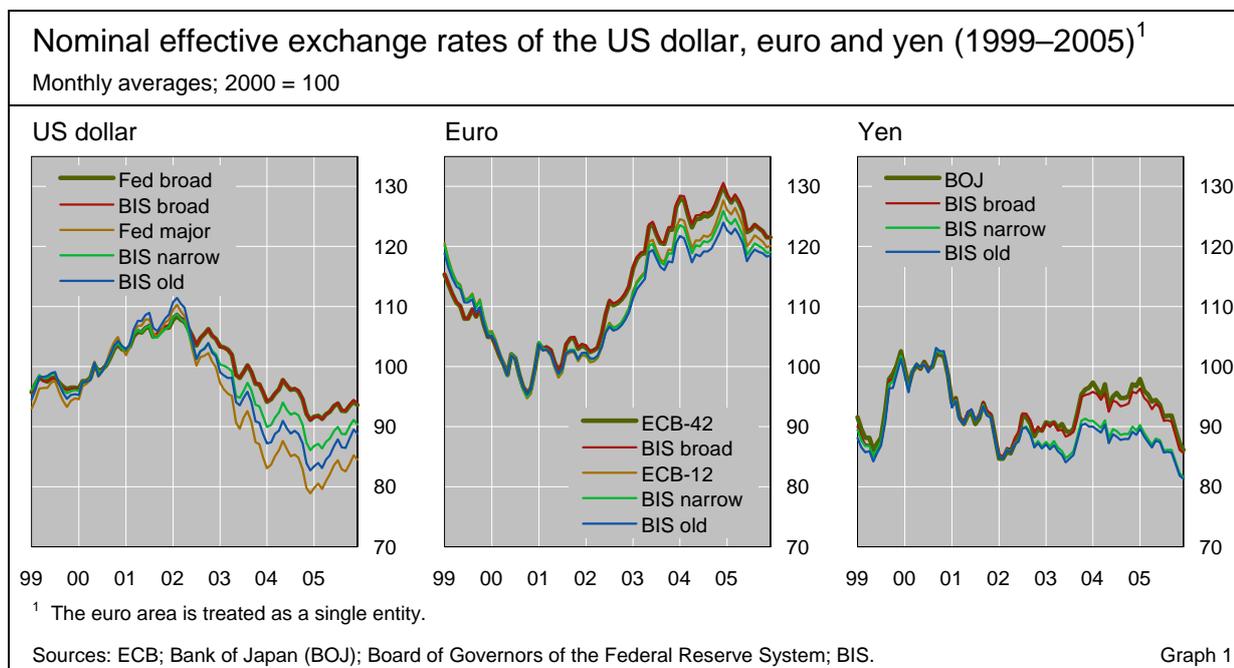
[28] In 2004, China alone accounted for more than 10% of the United States' total trade.

The impact of the refinements is also quite evident for the yen (Graph 1, right-hand panel). This is not surprising given the sustained growth of intraregional trade in Asia. For instance, from early 2002 to end-2004, the nominal appreciation of the yen measured by the new broad BIS index is 6.5 percentage points higher than that measured by the old index. This difference can once again be explained by the emergence of Asian trading partners, as their currencies add a bigger "dollar bloc" weight to the yen basket. Since, over the period discussed, the yen appreciated against the dollar and depreciated against the euro, a bigger dollar bloc in the yen basket effectively implies a greater appreciation of the yen, and the behaviour of the Bank of Japan index seems to confirm this conclusion.[29]

... and yen

Trade data adjustment and the Chinese renminbi

The effect of the adjustment concerning China's re-exports is not apparent in the EER indices of the currencies just discussed, for reasons explained in the methodology section. However, the adjustment does have a noticeable impact on the renminbi and Hong Kong dollar EER indices, and we illustrate this with the former.

Impact of trade data adjustment on renminbi

Consider the adjusted renminbi EER basket. With a redistribution of weights from Hong Kong to China's other Asian trading partners (particularly Japan and Taiwan), the dollar bloc in the renminbi basket (largely associated with the HKD/USD peg) now decreases. This implies that, with the renminbi and US dollar remaining closely linked, the adjusted renminbi EER indices show more sensitivity to any movements in non-US dollar currencies, as can be seen in Graph 2.

Effective exchange rates of the renminbi[1]
2000 = 100

[1] Broad basket. [2] Nominal effective exchange rates deflated by relative consumer prices.

Source: BIS.   Graph 2

---
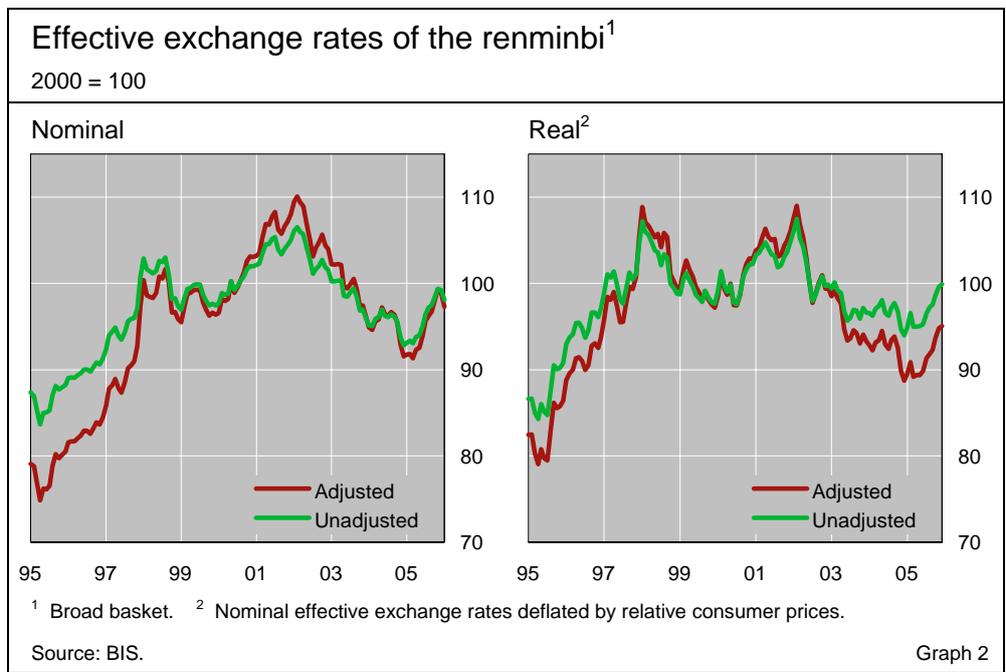
[29] It should, however, be noted that the Bank of Japan EERs use only bilateral export weights.

The adjustment has implications for macroeconomic analysis. For example, as calculated by the improved measures, the deflationary shock to China during the Asian crisis is shown to be much sharper, owing to the heavier weights on many depreciating Asian currencies and, correspondingly, a lighter weight on the Hong Kong dollar. Thus, the renminbi appreciated much more in effective terms than would have been measured otherwise (Graph 2, left-hand panel).

Conclusion

International trade patterns have changed dramatically over the last decade, in both scale and geographical distribution. To better incorporate these developments, the BIS has updated its effective exchange rate indices. In particular, it has expanded the country coverage, and followed the increasingly common practice of allowing for time-varying weights. Moreover, in consideration of China's growing significance in global trade, it has also made special adjustments in EER measures to account for the mainland's indirect trade with the rest of the world via Hong Kong. The new weights better represent trade flows, and should improve the usefulness of the BIS effective exchange rate indices as reliable indicators of exchange rate movements and their impact.

References

Armington, P S (1969): "A theory of demand for products distinguished by place of production", *IMF Staff Papers*, vol 6, pp 159–78.

Bank of Japan (2005): "Explanation of the effective exchange rate (nominal, real)", Research and Statistics Department, January.

Bayoumi, T, J Lee and S Jayanthi (2005): "New rates from new weights", *IMF Working Paper* WP/05/99, May.

Buldorini, L, S Makrydakis and C Thimann (2002): "The effective exchange rates of the euro", *European Central Bank Occasional Paper Series* no 2, February.

Chinn, M (2005): "A primer on real effective exchange rates: determinants, overvaluation, trade flows and competitive devaluation", *NBER Working Paper* no 11521, August.

Durand M, J Simon and C Webb (1992): "OECD's indicators of international trade and competitiveness", *OECD Economics Department Working Papers* No 120, Paris.

European Central Bank (2004): "The update of the euro effective exchange rate indices", September.

Fung, S S, M Klau, G Ma and R McCauley: "Effective exchange rates in Asia with entrepôt and growing intraregional trade", forthcoming.

Gudmundsson, M: "The role of the effective exchange rate in monetary frameworks: options, operations and effects", forthcoming.

Ha, J and K Fan (2003): "Alternative measures of the real effective exchange rate", *Hong Kong Monetary Authority Quarterly Bulletin*, March, pp 16–21.

Koch, E (1984): "The measurement of effective exchange rates", *BIS Working Papers*, no 10, September.

Hargreaves, D and B White (1999): "Measures of New Zealand's effective exchange rate", *Reserve Bank of New Zealand Bulletin*, vol 62.

Loretan, M (2005): "Indexes of the foreign exchange value of the dollar", *Federal Reserve Bulletin*, Winter.

Lynch, B and S Whitaker (2004): "The new sterling ERI", *Bank of England Quarterly Bulletin*, Winter.

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

OECD (2005): *Main Economic Indicators*, September.

Spilimbergo, A and A Vamvakidis (2000): "Real effective exchange rate and the constant elasticity of substitution assumption", *IMF Working Paper* no 128, July, Washington DC.

Turner, P and J Van't dack (1993): "Measuring international price and cost competitiveness", *BIS Economic Papers*, no 39, Basel, November.

United Nations (1998): "International merchandise trade statistics – concepts and definitions", *Statistics Division*, Series M, no 52, rev 2.

Appendix I: EER weights for broad indices (based on 2002–04 trade, in per cent)

Weight on: in the EER for:	United States	Euro area	Japan	Other industrial countries	Emerging Asia	Central and eastern Europe	Latin America and others
Industrial countries							
Australia*	17.4	17.8	14.2	13.2	33.8	1.0	2.5
Canada*	62.4	8.5	5.1	4.1	13.6	0.9	5.5
Denmark*	6.6	46.2	3.0	24.6	11.0	7.3	1.3
Iceland	10.8	40.4	4.7	27.3	9.7	6.1	1.1
Japan*	22.5	16.2	.	9.6	45.9	2.4	3.5
New Zealand*	14.7	15.6	14.6	27.1	25.5	0.8	1.8
Norway*	7.8	38.2	4.8	28.4	12.3	7.2	1.3
Sweden*	9.6	43.8	4.2	21.5	10.6	8.1	2.1
Switzerland*	10.2	55.9	5.0	10.0	10.6	5.7	2.6
United Kingdom*	13.6	48.9	5.1	8.8	14.6	6.1	2.8
United States*	.	18.5	11.9	23.2	29.4	2.2	14.8
Euro area*	17.5	.	8.0	29.6	22.7	17.8	4.5
Austria*	6.7	56.7	3.4	11.1	8.4	12.5	1.3
Belgium*	8.6	55.1	4.0	14.2	10.0	5.4	2.6
Finland*	8.3	37.8	5.2	21.6	13.0	12.2	1.9
France*	9.7	50.4	4.5	14.5	12.0	6.7	2.2
Germany*	10.9	38.1	5.2	16.3	14.0	13.0	2.6
Greece*	6.4	54.0	4.5	10.7	13.8	9.3	1.4
Ireland*	19.1	33.5	5.4	23.9	12.5	3.4	2.3
Italy*	8.3	49.6	4.0	13.4	11.7	10.2	2.6
Netherlands*	10.0	46.5	4.3	15.3	15.6	6.3	1.9
Portugal*	4.7	69.8	2.5	11.3	5.9	4.0	1.7
Spain*	5.8	59.6	3.6	12.7	10.1	5.6	2.5
Emerging Asia							
China	18.5	16.2	17.4	8.7	31.7	4.2	3.4
Hong Kong SAR*	13.9	12.8	13.8	8.8	46.0	1.9	2.9
India	16.9	26.6	7.2	13.7	27.5	4.1	4.0
Indonesia	14.9	15.9	18.8	9.4	36.6	2.2	2.3
Korea*	18.4	14.9	19.2	7.8	33.6	2.9	3.3
Malaysia	20.4	12.5	16.5	7.3	39.5	1.6	2.3
Philippines	22.3	11.6	21.7	6.2	34.4	1.8	2.0
Singapore*	16.6	13.4	14.3	7.8	44.6	1.5	1.9
Taiwan, China*	15.7	12.1	18.3	6.6	42.1	2.4	2.8
Thailand	14.4	13.0	22.6	7.9	37.5	2.0	2.6
Central and eastern Europe							
Bulgaria	5.1	55.5	2.5	9.5	8.7	17.5	1.1
Croatia	4.4	57.4	2.5	8.3	8.9	17.6	0.9
Czech Republic	5.4	55.0	3.4	10.7	11.1	13.3	1.1
Estonia	4.4	43.9	4.4	19.0	10.0	17.6	0.8
Hungary	5.8	54.0	4.1	10.6	13.1	11.3	1.3
Latvia	3.5	43.2	1.0	19.6	4.9	27.2	0.6
Lithuania	3.6	44.4	1.9	16.9	7.3	25.3	0.6
Poland	4.8	55.2	2.8	13.8	10.1	12.3	1.1
Romania	5.1	56.4	2.6	10.6	10.1	13.9	1.3
Russia	8.9	37.6	7.0	11.0	22.6	11.1	1.9
Slovakia	5.2	52.5	3.1	9.0	8.7	20.7	0.9
Slovenia	4.8	58.8	2.2	9.1	7.5	16.4	1.1
Turkey	7.9	48.2	4.1	13.6	14.2	9.7	2.4
Latin America and others							
Argentina	19.5	17.3	5.8	6.2	12.6	1.7	37.0
Brazil	28.3	23.0	6.7	9.5	16.0	2.6	13.9
Chile	20.3	22.1	6.5	8.3	21.3	2.0	19.6
Mexico*	61.1	9.0	5.3	6.8	14.6	0.7	2.6
Israel	25.7	30.6	5.1	14.5	15.8	5.7	2.6
South Africa	14.5	33.0	9.3	16.8	20.8	2.8	2.9

Note: Economies included in the narrow indices are indicated by asterisks; the corresponding EER weights are not shown in this table.

Source: BIS.

	BIS	**IMF**	**OECD**
Available currencies/ economies	51 (including 11 euro area countries), plus a separate set for the euro area	Industrial System method: 164 (plus a separate set for the euro area) Global System method: 16 Others: 4	30 OECD countries; 7 dynamic Asian economies and 5 major emerging market countries, plus European Union (15) and euro area
Weighting scheme	Weighted average of import and double export weights. Export weights account for the relative importance of direct export competition and third-market competition	Takes into account commodity weights, manufacturing weights (with third-market effects) and, for some countries, tourism services weights; weighted by their relative importance in each country's total trade	Double-weighting; accounts for third-market competition
Underlying trade flow	Manufactured goods (SITC 5-8)	Commodities, manufactures, and for some countries tourism services trade; other services trade assumed to be distributed in the same manner as manufactured trade	Manufactured goods
Basket size[1]	Broad index: 51 Narrow index: 26	184 countries	46 countries
Base period for weights	Updated every three years; chain-linked	Updated discretely, fixed (most recent: 1999–2001)	Updated yearly; chain-linked
Deflator for REER	Consumer prices (except wholesale prices for India)	Consumer prices; for some currencies also unit labour costs and normalised unit labour costs	Consumer prices

	ECB	**Bank of England**	**Federal Reserve Board**
Available currencies/ economies	Euro	Sterling, plus 10 non-sterling currencies (using IMF weights)	US dollar
Weighting scheme	Weighted average of import and double export weights. Export weights account for the relative importance of direct export competition and third-market competition	Takes into account import, bilateral export and third-market competition; weighted by their relative importance in the UK's total trade; location of competition weights are fixed across all countries	Simple average of import and export weights, with export weights being the average of direct export competition and third-market competition shares
Underlying trade flow	Manufactured goods (SITC 5–8)	Manufactured goods and services	*Imports* – total imports excluding oil *Exports* – total exports excluding gold and military items (but includes agricultural exports from 2002)
Basket size[2]	EER-12 EER-23 EER-42	ERI:[3] 15 Broad ERI: 24	Broad Index: 26 Major Currency Index: 7 OITP:[4] 19
Base period for weights	Updated discretely; time-varying (1995–97; 1999–2001)	Updated yearly; chain-linked	Updated yearly; chain-linked
Deflator for REER	CPI, PPI, ULC in manufacturing, GDP deflator and ULC in total economy (harmonised; for EER-12 and EER-23) CPI (EER-42)	Consumer prices	Consumer prices

[1] Counting individual euro area countries.   [2] Counting the euro area as an entity.   [3] Exchange rate index. To be included in the ERI, the partner country must account for 1% of either UK imports or exports; the threshold for the broad ERI is 0.5%. Thus the currency basket may change every year.   [4] Other important trading partners.

