

## Highlights of international banking and financial market activity<sup>1</sup>

The BIS, in cooperation with central banks and monetary authorities worldwide, compiles and disseminates several datasets on activity in international banking and financial markets. The latest available data on the international banking market refer to the third quarter of 2007. The discussion on international debt securities and exchange-traded derivatives draws on data for the fourth quarter of 2007.

### The international banking market

Activity in the international banking market continued to expand in the third quarter of 2007, amidst growing tensions in global financial markets. The three sections below focus on developments in the interbank market using the three sets of international banking statistics collected by the BIS. The first tracks the movements in the most recent quarter, with particular emphasis on activity in banks located in the United Kingdom. The next section provides an analysis of the evolution of international banks' US dollar funding needs. The data suggest that European banks have, since 2000, increasingly borrowed from other banks to finance their growing net long positions vis-à-vis non-banks, which may have contributed to problems in the interbank market as refinancing became more difficult. The third section looks at bilateral interbank exposures of various national banking systems using the BIS consolidated banking statistics. Relative to Tier 1 capital, international interbank exposures differ significantly across systems, with European banks generally exhibiting higher ratios than US banks.

#### *Global flows and the London interbank market*

BIS reporting banks' cross-border claims continued to expand in the period under review. Total claims rose by \$1.1 trillion in the third quarter of 2007, to reach \$32 trillion. An expansion in interbank claims accounted for \$661 billion of the overall increase, despite the growing squeeze in various segments of the

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market. In recent quarters, the rate of expansion in international bank credit rose to its highest level in 20 years. The year-on-year growth in total claims, which has been accelerating steadily since 2002, reached 22% in the most recent quarter, a level last seen prior to the 1987 stock market sell-off. As discussed in more detail in the box on pages 24–5, economic slowdowns and episodes of financial turmoil in the past were often preceded by periods of accelerating growth in international bank credit, particularly in interbank lending.

The top panels of Graph 1 map the net flow of funds via the international banking system in the third quarter of 2007. The largest arrow, representing a net flow of funds (\$172 billion) from the United States to the United Kingdom, was in part driven by changes in interbank positions (top right-hand panel). US dollar-denominated claims booked by banks in the United States on banks in the United Kingdom expanded by \$89 billion in the most recent quarter, driving the overall estimated net interbank flow of \$71 billion. The BIS locational banking statistics by nationality, which do not provide a vis-à-vis country breakdown, suggest that much of this reflected inter-office activity of UK-headquartered banks.<sup>2</sup>

Changes in positions vis-à-vis non-banks also contributed to the overall net transfer of funds from