Sources: Bayoumi et al (2005); ECB (2004); Loretan (2005); Lynch and Whitaker (2004); OECD (2005); BIS.

Appendix III: Real effective exchange rates (broad indices; quarterly averages, 2000 = 100)

Note: In terms of relative consumer prices; an increase indicates an appreciation. Reduced scale for the bottom panels.   Graph 3

Allen Frankel

+41 61 280 9457
allen.frankel@bis.org
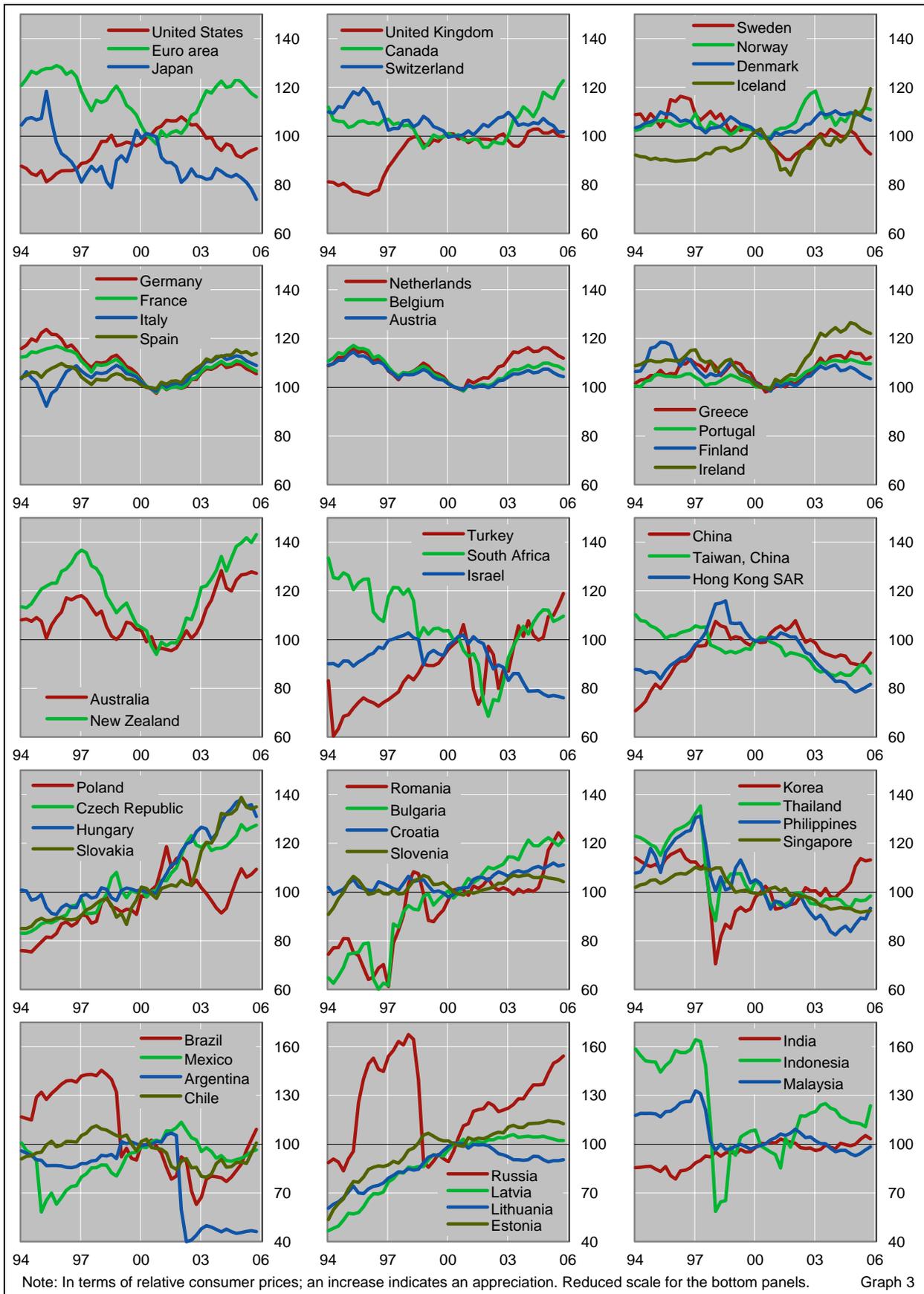
Prime or not so prime? An exploration of US housing finance in the new century[1]

Significant US house price appreciation in the last few years has greatly helped to enlarge the size and scope of secondary markets for securities backed by non-prime mortgage loans. But while many households now have access to loans which otherwise might not have been available, were housing market conditions to worsen, investors would face new issues in the valuation of mortgage-backed securities and possibly unanticipated risks.

JEL classification: G180, G280, L890.

The system of US housing finance has changed profoundly in recent years. Despite the dominant role of the government-sponsored housing finance agencies, non-agency mortgage underwriters account for a steadily increasing share of US housing finance. While the agencies specialise in the underwriting of mortgage loans to prime households, growth in non-agency lending has been to non-prime borrowers. This implies lending not only to borrowers with somewhat blemished credit histories, but also to those unable or unwilling to either finance required down payments with own funds or document their sources of income.

The securitisation of non-prime housing loans represents a significant change for one of the biggest and most important financial markets in the world. Most US residential mortgages are packaged and resold in mortgage-backed securities (MBSs), and foreign investment in these securities has soared. As with the restructuring of mortgages and the secondary sale by the housing finance agencies of pass-through securities, non-prime loans have also come to be routinely incorporated into pass-through securities via a similarly structured process. However, in contrast to agency-backed securities, which are exposed to prepayment risk but protected against loan defaults by guarantees, investment in non-agency securities involves exposure to both prepayment *and* default risk. In this article, we argue that the significance of this additional risk has been disguised in recent years by housing price

---

[1]   The views expressed in this article are those of the author and do not necessarily reflect those of the BIS.

appreciation. In consequence, a turn in the housing market might remind holders of these securities of some of their downside risk characteristics.

The remainder of this special feature is structured as follows. The next section presents a broad overview of recent developments in MBS markets. The section which follows focuses on innovations in mortgage contracts, the employment of credit scoring measures to calibrate default risk, and new challenges in forecasting prepayments. We finish with some brief concluding remarks.

Recent developments

Mortgage-backed securities are now well established as one of the largest and most significant financial markets in the world, as well as the most prevalent form of securitisation. More than half of all US residential mortgages are incorporated in MBSs.[2] Since the mid-1990s, the share of MBSs in US bond markets has surged to nearly one third of the total outstanding and has remained at a high level (Graph 1, left-hand panel). The market has also become more global: the stock of foreign investment in US mortgage securities has increased more than fourfold since 1990, to nearly $1 trillion. Although much of this foreign investment is accounted for by holdings of agency-issued straight debt securities, recent survey data suggest that foreign investors have assumed sizeable stakes in MBS investments as well.[3]

The MBS market has grown markedly …

MBSs outstanding and MBS issuance

[1] Amount outstanding in the US universal bond index of Lehman Brothers, in trillions of US dollars.   [2] As a share of the total amount outstanding of bonds in the Lehman US measure of all US bonds outstanding, in per cent.   [3] In trillions of US dollars.

Sources: Lehman Brothers; UBS, based on data compiled by LoanPerformance.   Graph 1

---
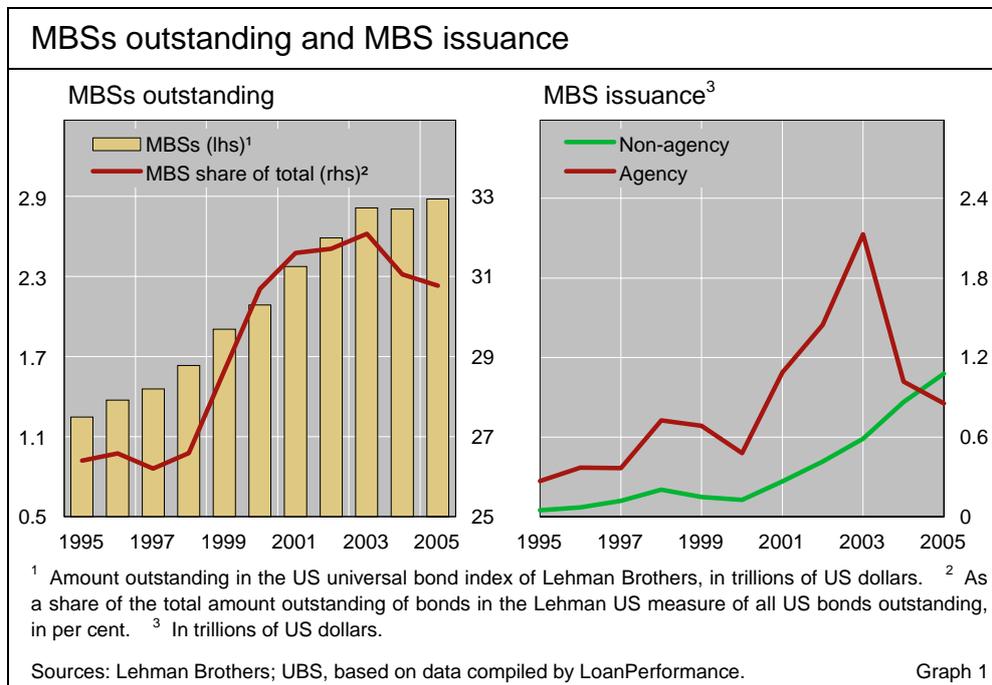
[2]   This includes MBSs held in own portfolios by Fannie Mae and Freddie Mac; see Office of Federal Housing Enterprise Oversight (OFHEO) (2005).

[3]   A recurring survey of central banks conducted by UBS found that 40% of central banks listed MBSs in 2005 as an approved class for their investments as compared to only 2% in 1998; see UBS (2006a). However, the absence of detail in existing data sources means that we

Non-agency MBS issuance by market segment

As a percentage of total[1]
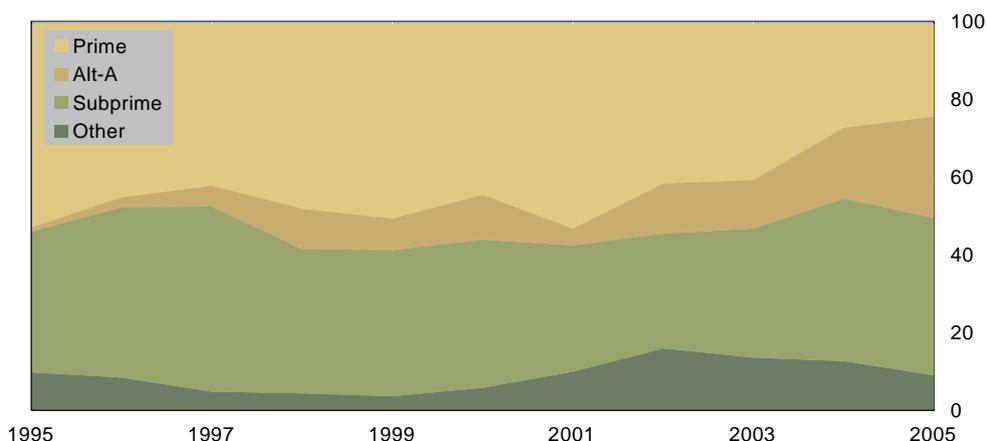
Note: For the definition of the various market segments, see footnote 4 in the main text.

[1] First half of 2005.

Source: UBS, based on data compiled by LoanPerformance.   Graph 2

… while the share of non-agency MBS issuance has surged

The MBS market has also undergone a major structural change. Annual non-agency MBS issuance has not only nearly doubled to more than $1 trillion in the past few years, but on a relative basis it has moved from less than a quarter to more than half of total MBS issuance (Graph 1, right-hand panel). This increase in non-agency issuance has coincided with an increase in mortgage loans to households not classified as prime; such loans accounted for less than 50% of all non-agency issuance in 2001, but for more than three quarters thereof in 2005 (Graph 2).[4] Of the categories below prime, the segment that has shown the greatest growth in recent years is the Alt-A segment, or loans to borrowers which have prime borrower-like credit histories but do not meet another agency classification for prime status, such as income documentation or property type. Thus the Alt-A market gives a number of households with good credit histories access to mortgages which otherwise would be unavailable. Expectations of rising house prices have probably played an important role in the increased share of this segment, and non-agency mortgage origination more generally, as will be explored in the next section.

Automation has facilitated the screening of mortgages

Technology has been an important factor in facilitating securitisation. Household mortgage loan applications are now much more likely to be assessed by an automated process that employs credit histories captured by

have no basis on which to assess the size of foreign investor exposure to credit risk through the purchase of non-agency MBSs.

[4] Prime non-agency loans involve lending that would meet agency underwriting requirements except for the fact that the loan amounts exceed a government-set ceiling on individual agency-underwritten loans (currently $417,000 for single family homes in the continental United States). Alt-A loans are loans to borrowers which usually meet the agency requirements with regard to credit score but do not meet one or more of the other agency requirements for loan-to-value ratios, income documentation, property type, etc. Subprime loans are loans to borrowers with blemished credit histories. The subprime sector generally does not include second mortgages such as home equity loans, which are part of the other category in Graph 2. For a more detailed discussion of some of these market segments, see Heike and Mago (2005) and Pennington-Cross (2002).

Mortgage defaults and credit scores[1]

[1] The graph employs a validated sample of mortgages originated between 1995 and 2001. The loans are divided into 20 percentile groupings, from the 5% with the highest credit scores (low risk) to the 5% with the lowest credit scores (high risk). The graph shows the default rate (normalised) for the risk groupings.
[2] The normalised default rate is the ratio of the default rate for the percentile subsample to the default rate for the entire sample of loans.

Source: Zorn (2005).   Graph 3

national credit data repositories, distilled by a credit score, often called a FICO score.[5] Statistical evidence confirms that lower credit scores are systematically associated with a higher probability of default on mortgage loans (Graph 3). The use of these scores for the pricing of non-agency mortgages has become standard: information that in the past might have been acquired by virtue of an ongoing banking relationship is now often summarised in a credit score. This in turn has probably increased the economies of scale in mortgage origination: indeed, the market share of the top 25 mortgage originators has increased from 30% in 1990 to more than 80% today (OFHEO (2005)).

Credit scores have done fairly well in predicting mortgage defaults

There have also been innovations in the organisational structure of mortgage providers that encourage the growth of the market by facilitating the transfer of risk from MBS originators. A large share of non-agency mortgage loans is originated by specialised financial firms, many of which have been organised as real estate investment trusts (REITs), effectively open-end equity funds. In fact, the capacity of most non-agency mortgage originators to respond to market demand has been encouraged by innovations permitting the better structuring and management of their equity capital positions. The box on page 71 discusses one securitisation technique of relatively recent vintage, the issuance of net interest margin securities (NIMS), that has been employed by non-agency mortgage securities issuers to reduce their residual exposures and economise on costly equity capital.

Innovative financial structures for mortgage providers

---

[5]   The acronym FICO is derived from "Fair Issac & Co". This firm is a producer of statistical models. Other companies are the actual compilers of credit history files. FICO scores rank the relative risk of consumers defaulting or becoming seriously delinquent.

Net interest margin securities (NIMS)

A typical subprime mortgage securitisation is collateralised by loans carrying interest rates well in excess of those paid to debt securities investors. Excess spread not paid out to senior creditors to cover loan losses is paid to the investor in the equity tranche, the investor frequently being the firm that originated the mortgage loans and issued the mortgage-collateralised securities. It has become standard for an MBS issuer to securitise its own residual interests in deals through the issuance of net interest margin securities (NIMS).

Figure A sets out the structure of mortgage loan securitisations that incorporate NIMS; Figure B sets out the cash flows involved. The charts are simplifications: mortgage-related securities structures can have multiple layers, and NIMS structures can also be layered in multiple tranches. NIMS are typically bought by specialist investors in private placement transactions. The prevalence of the private placement format is fully consistent with the idiosyncratic nature of individual NIMS issues.

The earliest NIMS transactions in the mid-1990s (manufactured housing securitisations) performed poorly. Many of the deals had structural elements that paid at a slower rate than had been anticipated. Lessons were learned from the modelling mistakes made in early deals. Recent

Financing structure
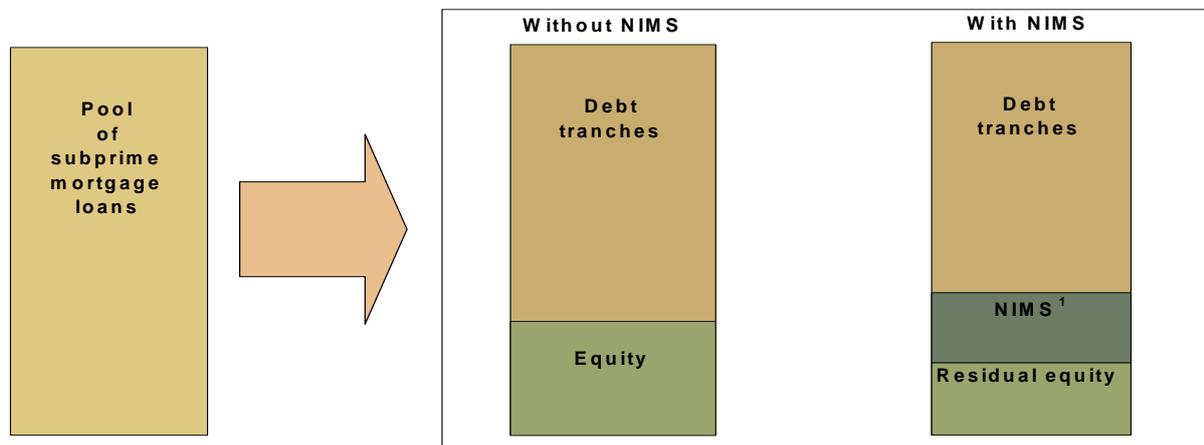
Figure A

Cash flows
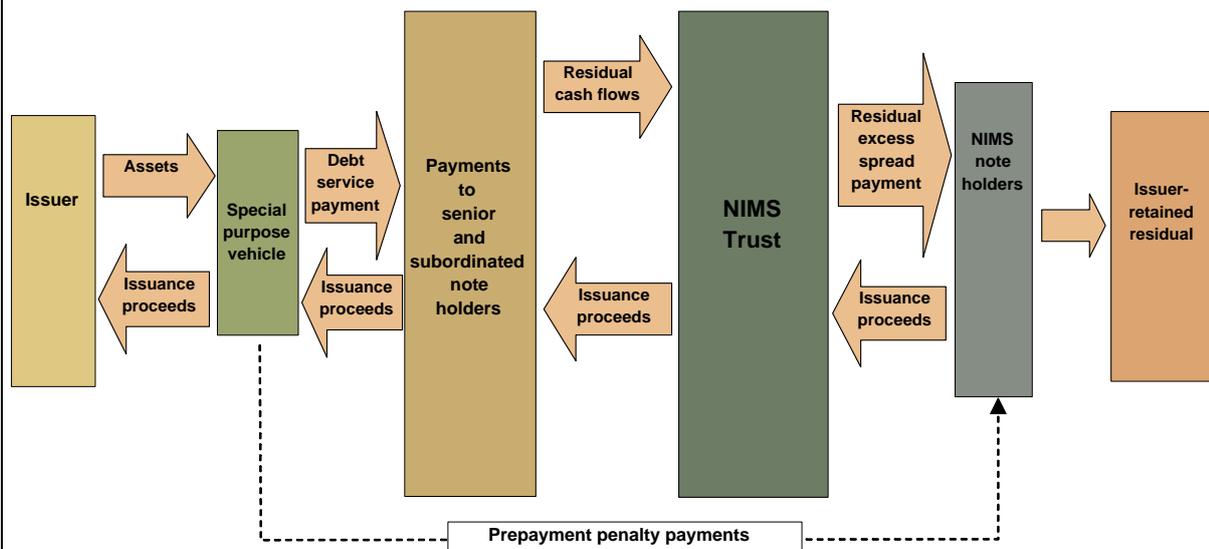
Figure B

Consequences of repayment rates for NIMS[2]

| Low repayment rate, r_L | Anticipated repayment rate, r_M | High repayment rate, r_H |

□ Cash flows to equity investors
□ Cash flows to NIMS investors

NIMS' expected maturity

Undiscounted cash flow

Period
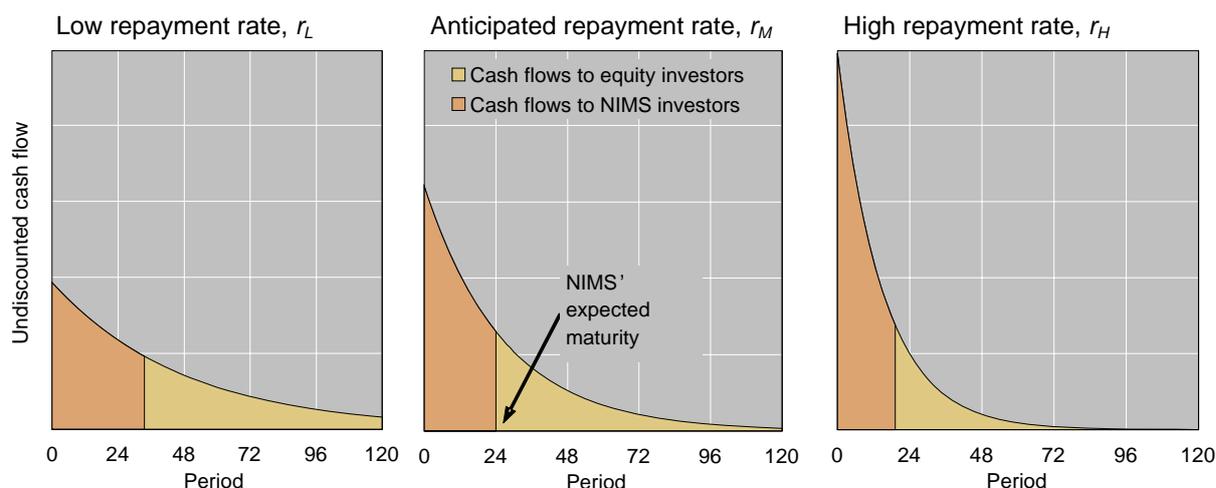
[1] Residual cash flows pass to equity holders only after NIMS have been paid off. [2] The net present value of a NIMS stake is the discounted amount of the total cash flows represented in the shaded area of the three panels. When the repayment rate is lower (slower) than anticipated, the net present value captured by a NIMS stake is less, ie $NPV(r_L) < NPV(r_M)$; conversely, a higher (faster) repayment rate corresponds to a higher net present value, ie $NPV(r_H) > NPV(r_M)$.

Source: BIS.   Figure C

NIMS transactions have employed a number of structural upgrades, eg NIMS investors have been given senior claims on receipts of prepayment penalties, which hastens the repayment to NIMS investors when household mortgage prepayments are surprisingly high (Figure C, right-hand panel). In the absence of this feature, mortgage prepayments only have the effect of reducing net spread income and, therefore, *reduce* the speed of repayment to the NIMS tranche and its net present value (Figure C, left-hand panel).

New risks in the new century

One distinction of non-agency underwritten mortgages is that pricing is much more sensitive to credit risk. Agency-backed mortgages continue to have a uniform interest rate for almost all (prime or near prime) qualified contracts, a pattern which is sustainable in part because the credit quality of the underlying household panel is rather homogeneous. However, for non-agency mortgage loans, observed mortgage rates tend to vary in line with the default probabilities suggested by the standard distributions of households' credit scores.

Mortgage rates have become more sensitive to credit risk

The dependence on credit scores has become even more pronounced over time. Credit scores are constructed from all available credit histories and were initially designed as a measure of the likelihood that a consumer would become seriously delinquent on consumer loans. It was only after their introduction in consumer finance that it became apparent that the scores could also be used to predict mortgage loan defaults. The market has over time come to rely on credit scores as the primary input for the prediction of mortgage loan default probabilities.[6]

Growing dependence on credit scores to differentiate borrowers

---

[6] Credit scores are based on limited data sets, the information being submitted by credit granting firms. One example of a reporting firm would be a bank that has issued a credit card. The bank would report information such as the amount of the approved credit limit,

A few stylised facts stand out about the distribution of households' credit scores and non-agency mortgages. First, credit scores for households taking out non-agency backed mortgages tend to be lower than those for the entire US household sector, indicating a lower credit quality on average (Graph 4). At the same time, credit scores for these households are higher than they were at the turn of the century, in part the product of an influx of good credit households and consistent with the increase in Alt-A loans described above (Graph 4, right-hand panel). This suggests that the new developments in mortgage finance are making it easier for households to leverage their credit scores to gain increased exposure to the housing sector.

"Affordable" loan products

A large number of non-agency originators specialise in the underwriting of "affordable" loan products, such as option ARMs (adjustable rate mortgages) and IO (interest-only) loans. The former grant borrowers the option to make partial interest payments and thus negatively amortise the balance on their loans. Doing this as house prices rise is equivalent to an automatic withdrawal of equity. The latter grant borrowers the option to defer the start of their mortgage amortisation payments. Normally, a household can qualify for a larger loan amount by choosing these types of mortgages (see Hancock et al (2005)).

The screening of households for suitability for affordable loans relies heavily on credit scores, as few affordable loans are made to low FICO score borrowers (Table 1). Credit rating agencies have reinforced the tendency to screen the loans in this fashion, by markedly raising the required credit

Distributions of credit scores

US households[1]

Non-agency mortgages[2]

[1] Histogram of US households by FICO score, in per cent. [2] As a share of originated loans; the dotted line represents the border-value FICO score for subprime values; in per cent.

Source: UBS, based on data compiled by LoanPerformance.   Graph 4
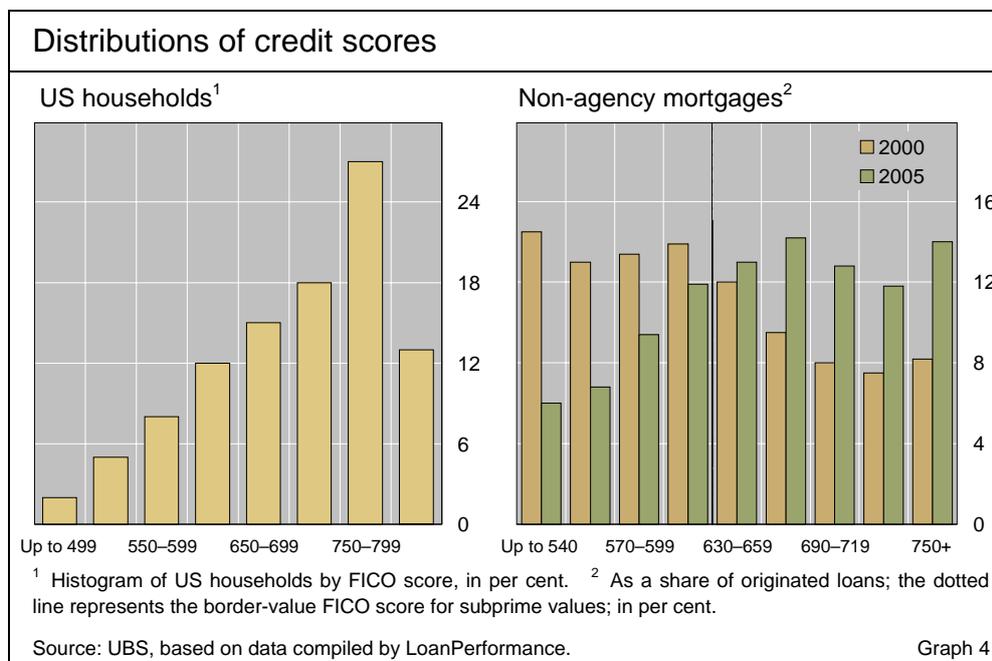
outstanding balances, late payments and delinquent payments. Information on households' income or households' net worth positions is not captured by such reporting. For further discussions of credit scores and their usage, see Avery et al (1996) and Ben-Shahar (2005).

Selected characteristics of non-agency loans made in 2005
By FICO bucket

FICO range	Loan size (USD thousands)	LTV	% option ARM	% IO	% California	% non-conforming
<540	162	74.5	0.0	2.2	25.5	11.8
540–569	168	78.6	0.0	6.9	25.0	14.6
570–599	172	82.1	0.0	19.4	25.3	16.2
600–629	192	84.0	4.8	26.8	29.3	22.6
630–659	222	83.0	14.5	29.2	36.1	32.1
660–689	259	80.7	22.4	32.0	41.4	43.5
690–719	285	78.8	22.6	36.0	44.4	51.2
720–749	291	78.3	18.7	38.1	44.4	55.3
750–780	327	74.4	18.2	39.7	45.4	63.1

Note: "LTV" is the average loan-to-value ratio for the loans in the FICO range. "% option ARM" and "% IO" are the percentage of those types of loans (described in the text) in the FICO range. "% California" is the percentage of loans in the FICO range originated in California. "% non-conforming" is the percentage of loans in the FICO range of a size greater than the GSE cap amount applied at the time of loan origination.

Source: UBS, based on data compiled by LoanPerformance.   Table 1

enhancements for securities backed by loans to households with low credit scores.

The expansion of new mortgage loan products shows a strong correlation with the strength of the real estate market. In particular, the market share of the new mortgage loan products in individual US states tends to be higher in states where there are high rates of house price inflation (Graph 5). As rising housing prices result in lower loan default rates and loss severity, the providers of affordability loans are prepared to increase their supply in robust housing markets. But, by the same token, were housing market conditions to worsen,

New products are much more common in strong real estate markets

Mortgage loan composition and housing prices, 2002–05[1]

Legend: ● Arkansas ● Alabama ● Oregon ● Maryland ● Virginia ● Florida ● California ◇ 2002 △ 2003 □ 2004 ○ 2005

Y-axis: Affordability loan share[2]
X-axis: Annual house price appreciation

[1] For 2005, year to date; in per cent.   [2] The ratio of affordability loans (ie adjustable rate mortgages and interest-only loans) to all non-agency mortgage loans, in per cent.

Source: JPMorgan Research.   Graph 5

both the performance and provision of these products might go into reverse as well (see Downing et al (2005) and Longstaff (2004)).

The risk of keying to average credit scores

Pricing of mortgage pools is often based on the *average* credit score ...

Investment and pricing of mortgage pools are often keyed to the average FICO scores of all the underlying credits, rather than to a more complex function of the distribution of scores.[7] The costs of such a simplifying assumption could be considerable. Our conjecture is that housing market conditions matter greatly for the economic significance of differences in the credit scores of borrowers combined in a single pool. Namely, persistently strong housing markets offer less incentive for investors to be concerned with pool composition than do persistently weak housing markets.

... which might lead to unanticipated losses ...

Graph 6 illustrates the systematic underprediction of defaults that can result from pricing a mortgage pool off the average credit score. Because the relationship between default rates and FICO scores is convex – ie a deterioration in the scores increases default rates more than a commensurate improvement lowers default rates – the average of the expected default rates for a sample of FICO scores is greater than the default rate for the average of the same sample's score.[8] For instance, between the solid red and dashed red lines in the graph, the distance $u_1 p_1$ is the increase in the default rate associated with an investment in a pool of mortgages with scores A and C rather than only in mortgages which have score B, the average of A and C. These defaults are unanticipated when investors key to the average credit score rather than multiple characteristics of the distribution.

... particularly in sluggish real estate markets

Graph 6 also illustrates a potential outcome for mortgage pool holders of a shift from strong to weak housing markets. The iso-curves relate credit scores to default rates for different states of the housing market. Curves move away

Default rates, credit scores and the housing market

Source: BIS.   Graph 6

---
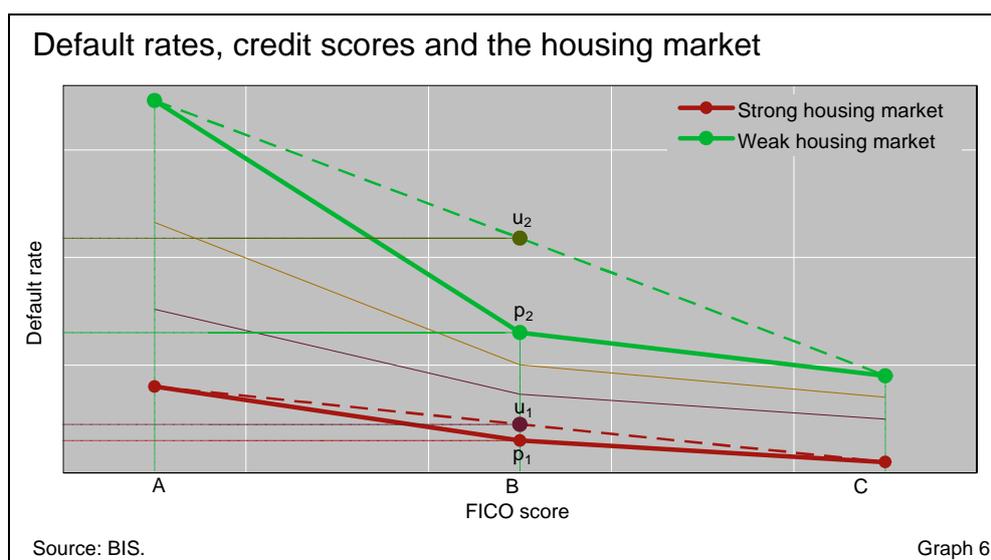
[7] For a discussion of this issue, see UBS (2006b).

[8] This corresponds to the result for structural models of default that the expected probability of default of the average (representative) firm underpredicts realised default rates. For a further discussion, see Tarashev (2005).

from the origin as housing market conditions deteriorate, implying higher defaults for a given FICO score. Since default rates are likely to be convex in housing prices,[9] it follows that the relationship between default rates and credit scores will become increasingly convex as we move from more to less robust housing markets, which in turn produces an increase in unanticipated defaults, ie $u_2 p_2 > u_1 p_1$. One interpretation of the increase is that it signals that more effort needs to be expended to correctly price loan pools, especially in stronger housing markets, to avoid unanticipated losses should markets turn weaker. Because the US housing market has not been weak since the proliferation of new mortgage products, the scale of the resulting exposure should not be underestimated.

New challenges in forecasting prepayment[10]

Changes in the mortgage finance system also pose new challenges for investors in assessing their exposure to the exercise of prepayment options by borrowing households. Under the old system of mortgage finance, all "qualified" borrowers took up standard mortgage contracts with identical terms, while other borrowers were rationed out of the mortgage market. Owing to high transaction costs, individual borrowers refinanced only in response to sizeable reductions in mortgage rates. Improvement in a borrower's creditworthiness or increases in house prices, per se, provided little incentive to prepay. As a result, the investor's problem was centred on forecasting the levels and volatility of interest rates.

In contrast to the old system of housing finance …

By contrast, under today's mortgage finance system, the challenge of forecasting prepayments is more complex. All applicants receive mortgages whose pricing is based, in part, on LTV ratios measured on a mark to market basis. Mortgage refinancing rates are based on the households' current credit standing, and lower transaction costs imply that borrowers can exercise prepayment options more efficiently. Consequently, borrowers rapidly prepay to benefit from lower mortgage costs, which can be due to an improvement in a household's creditworthiness as much as lower market rates. This credit standing can in turn result from an improved credit history or an increase in house value. Thus, investors in mortgage securities have an increasing interest in anticipating moves in credit and real estate markets as well as interest rates.

… under the new system …

… housing prices can greatly affect prepayment risk

Concluding remarks

The character of US mortgage finance has changed markedly over the last few years. The new system is not a by-product of a regulatory reform initiative; it is largely a market-based response to incentives generated by very buoyant

---

[9] Convexity of defaults is the norm for most collateral attributes, including LTV ratios and loan size, as discussed in UBS (2006b).

[10] For more detailed discussions of the issues involved in the estimation and valuation of prepayment risk in MBSs, see Breeden (1994), Gan and Riddiough (2003), Department of the Treasury et al (2003) and Heidari and Wu (2004).

housing markets.[11] The key initial condition was the existence of institutions with a recognised capacity to invest in mortgage pools and structured finance securities. The key proximate factor was the willingness of households to leverage their credit scores to take outsized exposures in housing markets.

There are signs that the US housing market is cooling. As house price appreciation slows, mortgage defaults become more likely and, at the same time, voluntary prepayments become less likely. To the extent that some investors may have failed to recognise the degree of sensitivity of their MBS investments to housing market developments, they may be exposed to losses in excess of what they had anticipated.

References

Avery, R B, R W Bostic, P S Calem and G B Canner (1996): *Credit risk, credit scoring, and the performance of home mortgages*, July, pp 621–48.

Ben-Shahar, D (2005): *Default, credit scoring, and loan-to-value: a theoretical analysis under competitive and non-competitive mortgage markets*, Arison School of Business, July.

Breeden, D T (1994): *Complexities of hedging mortgages*, December, pp 6–41.

Committee on the Global Financial System (2005): *Housing finance in the global financial market*, December.

Department of the Treasury, Office of Federal Housing Enterprise Oversight and Securities and Exchange Commission (2003): *Staff Report: enhancing disclosure in the mortgage-backed securities markets*, January.

Downing, C, D Jaffee and N Wallace (2005): *Information asymmetries in the mortgage backed securities market*, University of California at Berkeley, May.

Gan, J and T J Riddiough (2003): *Piercing and then papering over the veil of ignorance: GSE monopoly and informational advantage in the market for residential mortgages*, AFA 2004 San Diego meetings, March.

Hancock, D, A Lehnert, W Passmore and S M Sherlund (2005): *An analysis of the potential competitive impacts of Basel II capital standards on US mortgage rates and mortgage securitization*, Federal Reserve Board, April.

Heidari, M and L Wu (2004): *What constitutes a good model? An analysis of models for mortgage backed securities*, August, available at www.ssrn.com/abstract=585622.

Heike, D and A Mago (2005): "The ABCs of HELs", *Journal of Fixed Income*, June, pp 5–39.

Longstaff, F A (2004): "Optimal recursive refinancing and the valuation of mortgage-backed securities", *NBER Working Papers*, 10422, April.

---

[11] There have also been common elements across countries in the global transformation of housing finance, which are discussed in detail in a recent report of the Committee on the Global Financial System (2005).

Office of Federal Housing Enterprise Oversight (2005): *Mortgage markets and the enterprises*, August.

Pennington-Cross, A (2002): "Subprime lending in the primary and secondary markets", *Journal of Housing Research*, vol 13, issue 1, pp 31–50.

Tarashev, N (2005): "Structural models of default: lessons from firm-level data", *BIS Quarterly Review*, September, pp 99–108.

UBS (2006a): *Mortgage Strategist*, 10 January, pp 20–21.

——— (2006b): *Mortgage Strategist,* 24 January, pp 19–24.

Zorn, P (2005): *Credit scoring and mortgage default modelling*, Freddie Mac, LoanPerformance Risk Summit, July.

Clifford R Dammers[1]　　　　Robert N McCauley

+852 2878 7106
robert.mccauley@bis.org

Basket weaving: the euromarket experience with basket currency bonds[2]

ECU-denominated international bonds owed much of their limited success in the 1980s and 1990s to restrictions on the internationalisation of the Deutsche mark and to speculative investment, rather than simply to the benefits of diversification. Basket bond issuance may come at the cost of a less liquid domestic bond market.

JEL classification: E42, E58, F02, F31, F33, F36, G15.

Asian policymakers have given priority to developing domestic bond markets. The Asian financial crisis of 1997–98 suggested that more developed local bond markets could have limited risky mismatches between foreign currency liabilities and home currency assets. Since the crisis, central banks have also agreed to a network of swap arrangements to prevent a recurrence of speculators' attacking first one and then another currency. The depegging of the Chinese currency from the US dollar has made concerted exchange rate management possible as a third element in regional cooperation, along with bond market development and foreign exchange reserve sharing.

In this context, the eurobond market has been seen as a precedent for regional market development in the service of financial, currency and monetary cooperation. In particular, market participants' use of a basket of European currencies that eventually became the euro strikes many as an example worth pursuing in Asia. Leading advocates in Asia include Chaipravat et al (2003) and Ito (2004).[3] The latter links multicurrency bond issuance to prospective management of currencies against a common basket, such as that proposed by

---

[3]　See also Mori et al (2002), Plummer and Click (2005) and Eichengreen (2006).

Williamson (1999). More recently, ASEAN+3 (2005) refers to "possible issuance of Asian currency-basket bonds" (see also Jung et al (2002)).

What was the euromarket experience with multicurrency or basket bonds? Did market participants use officially defined baskets or "roll their own"? Did they use baskets to diversify or for other reasons?

This special feature takes up these questions. The next section examines the record of basket issuance in the euromarket before the inception of the euro in 1999. The following sections consider the theoretical and practical advantages and disadvantages of basket bonds. The final section concludes.

Basket bonds in the international bond market

A basket currency is a weighted average of a collection of currencies. The simplest example would include just two currencies, for instance one defined as 50 US dollar cents and 60 Japanese yen. The issuer of a bond so denominated promises to pay interest and principal in an amount calculated on the payment date by taking the spot exchange rate of each of the constituent currencies against the settlement currency and summing the amounts.

Four baskets were used to denominate international bonds in the second half of the 20th century. Three of them turned out not to have much staying power. The fourth proved to be most successful just before it became the euro in 1999. In all but one case, private parties adopted existing official units of account and grappled with the inherent possibility that the official sponsor might change or discontinue using the basket.[4]

The basket currencies were generally virtual currencies, that is, it was not possible to settle in them. Investors bought the bonds with an actual currency and received payments of interest and principal in an actual currency – usually the US dollar. It was said that the Benelux banks profited less from marketing currency basket bonds than from exchanging the coupons for domestic currency each year at the banks' counters in Luxembourg. Only the last basket, the ECU, which is defined below, benefited from the initiative of a Belgian bank in the early 1980s to provide clearing facilities, so that ECU-denominated debt service could be settled in ECUs.

The European unit of account (EUA)

The first basket currency to be used in Europe after World War II was the European Unit of Account (EUA). Based on the currencies involved in the European Payments Union, it aimed at preserving the gold value of an

---

[4]   There were precedents for bonds denominated in some combination of currencies. Before the First World War international bonds floated in Europe not infrequently were multicurrency bonds or denominated in gold francs. A multicurrency bond, used by Russian railroads among others, gave the investor the right to be paid in a choice of currencies – typically French francs, Reichsmarks or pounds sterling, at the spot exchange rate prevailing at the date of issue. Rather than a true basket, such contracts, along with widely used gold clauses, were really embedded currency options that protected the investor against currency devaluation. After the collapse of the Bretton Woods fixed exchange rate system, there was a brief flurry of dual currency bonds – eg Deutsche mark/US dollar. Such bonds in effect gave the investor a normal bond and a long-dated currency option, and thus were not really basket bonds.

investment. The first eurobond, which happened to be for a Portuguese borrower, was denominated in the EUA. "EUAs were complex instruments, dependent for their value on a composite of 17 currencies and the price of gold" (Gallant (1988, p 77)). The recipient of a payment in EUAs, initially the borrower and subsequently the investor, could choose the currency of payment (Fisher (1981, p 140)). There were 96 issues amounting to about $2 billion between 1963 and 1982 (Gallant, ibid). Its definition shifted in response to the breakdown of the Bretton Woods system: "From 1972 when, at least for the currencies of the EEC members, the system of fixed parities vis-à-vis gold was replaced by a system of central rates, a new EUA emerged, based on the central rates of the nine EEC currencies" (De Beckker (1984, p 129)). The EUA never really took off with investors or issuers.

The eurco

... the eurco ... The next, and most short-lived, basket currency was the European Composite Unit (eurco). A purely conceptual construct, it was defined as a weighted average of the nine European Economic Community currencies. It was apparently not related to anything actually used by anyone. Advance notice from the investor was required as to the currency in which payment was to be made. Three bonds in the amount of $130 million were issued in 1972–73 (Fisher (1981, p 139)). It was a genuine basket bond but its purely private definition did not catch on. That is probably one reason why it was succeeded by the SDR in 1975.

Special drawing rights (SDRs)

... the SDR ... The private SDR was the exact equivalent of the IMF's Special Drawing Rights (SDR) and its value each day was the price in dollars or other currencies as calculated and published at noon each day in Washington by the IMF. Originally, 16 major currencies were used to define the SDR, but in 1981 the basket was reduced to five currencies: the dollar, Deutsche mark, yen, French franc and pound sterling, with weights chosen to reflect the respective economies' size and international trade. The terms and conditions of SDR bonds provided that if the IMF stopped using the SDR or publishing its value, a calculation agent appointed by the issuer would do so. Payments were generally made in dollars, although payments in other currencies may have been anticipated. The BIS data on international bond issues show 13 SDR issues, including the first two by the Swedish city of Malmö and the Swiss company Sandoz, aggregating to the sum of just $594 million. With few countries managing their currencies against the SDR and no governments politically committed to it, private SDR bonds put in no more than a cameo appearance.[5]

---

[5] Eichengreen and Frankel (1996, p 366): "If the dollar is the world monetary system's version of the English language, the SDR is the system's version of Esperanto. The SDR was created by the IMF to be an ideal international currency. Its definition makes it intrinsically more useful than the dollar, just as Esperanto is intrinsically superior to English. The reason that the SDR is even less widely used today than it was ten years ago is that, like Esperanto, it lacks a natural base of constituents who would use it even if it was not in international use". See also Kindleberger (2000).

The European currency unit (ECU)

When investors regained their appetite for the dollar as it strengthened in the early 1980s, the banks that had been lead-managing EUA or SDR issues returned to arranging or co-managing dollar-denominated issues. However, as the big banks began to dominate the market, the smaller continental banks looked back to the basket currency concept, where they had developed a loyal retail investor base and expertise.

The continental banks took up the most successful of the basket currencies and the only one that had real staying power, the ECU or European Currency Unit. Like the EUA and SDR, it was a private basket that mimicked a unit of account of a public sector entity, in this case the European Community. The ECU was defined as so many hundredths of a Deutsche mark, so many French francs, so many Belgian francs, and so on (Table 1).

Of course, as the European Community expanded, it changed the ECU's composition to include the currencies of new members. Correspondingly, with very few exceptions, payments in private ECUs also changed accordingly, whether associated with new or outstanding issues. However, the changes did not result in any volatility to speak of in the value of the ECU measured in terms of either the dollar or the Deutsche mark. This resulted in part from the small weights assigned to the new currencies, which were in any case expected to track the major European currencies.

Perhaps the combination of being tied to an official European unit of account against which currencies were stabilised and the stability in its value against the Deutsche mark explains the relative success of the private ECU. According to BIS data, 1,218 issues were completed with an aggregate principal value of $168 billion equivalent to end-1997 (Graph 1). A 10th of all international bonds were issued in ECUs in 1991. In addition, commercial banks made loans denominated in ECUs, including home mortgages in Italy and the United Kingdom. The ECU was also sometimes included in multicurrency loans (BIS (1991, pp 146–8), EMI (1996, pp 39–40)).

Composition of the ECU			
	13 March 1979	17 September 1984	21 September 1989
Belgian franc	3.66	3.71	3.301
Danish krone	0.217	0.219	0.1976
Deutsche mark	0.828	0.719	0.6242
Greek drachma	–	1.15	1.44
Spanish peseta	–	–	6.885
French franc	1.15	1.31	1.332
Irish pound	0.00759	0.008781	0.008552
Italian lira	109.0	140.0	151.8
Luxembourg franc	0.14	0.14	0.13
Dutch guilder	0.286	0.256	0.2198
Portuguese escudo	–	–	1.393
Pound sterling	0.0885	0.0878	0.08784
			Table 1
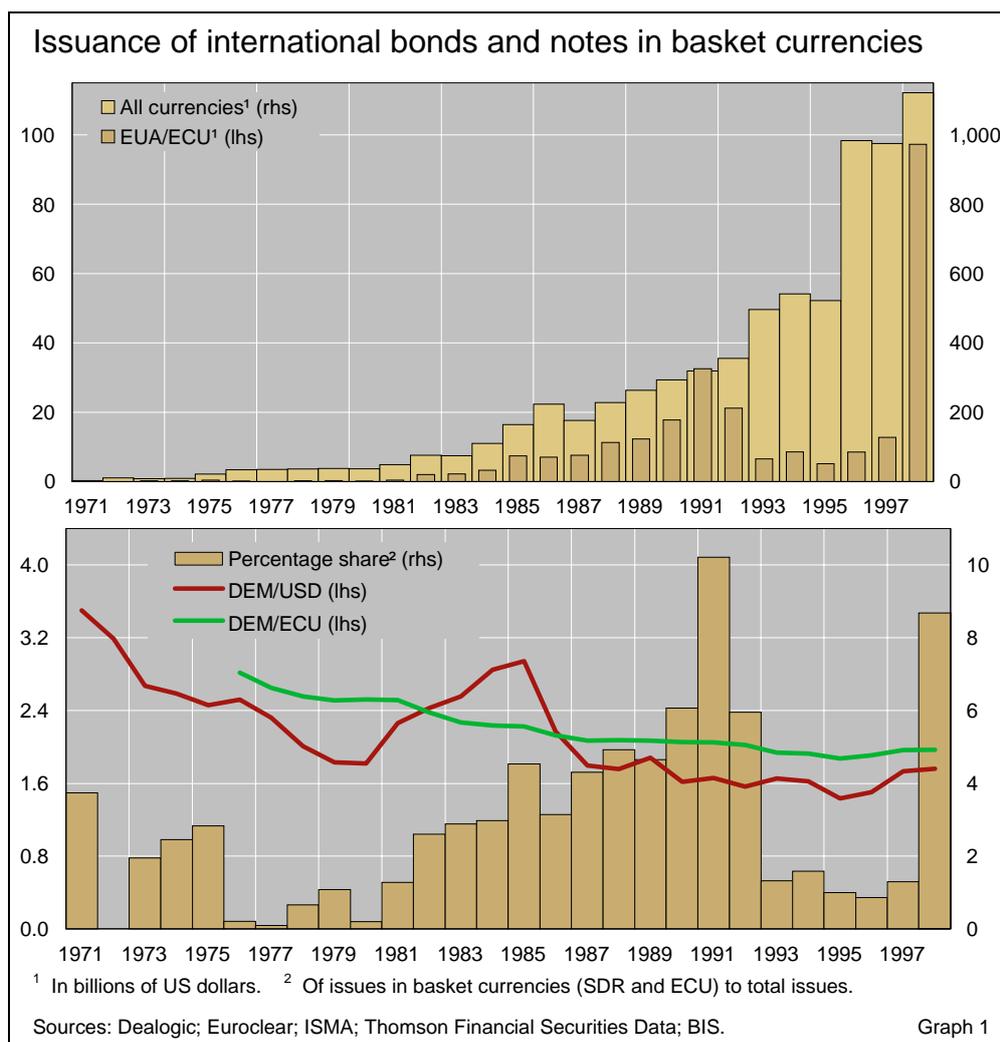
Issuance of international bonds and notes in basket currencies

All currencies[1] (rhs)
EUA/ECU[1] (lhs)

Percentage share[2] (rhs)
DEM/USD (lhs)
DEM/ECU (lhs)

[1] In billions of US dollars. [2] Of issues in basket currencies (SDR and ECU) to total issues.

Sources: Dealogic; Euroclear; ISMA; Thomson Financial Securities Data; BIS.   Graph 1

The ECU Banking Association created a clearing system for ECUs and some Benelux banks offered their customers ECU-denominated accounts so that coupon and principal payments could be credited to them without having to be paid in dollars and bearing the foreign exchange costs. The BIS offered the service of ECU clearing (BIS (1986, pp 172–3; 1987, pp 183–4; 1999, p 162)). This can be considered a form of private money, in contrast to the other baskets that were settled in major or constituent currencies.

The separate existence of the private ECU meant that, like a closed-end mutual fund, its value could vary in relationship to its intrinsic or theoretical value. Arbitrage mechanisms, while limited, constrained this premium or discount to theoretical value to a narrower range than that observed in closed-end funds. Still, the implication of the discount or premium is that the ECU's performance as a hedge was subject to an extra source of variance.

Advantages of basket bonds

One evident advantage of basket bonds is the diversification of currency risk. In practice, regulatory arbitrage, namely the avoidance of German restrictions on the internationalisation of the Deutsche mark, also figured importantly in the

use of the ECU in the eurobond market. In the lead-up to the ERM crisis of 1992, a speculative motive was also evident.

Diversification

Basket currency bonds promise investors a less volatile investment because of the diversification of the constituent currencies. If one constituent currency loses value against the dollar or the investor's base currency, the impact would be limited to its share of the basket.[6] Theoretically, an investor could buy a portfolio of bonds denominated in all of the currencies in the basket.

ready-made diversification ...

In practice, the ability of investors to "roll their own" varies between retail and institutional investors. Retail investors benefit from pre-packaged diversification. They would otherwise have to buy a large number of bonds and they might not have enough disposable funds, given the market convention of minimum denominations. In addition, the bonds are unlikely to be available: any issuer is unlikely to have issued in all the currencies in the basket, and in any case the maturities of any available bonds would vary. For institutional investors, by contrast, basket weights are unlikely to match the currency distribution of liabilities (in the case of a multinational financial firm) or a preferred distribution of foreign exchange risk assumed.

... especially for retail investors ...

For issuers, basket bonds similarly hold out the promise of a smaller exposure to exchange rate movements. For much of the time basket currencies were used, the currency swap had not been invented, so that liabilities in one currency could not be easily transformed into liabilities in another currency. In fact, investment bankers pitched currency basket bonds to issuers as a natural liability to hedge fixed assets in Europe owned by US multinational corporations. When the US accounting rules changed in 1982, US treasurers sought to match fixed assets with long-term liabilities in the same currency (Andrews (1983–84)). In the case of the European currencies that were managed against the ECU, governments were attracted to ECU issuance by the promise of limited exchange rate risk.[7]

Regulatory arbitrage

Basket currency bonds facilitated not only diversification but also arbitrage of regulation. It is little appreciated that such success that the ECU and its predecessors enjoyed in the euromarket owed much to official restrictions on the use of the Deutsche mark to denominate bonds for non-residents. True, the ECU construct allowed the international marketing of other currencies whose use for the denomination of international bonds was not legal initially. Much

... a proxy for the Deutsche mark, given limits on its use ...

---

[6] Diversification benefits in the context of Asia appear to be considerable. Ogawa and Shimuzu (2004) and McCauley and Jiang (2004) find diversification benefits, while Park and Park (2005) express reservations. These benefits, however, in part derive from the closed nature of important bond markets in Asia, not least that of China with its capital controls, but also those of Indonesia or the Philippines, where idiosyncratic political risk tends to lower the correlation of returns with those in major markets.

[7] In the terms of Kenen (2006), the ECU benefited from being an internal basket for many economies, while the SDR suffered from being an external basket for a few.

more importantly, however, ECU issuance allowed non-German market participants to market Deutsche mark proxies.

In particular, the Bundesbank's efforts to restrain the internationalisation of the Deutsche mark created an opening for the ECU. A gentleman's agreement with leading German banks in 1968 established an *anchoring* principle requiring a German bank to lead the underwriting of a Deutsche mark bond issued by a non-resident.[8] In 1985, the anchoring principle was broadened to allow German subsidiaries of foreign banks to lead-manage foreign Deutsche mark bonds. Only the launch of the European Single Market project forced the acceptance in August 1992 of foreign bank branches as well as subsidiaries as lead underwriters of foreign Deutsche mark bonds.[9]

Because of this regulation, the attraction of a basket waxed when the dollar fell out of favour. When the dollar weakened in the early 1970s, in 1977–78 or in the late 1980s, investor demand swung away from the dollar to the Deutsche mark (Cohen (2005). German banks tended to gain market share as underwriters from US, Benelux, French and Swiss banks.[10] Under these circumstances, the latter sought an alternative to the US dollar, and the more closely it could mimic the Deutsche mark, the better. And in fact all of the basket currencies contained the Deutsche mark.

The nationality of underwriters of Deutsche mark and ECU issues makes very clear the advantage of the ECU to French, Benelux and other continental European banks. Available data do not permit the isolation of the pre-1985 experience, but a seven-year period ending in mid-1987 shows the dominance of German banks as lead underwriters of Deutsche mark bonds (Table 2, top panel). The liberalisation of 1985 is already evident, however, in two German subsidiaries of foreign firms serving as lead underwriters.

The full effects of the 1985 liberalisation of the Deutsche mark sector are evident in the slippage of the German banks in the early 1990s (Table 2, centre panel). By then, banks headquartered outside Germany claimed a market share of almost three quarters in running the books of Deutsche mark-

---

[8] That year, a *rationing* mechanism was set up to limit issuance. In addition, the practice of *converting* Deutsche marks raised by foreign issuers into dollars and transferring them abroad was informally encouraged. "These agreements made it easier for the Bundesbank to stabilise recourse to the capital market … German credit institutions … were shielded from competing [with] foreign credit institutions and were thus able to achieve higher earnings in [the] underwriting business." The Bundesbank also prevailed on foreign central banks to prevent Deutsche mark issues by non-residents outside Germany (Franke (1999, p 247)).

[9] The Bundesbank kept "the anchoring principle so that it could retain its influence on D-mark issues, and in particular on innovative forms". A requirement that foreign banks have "a sound syndication department in Germany … protected Germany, as a financial centre, from the migration of the underwriting business" until the inception of the euro in 1999 (ibid, p 248).

[10] At the time, only Swiss banks were allowed to arrange or co-manage Swiss franc-denominated bond issues and the Swiss banks operated a cartel that excluded foreign-owned Swiss banks from Swiss franc bond issues. Moreover, the German and Swiss banks for a time had a non-aggression pact under which they did not open branches or subsidiaries in each other's country. Another approach was to underwrite bonds in the smaller currencies closely linked to the Deutsche mark, but this posed a disadvantage compared to issuing basket bonds. Austrian schilling and Danish krone bonds benefited from expectations that these currencies would continue to closely track the Deutsche mark but the domestic markets for those currencies were too small to justify most foreign banks' establishing a presence, which was a requirement to lead-manage a bond issue in kroner or schillings.

Lead underwriters of Deutsche mark and ECU eurobonds			
By number			
Nationality of lead underwriter	Currency denomination of eurobond		
	Deutsche mark	ECU	Total
January 1980–July 1987			
German	622	0	622
Others	32 [1]	277	309
Total	654	277	931
January 1991–August 1992			
German	116	14	130
Others	207	132	339
Total	323	146	469
September 1992–December 1998			
German	440	0	440
Others	1,292	56	1,348
Total	1,732	56	1,788

Note: The X^2 test statistic for the independence of currency denomination and nationality is 793.7 for the top panel, 34.8 for the centre panel, and 18.9 for the bottom panel while the critical value for the 1% level of significance is 6.6.

[1] German subsidiaries of Credit Suisse First Boston and Morgan Guaranty.

Sources: Dealogic; Gallant (1988, pp 89 and 104); BIS.   Table 2

denominated foreign bond issues. Meanwhile, German banks won only about a 10th of ECU mandates. Looser regulation led to less specialisation in the two segments than in the 1980s.

After the liberalisation required by the Single Market project, German banks lost further market share in the Deutsche mark sector while giving up on the moribund ECU sector (Table 2, bottom panel). Without the protection of the requirement for a German subsidiary, foreign banks won two thirds of the Deutsche mark mandates. Meanwhile, the ECU sector declined owing both to the contestability of the Deutsche mark sector and to the 1992–93 crises.

"Convergence trade"

The theoretical argument for basket bonds focuses on diversification of currency risk. In practice, much demand for ECU bonds reflected a search for yield on the presumption of currency stability (the "convergence trade").

… and high coupons promising excess returns

Two stylised facts about ECU bond issuance point to their serving as a means for investors to speculate on currency stability to achieve excess returns over Deutsche mark yields. First, issuance rose into early 1992, the year of the first crisis in the European exchange rate mechanism (ERM). Thereafter, events running from the Danish referendum in June 1992 to depreciations in the autumn to the acceptance of broad bands in late 1993 severely tested the ECU bond markets (BIS (1993, pp 120–23)). Second, after the exit of major currencies from the ERM imposed losses on holders of ECU bonds in the Benelux countries and Germany, issuance subsequently dropped off very sharply and the stock of ECU bonds outstanding shrank for the next five years (Graph 2). The stock of ECU bank claims and measures of turnover

The private ECU market

- Outstanding ECU international bonds and notes[1]
- Net outstanding ECU bank lending[1,2]
- ECU clearing banks[3,4]
- ECU turnover[3,5]
- Average daily transactions netted by BIS[3,6]

[1] In billions of ECUs.   [2] Net outstanding bank claims defined as gross cross-border claims minus interbank deposits in BIS reporting countries.   [3] 1992 = 100.   [4] Number of private ECU clearing banks participating in the BIS clearing system in October 1986 and March of other years; March 1992 observation is 44.   [5] Turnover of ECU securities in primary and secondary markets. Instruments covered are straight eurobonds, straight domestic bonds, convertibles, floating rate notes, certificates of deposit and short- and medium-term notes; turnover was ECU 1.5 trillion in 1992.   [6] In number, as of December each year; December 1992 observation is 6,496.

Sources: National authorities; Cedel Dealogic; Euroclear; ISMA; Thomson Financial Data; BIS.   Graph 2

also turned down or tended to level off.[11] The stock of ECU bonds contracted in parallel with a reduction in non-resident holdings of domestic bonds in high-interest European currencies.

Only on the eve of the introduction of the euro at the start of 1999 did ECU bond issuance recover (BIS (1998, pp 153–4)). By then, however, the ECU's appeal had become that of a proto-euro. Issuance reflected the confidence that the euro would be introduced at one euro to one ECU. This decision by the European authorities put ECU bonds on a through train to the euro bond market, while bonds denominated in the predecessor currencies were shunted onto the side track of "redenomination" on the way to the euro bond market.

Disadvantages of baskets

Basket bonds carry two burdens:

Competing with these advantages, basket currencies had several disadvantages. These derive broadly from complexity and illiquidity.

Complexity

legal uncertainty and complexity …

Any multicurrency bond needs criteria to select and to weight the currencies. Generally, issuers used officially defined baskets to denominate bonds in the euromarket. This choice, however, required lawyers to craft bond contracts to accommodate changes in official definitions.

---

[11] De Boissieu (1996, p 125), notes, "A significant drop in the market shares of the private ECU occurred after the two crises in the European Monetary System in 1992–93 and the consequent loss of credibility. The recovery has been slow since then. Market operators were negatively impressed over a certain period by the lack of both economic convergence in Europe and political credibility of European integration. Therefore, the premium, that is the gap between the theoretical value of the ECU basket and the actual value of the ECU, has increased dramatically and is still quite high".

Thus, with basket bonds, few people understood how the formulae worked and additional effort was required to explain the product to issuers and investors. Investors worried that the definition might be found lacking if the international exchange rate system changed. Use of some officially defined basket would not get around this problem. For example, bonds based on the SDR or ECU were sometimes referred to as private SDRs or ECUs to distinguish them from the official claims and liabilities so denominated. If the IMF or European Community ceased to use and publish the value of the SDR or ECU, what would happen to a bond issue denominated in these baskets? Of course, the terms and conditions of the bonds anticipated such a development but it was uncertain whether the lawyers had thought of every eventuality.

When different banks and lawyers arranged currency basket bonds, there was always the possibility that the definitions or formulae might differ slightly. If the differences were material, the bonds risked being treated as not being in the same currency. For instance, the Kingdom of Belgium issued two ECU bond issues that deliberately had a non-standard definition of the ECU. At the time, Portugal was about to join the European Community and the Portuguese escudo was perceived as a weak currency. There was concern that adding the escudo to the ECU basket would make the ECU less attractive to investors. In the event, both issues were repaid before the euro was introduced as the single European currency and existing ECU bonds became euro bonds.

Illiquidity

Basket bonds work against bond market liquidity directly and indirectly. Basket bonds themselves tend not to be very liquid because they attract buy-and-hold retail investors for whom they carry the advantage of one-stop diversification. As noted, basket bonds hold less attraction for institutions, with their greater propensity to trade in the secondary market.[12]

... and illiquidity

One class of institutional investor that can be drawn into a basket bond market is banks and specialised funds that can arbitrage between the basket and its underlying constituents. In particular, if the basket becomes cheap, such arbitrageurs will tend to buy it against short positions in its underlying currencies. Thus, once private banks ceased stabilising the ECU against its theoretical value,[13] its usual discount to its theoretical value provided a professional bid that might otherwise have been missing (Graph 3).

Basket bonds issued by governments also work against the liquidity of national bond markets in an opportunity cost sense. If a government sells a basket bond, or indeed any foreign currency issue, it leaves less paper in the domestic currency market. A smaller government bond market tends to have less turnover, and worse liquidity as measured by, say, the bid-ask spread (CGFS (1999a,b), McCauley and Remolona (2000), Mohanty (2002), Jiang and McCauley (2004)).

---

[12] An important exception was Japanese life insurers (McCauley and Yeaple (1994)).

[13] See Folkerts-Landau and Garber (1992).

Premium/discount of the market ECU to its theoretical value[1]

Monthly averages, in per cent

[1] Using noon spot rates in New York; calculated with the currency composition of the ECU as at 21 September 1989.

Sources: Federal Reserve Bank of New York; BIS calculations.   Graph 3
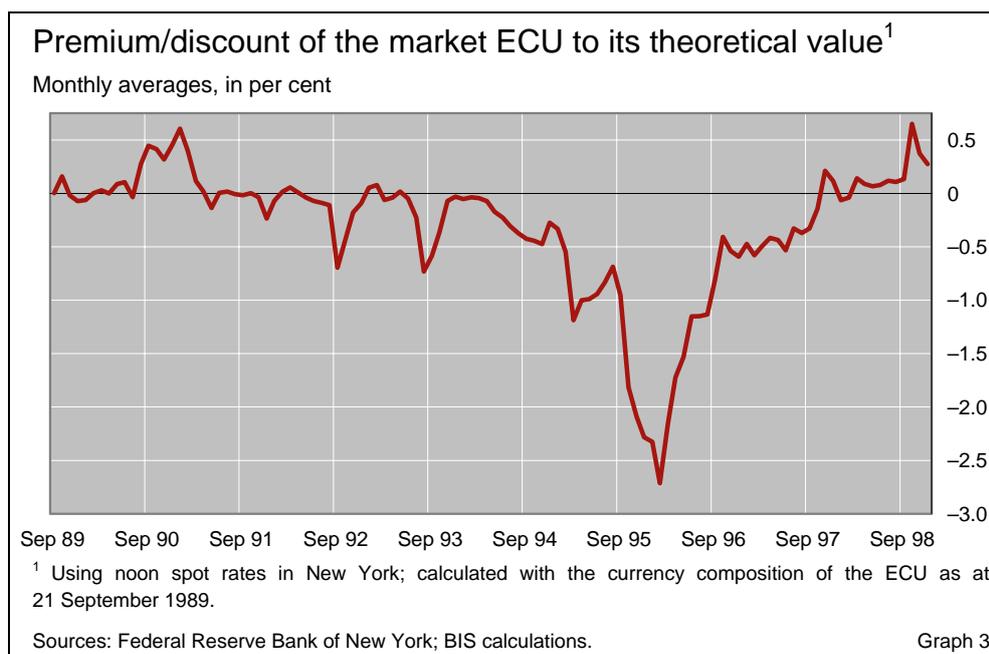
Thus, European governments that issued ECU bonds tended to issue less domestic currency denominated paper and at the margin to enjoy less liquidity in their domestic markets. This opportunity cost arose not so much from the sale of ECU paper in the international market. To some extent, as with Belgium's ECU 1.25 billion bond in March 1991, such issuance simply refunded existing foreign currency debt, in this case maturing Deutsche mark and Swiss franc bonds (BIS (1991, p 148)). The greater cost arose from government issuance of ECU bonds in the domestic bond markets of France, Italy, Spain and the United Kingdom. At end-1991, outstanding issues there of domestic ECU bonds and bills had reached the equivalent of $63 billion (BIS (1992, p 185)).[14] By splitting the domestic government bond market into two currency sectors, such ECU issuance made for less liquid markets.[15] Admittedly, this cost might have been small, given the development of the major European government bond markets at the time. However, in less developed bond markets the damage from similar debt management policies could be larger.

Conclusion

It might be easy to imagine that basket bonds paved the way to monetary union in Europe. According to this view, European investors buying basket bonds might well have broadened their investment horizon beyond their home market while assuming limited, diversified currency risk. Issuance of basket bonds might have increased monotonically until the ECU basket became the euro. On

---

[14] In 1990, 40% of the $75 billion equivalent of outstanding international bonds denominated in the ECU had been issued by official national and supranational issuers (BIS (1991, p 147)).

[15] Some of these countries benefited from the use of the official ECU to denominate claims arising from short-term intra-European swaps, which use shared the exchange risk between a central bank that drew on a swap and the one drawn upon. But this feature of the official ECU did not depend on these governments' use of the ECU to denominate their domestic debt.

this view, a little official encouragement of basket bonds in Asia might lead to a market process propelling Asian bond markets towards Asian monetary union.

This special feature has suggested that the facts fit uncomfortably with this reconstruction of the European record. Baskets to some extent served as a proxy for the Deutsche mark at a time when the Bundesbank was intent on keeping control of its own creation. Support for this reading comes from the nationality of underwriters of ECU and Deutsche mark international bonds. On this view, basket bonds in Asia would have the best prospects if the authorities of the region's key currency resisted its internationalisation.

The evidence further suggests that ECU bond issuance also responded to a speculative search for yield among European currencies. After the exchange rate risks underlying the ECU bonds' relatively high coupons became manifest in 1992, issuance of ECU bonds collapsed. By then, the liberalisation of the Deutsche mark foreign bond market had made it unnecessary for non-German banks to use the ECU as a proxy. The ECU bond market only revived in 1998 after European leaders decided that the basket would become the euro. Thus, it is more correct to say that the prospect of the euro revived the ECU bond market than that the euro bond market grew out of the ECU bond market.

Does this mean that it is a mistake to try to nurture a market for Asian currency basket bonds? Not necessarily. But the European experience draws attention to the linkage between private and official use of a basket as well as the issue of liquidity.

It appears that official use of a basket is a necessary but not sufficient condition for widespread private use. The least successful basket bond in the eurobond market history was the eurco, which did not benefit from an official definition. This precedent may suggest that denomination of bonds in an Asian basket defined solely for the purpose would be unlikely to catch on. Even official use of the SDR did not ensure private acceptance.

Liquidity considerations suggest that public issuers might do well to think twice before selling basket bonds. International financial institutions, whether in Europe before the euro or in Asia today, that sell basket bonds must decide whether to pass the multicurrency exposure on to borrowers or to hedge it out, in whole or part. Either approach might involve a cost compared to another funding route, reflecting the need to offer a higher yield on a basket to attract arbitrageurs rather than natural buyers. Such institutions need to weigh any policy benefits of basket issuance against any opportunity loss to be borne by their borrowers or shareholders.

Governments whose debt serves as a benchmark in the national currency face a different choice. More important than the narrow cost considerations would be the diversion of issuance away from the domestic market, which deprives it of the benefits of larger benchmarks. In some circumstances foreign currency funding may be well advised, and basket issuance might make sense. Otherwise, splitting issuance across currencies can work against liquidity and bond market development. Any policy reason for basket issuance by a national government must outweigh the opportunity cost of lower domestic currency bond issuance.

References

Andrews, M D (1983–84): "FASB 52: Corporate response and related foreign exchange market effects", *Federal Reserve Bank of New York Quarterly Review*, Winter, pp 69–70.

ASEAN+3 Finance Ministers (2005): *Progress report*, 4 May, Istanbul.

Bank for International Settlements (1986–99): *Annual Report.*

Chaipravat, O, B B Supaphol and K Sangsubahn (2003): "Regional self-help and support mechanisms: beyond the CMI", paper submitted to the ASEAN Secretariat.

Cohen, B H (2005): "Currency choice in international bond issuance", *BIS Quarterly Review*, June, pp 53–66.

Committee on the Global Financial System (1999a): "Market liquidity: research findings and selected policy implications", *CGFS Working Group Report No 11*, May.

——— (1999b): "How should we design deep and liquid markets? The case of government securities", *CGFS Publication No 13*, October.

De Beckker, R (1984): "The EUA sector", in I M Kerr (ed), *A history of the eurobond market: the first 21 years*, Euromoney Publications, London, pp 128–9.

De Boissieu, C (1996): "The SDR in the light of the multicurrency system", in M Mussa, J M Boughton and P Isard (eds), *The future of the SDR in light of changes in the international financial system*, IMF, Washington DC, pp 122–44.

Eichengreen, B (2006): "The parallel currency approach to Asian monetary integration", in panel on Asian currency matters at the American Economic Association, Boston, Massachusetts, 7 January 2006.

Eichengreen, B and J Frankel (1996): "The SDR, reserve currencies and the future of the international financial system", in M Mussa, J M Boughton and P Isard (eds), *The future of the SDR in light of changes in the international financial system*, IMF, Washington DC, pp 337–78.

European Monetary Institute (1996): *Annual Report*, "Private ECU markets", pp 39–40.

Fisher, F (1981): *International bonds*, Euromoney Publications, London.

Folkerts-Landau, D and P M Garber (1992): "The private ECU: a currency floating on gossamer wings", *NBER Working Papers*, no 4017.

Franke, G (1999): "The Bundesbank and the markets", in *Fifty years of the Deutsche mark*, Oxford University Press, Oxford, pp 219–66.

Gallant, P (1988): *The eurobond market*, Woodhead-Faulkner, New York.

Ito, T (2004): "Promoting Asian basket currency (ABC) bonds", in T Ito and Y-C Park (eds), *Developing Asian bond markets*, Asia Pacific Press.

Jiang, G and R McCauley (2004): "Asian local currency bond markets", *BIS Quarterly Review*, June, pp 67–79.

Jung, W, C Kim, S Lee and H Park (2002): "The creation of the ACU and its application to the bond market", in H G Choo and Y Wang (eds), *Currency union in East Asia*, Korean Institute for International Economic Policy, Seoul, pp 201–19.

Kenen, P B (2006): "Comment on 'The parallel currency approach to Asian monetary unification' by B. Eichengreen", in panel on Asian currency matters at the American Economic Association, Boston, Massachusetts, 7 January 2006, Princeton University (processed).

Kindleberger, C P (2000): "The politics of international money and world language", in *Comparative political economy: a retrospective*, MIT Press, Cambridge, Massachusetts.

McCauley, R and G Jiang (2004): "Diversifying with Asian local currency bonds", *BIS Quarterly Review*, September 2004, pp 51–66.

McCauley, R and E Remolona (2000): "Size and liquidity of government bond markets", *BIS Quarterly Review*, November, pp 52–8.

McCauley, R and S Yeaple (1994): "How lower Japanese asset prices affect Pacific financial markets", *Federal Reserve Bank of New York Quarterly Review*, vol 19, no 1, Spring, pp 15–33.

Mohanty, M S (2002): "Improving liquidity in government bond markets: what can be done?", in "The development of bond markets in emerging economies"*, BIS Papers*, no 11, June, pp 49–80.

Mori, J, N Kinukawa, H Nukaya and M Hashimoto (2002): "Integration of East Asian economies and a step-by-step approach towards a currency basket regime", *IIMA Research Report No 2*, November.

Ogawa, E and J Shimizu (2004): "Bond issuers' trade-off for common currency denominated bonds in East Asia", *Journal of Asian Economics*, vol 15.

Park, D and Y-C Park (2005): "Toward developing regional bond markets in East Asia", *Asian Economic Papers*, 3:2.

Plummer, M G and R W Click (2005): "Bond market development and integration in ASEAN", *International Journal of Finance and Economics*, 10, pp 133–42.

Williamson, J (1999): "The case for a common basket peg for East Asian currencies," in S Collignon, J Pisani-Ferry, and Y-C Park (eds), *Exchange rate policies in emerging Asian countries*, Routledge, London.

Nikola Tarashev

+41 61 280 9213
nikola.tarashev@bis.org

Kostas Tsatsaronis

+41 61 280 8082
ktsatsaronis@bis.org

Risk premia across markets: information from option prices[1]

A measure of risk premium is derived from the comparison of spot and option prices across the US equity and eurodollar markets. Risk premia in both markets co-move with volatility risk. Option prices, however, seem to underreact to changes in return volatility forecasts.

JEL classification: G120, G130, G140.

Financial market commentary often focuses on the identification and analysis of shifts in risk premia embedded in asset prices. Risk premia relate to the compensation that investors expect to receive for bearing risks. The analysis, however, is complicated by the fact that neither the premia nor their main drivers are directly observable. Inferences are typically made on the basis of comparisons between the prices of different securities with slightly different risk characteristics.

The compensation for risk naturally depends on investors' perception of the underlying risks and on the price they require per unit of risk, which relates directly to their attitude towards risk. Disentangling the two is key in deriving correct inferences from asset prices. The price of a security will decline if investors become more uncertain about the associated risk, even if they do not revise downwards their expectations of future cash flows. Alternatively, lower prices might signal investors' increased uneasiness with the uncertain nature of cash flows. In the first case, the price decline suggests a change in expectations about economic fundamentals that might be specific to the particular asset class. In the second case, it could be symptomatic of a more general shift in investor preferences that is likely to have implications for the pricing of risk across a spectrum of asset classes and might also affect other market functioning attributes such as liquidity.

In this article, we calculate risk premia on the basis of information regarding investors' risk attitudes that are extracted from option prices using techniques that have been developed recently in the academic literature. The

---

main innovation of our methodology is that it combines information from two different sources: the equity market and the money market. In doing so, it casts a broader net than other methods which also use information from option prices but typically focus on a single asset class. This results in reduced sensitivity of the estimates to technical aspects specific to any one market while making it easier to distinguish between diverging fundamentals across the two markets. Moreover, by deriving measures of market-specific risk premia in the context of a common specification of investor risk preferences, the methodology is consistent with the notion of an integrated financial system.

The article is organised in four sections. The first section discusses the definition of risk premia and gives a general description of the empirical methodology. The second focuses on the particular application to the two asset classes we examine. It discusses our findings and how investor perceptions about underlying risks relate to risk premia. The third section characterises the relationship between the estimated risk premia and the behaviour of asset price returns and volatilities. The final section focuses on the implications of assumptions regarding perceptions of risk for the estimates of risk premia and of investors' appetite for risk-taking.

Methodology[2]

Economic theory links the value of a security to the present discounted value of the associated stream of financial benefits. Investors' views of the likelihood of those benefits and their disposition towards uncertainty are the factors that determine the value of the security. Investors are assumed to assign a declining incremental value to additional benefits as the level of their wealth increases. This implies that, everything else constant, securities that offer higher payoffs when the level of wealth is lower are valued more highly. Another implication is that investors are risk-averse. The economic value of the uncertain payoff of a lottery ticket would be smaller than the statistical expectation of this payoff calculated on the basis of the lottery's odds. The difference between this statistical expectation and the economic (or preference-weighted) value of the uncertain payoff is often referred to as the risk premium.

Graph 1 illustrates this point. The red curve depicts the hypothesised statistical likelihood of future returns on a particular security. The value of the security to a risk neutral investor who shares this outlook about future returns should be equal to the statistical average of these payoffs, depicted by point **a**. By contrast, the preferences of a risk-averse investor can be summarised by the preference-weighted likelihood, shown as the blue curve, which puts greater weight on lower than on higher payoffs. The economic value of the security to this investor would be the average payoff calculated under this preference-weighted likelihood, depicted by point **b**.

Investors' aversion to risk …

---

[2]   The discussion and graphical exposition in this section draw on Tarashev et al (2003).

Statistical versus risk preference-weighted probability densities

Legend:
— Statistical
Preference-weighted:
— Low risk aversion
— High risk aversion

Investment payoffs

c b a

Graph 1
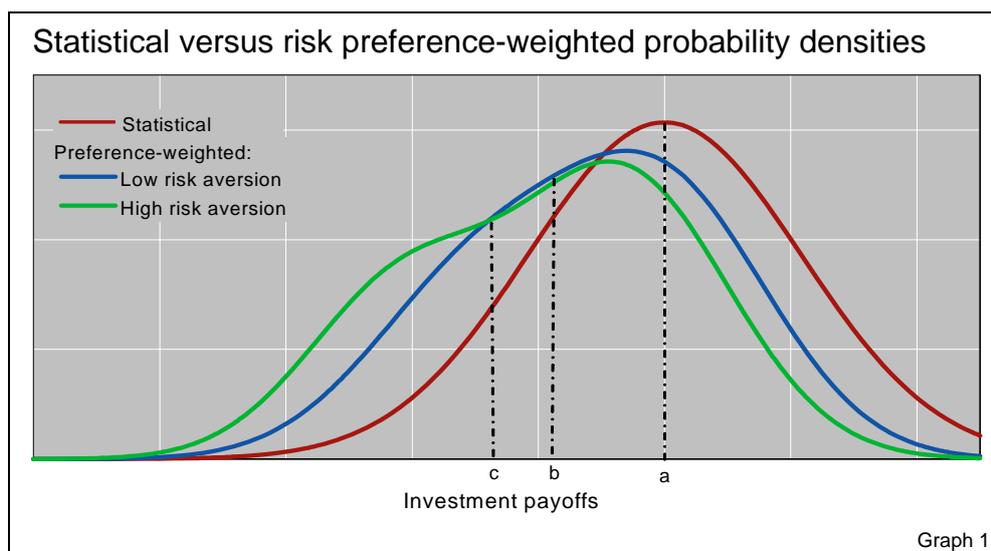
The distance between **a** and **b** reflects the risk premium, or the expected excess return over the statistical expectation of payoffs that a risk-averse investor requires as compensation for risk. The size of the premium is closely related to the shape of the statistical likelihood curve (the nature of uncertainty surrounding the payoff) and to the difference between it and the curve that incorporates the risk preferences of the investor. In fact, the green curve in the graph corresponds to the subjective likelihood for an investor who is less inclined to bear risk. The preferences of such an investor imply a larger gap between the statistical expectation of the payoff and the average payoff under the preference-weighted likelihood (point **c**) and, hence, a larger risk premium.

Our methodology for calculating risk premia is based on this framework and broadly follows Rosenberg and Engle (2002). It consists in (i) estimating the statistical likelihood of future payoffs on the basis of historical patterns in the price dynamics of a security and (ii) deriving a mapping between this likelihood and the preference-weighted likelihood by reference to a cross section of observed prices on option contracts on the same security. Even though the mapping is derived on the basis of option prices, it can be used to calculate the risk premium associated with the underlying security since it is assumed to represent the same set of fundamentals and investor preferences. (The box on page 96 provides further details.)

In recent years, there has been a growing literature that discusses the extraction of measures of investors' risk attitudes and risk premia on the basis of information contained in asset prices. The works of Rosenberg and Engle (2002), Bliss and Panigirtzoglou (2004), Aït-Sahalia and Lo (2000), Tarashev et al (2003), Misina (2005) and Gai and Vause (2005) present different methodologies aimed at isolating the effect of investors' aversion to risk on the pricing of financial securities. Another strand of this literature focuses on the impact of risk preferences on risk premia in different markets. Bollerslev et al (2005) compare the realised volatility in S&P 500 returns to the implied volatility in the prices of options on the same equity index to derive a measure

Deriving risk premia

We define risk premia as the difference between actual (or statistical) expectations and preference-weighted expectations of asset returns. In the most general terms, we first quantify two types of uncertainty: one regarding the return on the representative investors' overall wealth portfolio, and one regarding the payoffs from individual option positions. By parameterising the preferences of the representative investor, we can relate the two types of uncertainty to observed option prices. The values for the preference parameters are calibrated in order to match most closely the option prices observed in the data. Having quantified the relevant types of uncertainty and traders' preferences, we can calculate statistical and preference-weighted expectations and, thus, risk premia.

More concretely, our derivation starts from the idea that an option price is a preference-weighted expectation of the option's payoff. The latter is denoted by $g(R)$ and is fully specified contingent on the return of the underlying security, R_t. If we denote the return on investors' overall portfolio by W_t, the price, P_t, of a European-style option contract with an expiry date $t+T$ can be written as:

$$P_t\left(\theta_t\right) = e^{-r_t T} \sum g(R_{t+T}) M(W_{t+T}; \theta_t) \Pr(R_{t+T}, W_{t+T})$$

where r is the risk-free discount rate, $\Pr(R,W)$ denotes a statistical likelihood of the joint realisation or R and W as perceived by the representative investor, and the summation is taken over all the possible realisations of the pair $\left(R_{t+T}, W_{t+T}\right)$. The function M, commonly known as the pricing kernel, transforms the statistical probabilities into preference-weighted probabilities, $M(W, \theta)\Pr(W, R)$, when preferences depend on the parameters θ and the aggregate investment return.

To estimate the preference parameters (θ), we need to be able to calculate the implied option price, $P(\theta)$, for any values of these parameters. For the main part of the analysis, we apply a three-parameter orthogonal-polynomial specification to the pricing kernel (see Rosenberg and Engle (2002)). This specification is flexible enough to be applied to data from two different asset markets but, at the same time, is relatively robust to the risk of corruption from noise in the price data. In the last section of the paper, we use a two-parameter specification of the kernel, which directly delivers an indicator of risk aversion, but it is less robust to noise, and thus requires a further filtering of the option data.

The remaining task is to estimate the statistical probabilities of asset returns $\Pr(R, W)$, as perceived by the representative investor. We assume that these probabilities are based on statistical models that fit as closely as possible the observed return series. In addition, we pay particular attention to two aspects of the distributions of W and R: their volatility and correlation. To allow for time-varying asset volatility, we estimate an asymmetric GARCH model, first suggested by Glosten et al (1993), for each of the two returns separately. The model incorporates two established characteristics of asset returns: the persistence of volatility and the tendency of volatility to change with the level of returns. At each desired date t, we simulate the estimated GARCH models T days (roughly one month) into the future. In simulating the models, we draw pairs of shocks whose correlation coefficient equals the sample correlation between W and R over a two-year period prior to date t. For each date t, we repeat these simulations 5,000 times, thus deriving an empirical joint statistical likelihood $\Pr(W_{t+T}, R_{t+T})$.

The above procedure leads to an implied option price $P_t\left(\theta_t\right)$, which is a function of the values of the preference parameters. On each date t, these implied prices are then matched to the observed option prices for a cross section of contracts. The parameters (θ) are chosen to minimise

$$\sum_k \left(\left[P_t^k - P_t^k(\theta_t) \right] / P_t^k \right)^2$$

where k indexes the option contracts in the cross section and P^k denotes an observed option price.

Once we have estimated the preference parameters, we can calculate a risk premium for any asset. The risk premium is defined as the difference between the statistical expectation of an asset's return and the preference-weighted expectation of the same return. Taking an option's underlying asset as an example, its implied risk premium equals:

$$\sum r_{t+T} \Pr(R_{t+T}) - \sum r_{t+T} M(W_{t+T}; \theta_t) \Pr(W_{t+T}, R_{t+T})$$

of investors' pricing of equity market risk. In articles that have appeared in this *Quarterly Review*, Fornari (2005) analyses risk premia in fixed income markets using swaption prices, while Amato (2005) uses the preference-filtered likelihood of corporate bond payoffs embedded in CDS prices to derive measures of time-varying risk premia in the corporate bond market.

One important innovation in this article is that the estimation of the premia and the mapping between the statistical and preference-filtered likelihoods are based on information derived from two different markets. In an integrated financial system, there are strong a priori reasons for assuming that the preferences of the representative investor should have a similar impact on the pricing of different securities. Chief among these is the existence of arbitrageurs, who would take positions to exploit pricing discrepancies across markets.

The second innovation in this article is that the pricing filter is specified on the basis of an aggregate financial portfolio which includes equity and fixed income securities issued by both the public and the private sectors.[3] The composition of the portfolio corresponds closely to the composition of aggregate financial wealth and is thus better suited for the calibration of the representative investor's preferences. By contrast, existing methodologies focus on a single market (typically equities) and assume that the returns on that asset class are sufficient for characterising changes in overall investor wealth.

Risk premia in equity and money markets

We calculate time series of risk premia on the basis of option and futures prices and cash returns in the S&P 500 and eurodollar markets.[4] The data cover the period from February 1992 to February 2004. To avoid technical problems with option contracts too far away from or too close to expiration, we consider prices for contracts with one month to expiry date. Owing to a change in the frequency of eurodollar option expiry dates, we obtain quarterly risk premia estimates up to November 1995 and monthly estimates thereafter.[5]

Throughout the estimation, we conform to typical practice in the related literature. In particular, we closely follow Rosenberg and Engle (2002) in filtering out option contracts of suspect quality that could corrupt the estimation results. After suspect data have been eliminated, an average month features 34 strikes for the S&P 500 options and 14 strikes for the eurodollar options. In

---

[3] The aggregate financial portfolio is proxied by the stocks in the S&P 500 Index, the government bonds in the Lehman Brothers US Treasury Index and the corporate bonds in the Lehman Brothers US Corporate Investment Grade Index.

[4] The available data relate to American-style options on S&P 500 and eurodollar futures. In order to be able to apply the methodology outlined in the box, we adjust the option prices to their European-style analogues by following Barone-Adesi and Whaley (1987). We are grateful to William Melick for providing us with the eurodollar option data.

[5] In addition, poor data availability prevents us from calculating risk premia for the following months: January and December 1996, and April, June, July and September 1997.

addition and in line with the literature, we do not estimate a time-varying statistical expectation of S&P 500 returns but use instead the unconditional mean of these returns over the entire sample.[6]

Graph 2 plots the estimated measures of risk premia for the two markets. Each panel compares the estimation based on information from each market separately to that performed jointly using information from both markets. A number of observations are worth highlighting. First, for both markets, separately and jointly estimated premia exhibit similar patterns. Second, looking more closely at the eurodollar market premia, short-term movements in the market-specific indicators are dampened when the estimation is performed jointly across the two markets.[7] Finally, premia follow different trends across markets over the sample period. Equity market premia were on an upward trend between 1996 and 2000 but have been on a declining one since then.[8] By contrast, money market premia were on a general downward trend over most of the sample period, albeit at times matching short-lived swings in the equity market premium.

Return volatility is arguably the most commonly used measure of risk in financial markets. Graph 3 compares the behaviour of risk premia to

Risk premia
In per cent

S&P 500 returns   Eurodollar returns

Market-specific (rhs)[1]
Joint (lhs)[2]

[1] Based on S&P 500 option data (left-hand panel) and eurodollar option data (right-hand panel).   [2] Based on both S&P 500 and eurodollar option data.

Sources: Chicago Mercantile Exchange; authors' calculations.   Graph 2
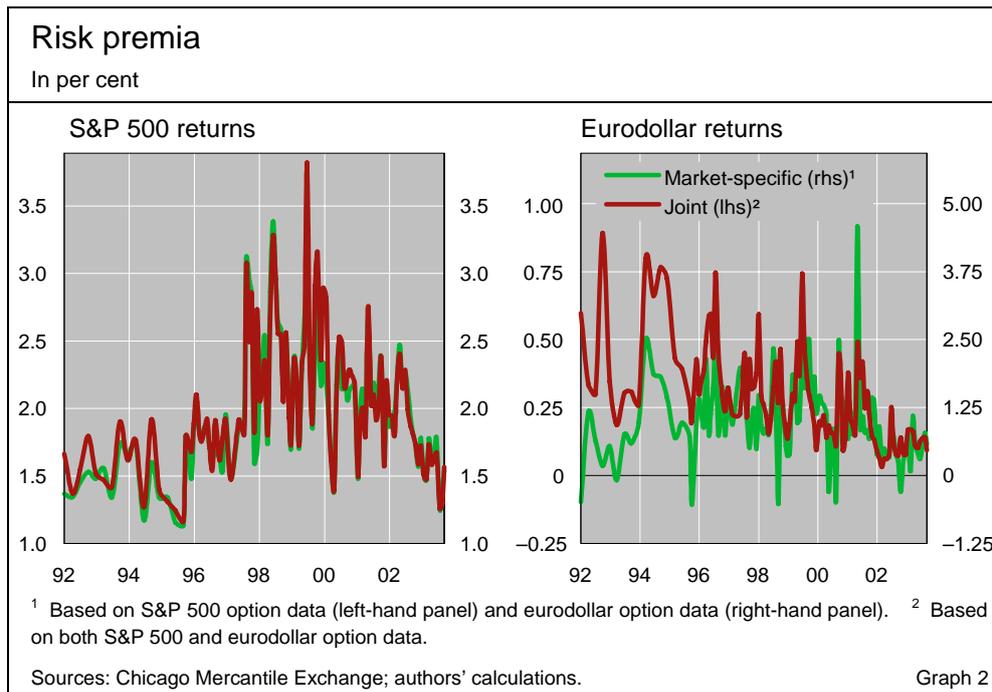
[6] The reason for not estimating a time-varying expected return is that the high volatility of stock returns introduces much uncertainty about their mean over short time horizons (one month, in our case). Allowing for time variation of the one-month statistical expectation of returns would tend to commingle the estimates of risk with those of expected return.

[7] The correlation between the risk premia estimated jointly and separately is 91% and 45% for the equity and the eurodollar markets, respectively. In addition, the standard deviation of market-specific risk premia on the eurodollar market equals 75% of the associated mean, while the same statistic drops to 63% for the jointly estimated risk premia.

[8] The upward movement of equity market premia is somewhat surprising as it coincides with a sustained bull market. The finding, however, is consistent with a higher return volatility over this period (see also the discussion in the next section).

Risk premia and expected volatility
In per cent

S&P 500 returns

Eurodollar returns

Expected volatility (rhs)[1]
Risk premia (lhs)[2]

[1] Based on GARCH estimates; annualised.   [2] Based on both S&P 500 and eurodollar option data.

Sources: Chicago Mercantile Exchange; authors' calculations.   Graph 3
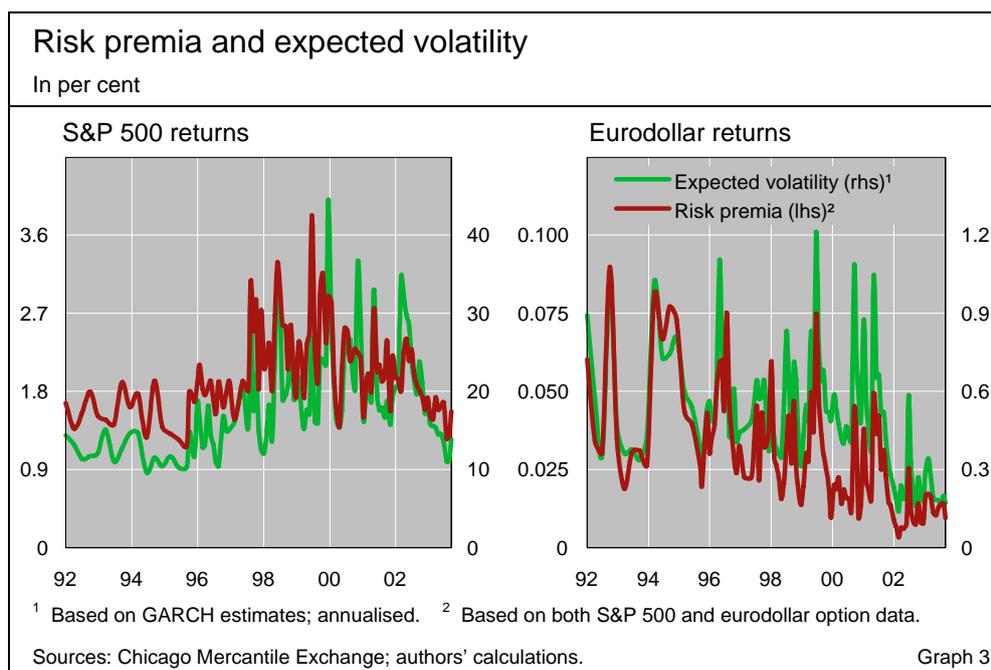
perceptions of risk, which are proxied by the expected short-term volatility of returns in the respective market. The volatility measure is based on the model of returns that underlies our estimation procedure. We observe that there is a fairly close co-movement between the two series. Premia seem to rise in anticipation of higher risk and to decline in more tranquil market conditions. This pattern is common across markets and throughout the sample period. This indicates that asset prices (in this case, options) do react to changes in perceived risk in the expected way.

Stylised patterns of risk, return and risk premia

This section examines further our estimates of risk premia by relating their dynamics to the dynamics of asset returns. A series of adverse investment returns is likely to induce investors to require greater compensation for bearing the risk of additional losses in subsequent periods. In addition, risk-averse traders would bid down the price of an asset if they perceived an increase in its volatility. With this in mind, we evaluate the relationship between risk premia and the level and volatility of asset returns and report the results in Table 1.

Table 1 presents the correlation coefficients of the estimated risk premia on the S&P 500 and eurodollar markets with three statistical characteristics of asset returns. The first characteristic is past realised returns and it is measured as the average return over the month ending on the date for which we calculate the risk premium. The second characteristic is the expected volatility of returns over the remaining life of the option. It is the volatility measure derived from the statistical likelihood that underpins our calculations, and represents an *ex ante* measure of perceived risk consistent with our statistical model of returns. The third characteristic, "realised volatility", is the actual realisation of asset price volatility around the expiry date of the associated option contract. In contrast to the second characteristic, this provides an *ex post* measure of volatility but

Risk premia and asset returns Correlation coefficients[1]			
Risk premium on:	Characteristics of corresponding asset		
	Past returns	Expected volatility	Realised volatility
S&P 500[2]	−0.32**	0.69**	0.39**
Eurodollar[3]	−0.20*	0.82**	0.33**
	Characteristics of aggregate portfolio[4]		
	Past returns	Expected volatility	Realised volatility
S&P 500	−0.30**	0.70**	0.39**
Eurodollar	0.12	−0.38**	−0.34**

* and ** denote statistical significance at the 5% and 1% levels, respectively.

[1] For the calculation of the correlation coefficients, a risk premium estimated for date t is aligned with, respectively: the average return between dates t–30 and t (past returns), the expected standard deviation of the return until the option's expiry date, as implied by GARCH estimates (expected volatility), and the standard deviation of returns between dates t+15 and t+45 (realised volatility).   [2] Correlation between the risk premium and summary statistics of S&P 500 Index returns.   [3] Correlation between the risk premium and summary statistics of eurodollar returns.   [4] The market portfolio is proxied by the S&P 500 Index and the Lehman Brothers Government Bond Index and Corporate Investment Grade Index.

Source: Authors' calculations. Table 1

could be thought of as an alternative measure of expected risk under the assumption that investors' expectations are correct on average. We calculate the three characteristics for returns on the S&P 500 Index, the eurodollar market and the aggregate portfolio.

Risk premia appear to react significantly to past returns. The first column of Table 1 indicates that abnormally low returns on the S&P 500 Index and the aggregate wealth portfolio tend to be followed by increases in the risk premium for equities. The same is true for eurodollar market returns and the corresponding premium. One explanation for the finding is that a series of low returns may put pressure on a trading operation's risk budget, which would drive up the required compensation for bearing risk in subsequent periods. Alternatively, the result might simply be a reflection of the frequently observed fact that price volatility increases when prices decline, coupled with persistence in bear market conditions. A period of low returns could be seen as foreshadowing high risk in the immediate future, hence raising the risk premium.

... past returns and ...

The second and third columns of the table provide evidence that the risk premium indeed compensates investors for expected and realised risk. The second column in the upper panel shows the positive link between risk premia and perceived asset return volatility, which was previously illustrated in Graph 3. For its part, the third column in the upper panel indicates that higher compensation for risk-taking is associated with higher realised risk. This also provides an indirect and partial validation of the statistical model of returns we use in our estimation method. The results reported in the lower panel of the table show that the risk premium on the S&P 500 Index is positively correlated with the perceived and realised volatility of returns on the aggregate wealth portfolio. Finally, we find a negative relationship between eurodollar risk premia and aggregate portfolio risk, mainly as a result of the low correlation between

... realised return volatility

the volatility of eurodollar returns and the volatility of returns on the aggregate wealth portfolio.

Perceptions of risk and measures of risk aversion

Our derivation of risk premia is based on a parameterisation of the risk preference filter of the representative investor. A direct by-product of the methodology is an indicator of investors' risk attitudes in the form of a time series of a key parameter in the estimated filter (see the box on page 96 for more details). In this section we discuss the behaviour of this indicator, which, in sharp contrast to the estimated risk premia, appears to be quite sensitive to how we model investors' perceptions of risk. We focus exclusively on the equity market.

Graph 4 plots measures of investor risk aversion on the basis of two alternative assumptions about investors' perceptions of risk.[9] The left-hand panel equates investors' expected volatility to the average estimated volatility over the entire sample, while the right-hand panel assumes that investors change their expectations of return risk consistently with the time series model we estimated. This time-varying measure of expected volatility is also depicted in both panels. The two assumptions about investors' perception of risk could be thought of as outlining the contours of a range of plausible alternatives. The fact that the estimates of risk premia under the two alternatives are virtually

Alternative indicators of risk aversion

S&P 500 futures market

Constant perceptions of risk[1]   Varying perceptions of risk[2]

Expected volatility (rhs)[3]
Risk aversion (lhs)

[1] Risk aversion estimates are based on the unconditional volatility of S&P 500 futures and put options on these assets.   [2] Risk aversion estimates are based on the conditional volatility of S&P 500 futures, as implied by GARCH estimates, and put options on these assets.   [3] Based on GARCH estimates; annualised; in per cent.

Sources: Chicago Mercantile Exchange; authors' calculations.   Graph 4

---

[9] The risk aversion indicator plotted in the graph is based on a simpler version of the model that allows us to summarise risk aversion as a single parameter of the pricing kernel (see box for details) but restricts the estimation to using only put option prices. These simplifications have no material impact on our overall conclusions.

identical provides comfort as to the robustness of the conclusions in the previous section.[10]

By contrast, the estimated indicator of risk aversion is very sensitive to alternative assumptions about investors' risk perceptions. Under the assumption of constant risk perceptions, the co-movement between the risk aversion indicator implied by the estimated model and our estimates of risk is very close. Risk aversion seems to increase when risk is elevated and to reach pronounced peaks in periods when contemporary market commentary indicated that investors were particularly shy of risk-taking. When one allows for time-varying risk perceptions, however, the derived indicator has a counterintuitive behaviour. It is negatively correlated with expected risk and seems to decline in periods when one would a priori have expected it to peak.

The latter finding is puzzling but it is not unique to our methodology, as Bliss and Panigirtzoglou (2004) find similar patterns for risk aversion when allowing for time-varying perceptions of risk. An explanation consistent with the underlying model is that while option prices do react to changes in forecasts of future return volatility, this reaction is subdued and excessively influenced by the historical average volatility of returns. This topic requires further analysis that lies beyond the scope of the present article.

Conclusions

In this article, we combined information from equity and money market option prices to derive measures of risk premia in these markets that are consistent with a single price of risk required by the representative investor. The process yields a robust measure of premia that co-move with measures of risk, in the form of both expectations and realisations of return volatility. Premia are also negatively correlated with past market returns, suggesting that investor behaviour might generate feedback from past to future asset price performance. The results suggest that consistent estimates of risk premia across asset classes could be a useful tool in interpreting financial market conditions, as well as in assessing near-term prospects in securities markets.

References

Aït-Sahalia, Y and A W Lo (2000): "Nonparametric risk management and implied risk aversion", *Journal of Econometrics*, vol 94, pp 9–51.

Amato, J D (2005): "Risk aversion and risk premia in the CDS market", *BIS Quarterly Review*, December, pp 55–67.

Barone-Adesi, G and R E Whaley (1987): "Efficient analytic approximation of American option values", *Journal of Finance*, vol 42, no 2, pp 301–20.

---

[10] The correlation between the two alternative premia over the sample period is equal to 94%. Given that the risk premium embedded in option prices increases with investors' perception of and aversion to risk, a change in the estimated risk aversion will counteract changes in estimated risk perceptions for a given set of observed option prices.

Bliss, R R and N Panigirtzoglou (2004): "Option-implied risk aversion estimates", *Journal of Finance*, vol 59, pp 407–46.

Bollerslev, T, M Gibson and H Zhou (2005): *Dynamic estimation of volatility risk premia and investor risk aversion from option-implied and realized volatilities*, working paper.

Fornari, F (2005): "The rise and fall of US dollar interest rate volatility: evidence from swaptions", *BIS Quarterly Review*, September, pp 87–97.

Gai, P and N Vause (2005): "Measuring investors' risk appetite", *Bank of England Working Paper Series*, no 283.

Glosten, L R, R Jagannathan and D E Runkle (1993): "On the relation between the expected value and the volatility of the nominal excess return on stocks", *Journal of Finance*, vol 48, no 5, pp 1779–801.

Misina, M (2005): "Risk perceptions and attitudes", *Bank of Canada Working Papers*, no 2005–17.

Rosenberg, J V and R F Engle (2002): "Empirical pricing kernels", *Journal of Financial Economics*, vol 64, pp 341–72.

Tarashev, N, K Tsatsaronis and D Karampatos (2003): "Investors' attitude towards risk: what can we learn from options?", *BIS Quarterly Review*, June, pp 57–65.

Blaise Gadanecz

+41 61 280 8417
blaise.gadanecz@bis.org

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

The various Basel-based committees and the Financial Stability Forum (FSF) took a number of initiatives during the fourth quarter of 2005. The FSF held its fourth Latin American meeting, as well as a meeting with representatives of the hedge fund community and their counterparties. At the FSF's request, the Joint Forum published a consultative paper on high-level principles for business continuity. The Basel Committee on Banking Supervision (BCBS) released two consultative papers, the Committee on the Global Financial System (CGFS) published a report on housing finance and the Committee on Payment and Settlement Systems (CPSS) issued three new publications. Table 1 provides a selective overview of these and other recent initiatives.

Financial Stability Forum

The Financial Stability Forum held its fourth Latin American regional meeting in Mexico City in November 2005. It also met with representatives of the hedge fund industry and their counterparties in London and New York.

At its fourth Latin American regional meeting …

At the *fourth Latin American regional meeting*, participants exchanged views on strengths and vulnerabilities in the international and regional financial systems and on recent progress in developing domestic securities markets. They also shared experiences on strengthening financial systems and reviewed the state of the banking sector.

At the meeting, it was noted that global and regional economic growth had been resilient in recent years and that continued expansion was expected. The region had benefited from improvements in the terms of trade, as well as lower funding costs and strong capital inflows supported by highly accommodative global financial conditions. Policymakers had generally succeeded in taming the high inflation rates experienced in the past, while flexible exchange rates had helped reduce vulnerabilities. Participants noted that it was important for regional economies to manage the consequences of these currently benign conditions, by using the opportunity to strengthen their economies and financial systems to deal with potentially more difficult times ahead. In this context, participants stressed the need for continuing structural reforms and fiscal discipline, as well as further consolidation of debt and improvements in debt management practices. They agreed on the importance of clear communication

… the FSF notes the need for continuing structural reforms and fiscal discipline

of policy priorities, including the commitment to price stability as the overriding objective of monetary policy.

Progress in promoting the growth of Latin American domestic securities markets was evaluated. Recent developments were seen as having brought benefits to both public and private issuers, including lower exposure to foreign exchange risk and a more diversified investor base. Demand for domestic securities has been growing rapidly, both from the increasingly important domestic institutional investor sector, in particular pension funds, and from foreign investors. Views were exchanged on the appropriate sequencing of policies in this area, including the development of market infrastructure, the fostering of a diverse set of domestic investors with adequate risk management skills, and the development of derivatives markets. A remaining challenge was to encourage greater private sector issuance, including measures to reduce the crowding-out of such issuance by government debt.

<div style="float:right">Development of domestic securities markets and policy implications</div>

Participants shared experiences with regard to the strengthening of financial systems, with particular focus on the prioritisation of reforms (a process seen as especially challenging given countries' multiple reform goals and limited resources), on assessments against international standards and on the need for enhanced prioritisation by the setters and assessors of standards.

<div style="float:right">Need for prioritisation of reforms</div>

In a context of stabilising economies and strengthened supervisory frameworks, it was noted that banking sector profitability and capitalisation had improved across the region. Foreign-owned institutions were playing an important role, providing capital and expertise, including in risk management. However, they were also posing challenges for policymakers and supervisors, especially as regards coordinating home and host supervision.

<div style="float:right">Stocktaking on state of banking sectors</div>

The FSF held two *informal workshops with members of the hedge fund community and their counterparties* in London and New York. Current developments in the hedge fund sector were discussed, together with risks in the present market environment, risk management challenges for hedge funds and their counterparties, and a range of operational issues. Participants noted growing institutional investor interest in the sector. This has brought increased investor scrutiny to the industry, with expectations of greater professionalism and more disciplined management practices. Recognising that the current accommodative market environment (including favourable credit conditions and ample financial market liquidity) may not endure, participants agreed on the critical importance of adequate counterparty risk management practices, including appropriate haircuts and other collateral management techniques. Participants also discussed operational issues in the market for credit derivatives. While they noted the progress recently made by the industry to reduce documentation backlogs, improve assignment procedures and facilitate settlement, further progress was deemed necessary to enhance market stability.

<div style="float:right">Informal workshops with hedge funds and their counterparties</div>

Joint Forum

At the request of the FSF, in December the Joint Forum released a consultative paper on *high-level principles for business continuity,* to help authorities

develop business continuity arrangements which are tailored to their own sectoral and local circumstances. The paper, open for comments until 10 March 2006, sets out seven principles:

(i)   the definition of responsibilities;

(ii)   the importance of performing active business continuity planning;

(iii) the need to tailor recovery operations to the risks posed to the financial system;

(iv)   the importance of internal and external communication;

(v)   specific provisions for cross-border communication;

(vi)   periodic testing;

(vii) implementation and review.

Basel Committee on Banking Supervision

In November 2005, the Basel Committee on Banking Supervision issued two consultative documents. One paper related to sound credit risk assessment and valuation for loans, and a second to home-host information sharing for the effective implementation of Basel II. The two papers were open for comment until 28 February. In addition, the Committee also provided clarification regarding the treatment of expected operational risk losses when using advanced measurement approaches.

Inadequate credit risk assessment policies and procedures, which may lead to untimely recognition and mismeasurement of loan losses, undermine the usefulness of capital requirements and hamper proper assessment and control of a bank's credit risk exposure. Given the importance of this topic, the BCBS issued a consultative paper on *sound credit risk assessment and valuation for loans*, which provides banks and supervisors with guidance in this area, regardless of the accounting framework applied. The document discusses the use of common data and processes for credit risk assessment, accounting and capital adequacy, and highlights provisioning concepts that are consistent with both the prudential and accounting frameworks. It also focuses on policies and practices believed to promote sound credit risk assessment and controls, including the responsibilities of the board of directors and senior management for maintaining aggregate provisions for loan losses.[1]

The paper also presents general guidelines on how supervisors should evaluate the effectiveness of a bank's credit risk policies.

Also in November, the Basel Committee released, in association with the Core Principles Liaison Group, a consultative paper on *home-host information sharing for effective Basel II implementation*. The paper elaborates on some of the high-level principles for cross-border implementation of the new framework, specifically by laying out general principles to guide the information sharing

---

[1]   Most of the guidance relates to the advanced internal ratings-based approach under Basel II, although some of it is applicable to all banks irrespective of the approach they are using. The paper focuses on loans carried at amortised cost, but some parts of it are believed to be relevant for addressing credit risk assessment and valuation issues pertaining to assets other than loans carried at amortised cost and other credit exposures.

Main initiatives by Basel-based committees and other bodies				
Press releases and publications over the period under review				
Body	Initiative	Thematic focus	Release date
FSF	*FSF meets with the hedge fund community and its counterparties*	• Trends in the hedge fund sector, risks in the present market environment, risk-management challenges for hedge funds and their counterparties, operational issues.	Nov 2005
	Fourth Latin American Meeting	• Strengths and vulnerabilities in the international and regional financial systems and their consequences for emerging markets, sustainability of public debt. Recent policies to develop domestic securities markets, national experiences with strengthening financial systems.	
Joint Forum	Consultation paper on *high-level principles for business continuity*	• Establishes consistent context for the development of business continuity arrangements, aimed at financial industry participants and financial authorities globally. Provides a broad framework.	Dec 2005
BCBS	Consultative paper on *sound credit risk assessment and valuation for loans*	• Policies and practices to promote sound credit risk assessment, valuation and control processes, and to clarify the responsibilities of the board of directors and senior management. Assessment guidelines for supervisors.	Nov 2005
	Consultative paper on *home-host information sharing for effective Basel II implementation*	• General principles to guide the sharing of information between home and host country supervisors in the implementation of the Basel II capital framework.	
	Newsletter on *the treatment of expected losses by banks using the advanced measurement approaches under Basel II*	• Clarification of the appropriate treatment of expected operational losses in calculating regulatory capital charges for operational risk.	
CGFS	*Housing finance in the global financial market*	• Analyses the significance of developments affecting the supply of, and demand for, housing finance. • Compares national housing finance systems.	Jan 2006
CPSS	*Cross-border collateral arrangements*	• Describes existing institutional arrangements, discusses alternative models for the acceptance of foreign collateral and identifies potential implications for financial stability, competition and the safety and efficiency of payment systems.	Jan 2006
	General guidance for payment system development	• Sets out 14 guidelines, based on consultation version of May 2005.	
	Statistics on payment and settlement systems in selected countries	• Preliminary statistics for 2004	
Source: Relevant bodies' websites (www.bis.org and www.fsforum.org).			Table 1

process. These include the clear communication of home and host supervisory responsibilities to banking groups with significant cross-border operations, and timely communication of information between home and host country

supervisors – recognising that different information sets are relevant for these two parties. The paper also addresses the format, frequency and confidentiality of information sharing. The general principles are supplemented by practical examples of the information that host supervisors might need for effective Basel II implementation and supervision.

Finally, in a newsletter prepared in response to queries from the industry, the BCBS provided clarification on the issue of the *treatment of expected operational risk losses in advanced measurement approaches (AMA) under the Basel II framework.* The newsletter offers four guiding principles to promote consistent implementation of AMA, while still leaving sufficient room for appropriate discretion by national supervisors.

Committee on the Global Financial System

CGFS report on housing finance identifies supply and demand factors …

The CGFS set up a working group in November 2004 to study recent changes in housing finance systems as part of the Committee's ongoing work to guard against risks to financial stability. The report prepared by the working group, entitled *Housing finance in the global financial market* and published in January 2006*,* aims to analyse the significance of developments that are common across countries and affect the supply of, and demand for, housing finance. These include higher loan-to-value ratios, an increase in the range and complexity of mortgage products, the growing importance of capital markets in the funding of mortgages, and a greater willingness of households to take on interest rate and other risks. The report lists as important implications the possibility of overstretched household balance sheets, the greater reliance by financial institutions on capital market funding for housing finance, their resulting exposure to financial market volatility, and the need for careful

… and highlights relevant policy issues

management of credit, operational and reputational risks. For investors, mortgage-backed financial products offer diversification opportunities but also introduce a new source of market volatility. Policymakers need to ensure that they have access to a broad array of high-quality data to monitor possible vulnerabilities, and should foster stress testing and information exchange at an international level. At the same time they must remain mindful of how changes in the different national regulatory and other environments could impact on national housing finance systems and economies, as well as global financial markets.

Committee on Payment and Settlement Systems

In January 2006, the CPSS released three publications: a report on cross-border collateral arrangements, general guidance for national payment system development, and a set of statistics on payment and settlement systems in selected countries.

In the area of cross-border collateral arrangements …

The report on *cross-border collateral arrangements* describes existing institutional arrangements through which central banks accept collateral denominated in a foreign currency or located in a foreign jurisdiction to support intraday or overnight credit, either routinely or in an emergency. It also

discusses alternative models for the acceptance of foreign collateral. In addition, the report identifies the potential implications of a central bank's collateral policy for financial stability, competition and the safety and efficiency of payment systems. The variety of collateral policies and practices among central banks, participants' differing needs, procedures and varying national legal frameworks suggest a wide range of approaches regarding the acceptance of foreign collateral. Thus, the G10 central banks agreed on adopting an "à la carte" approach, under which each central bank decides independently whether and, if so, under what circumstances, to accept cross-border collateral. That said, further cooperation and coordination among central banks might be desirable if this increases the effectiveness of an individual central bank's policies and actions, or serves to help the private sector in developing more advanced tools for managing collateral and liquidity.

... G10 central banks agree on an "à la carte" approach

The *general guidance for payment system development* is based on a consultative paper released in May 2005.[2] It draws on the contribution of a working group composed of a broad range of central bank experts from developed and developing countries around the world. The report includes 14 guidelines and accompanying explanatory text on payment system development. In addition, there are implementation sections which illustrate the guidelines with practical examples, issues and possible approaches to implementation.

Publication of general guidance for payment system development

The *statistics on payment and settlement systems* are part of an annual publication that provides data on payments and payment systems in the CPSS countries. This most recent statistical update contains individual country data and cross-country comparisons for 2004 and earlier years.[3]

---

[2] See *BIS Quarterly Review*, September 2005.

[3] Some data for 2004 are preliminary or missing; the CPSS intends to publish an updated version in March 2006.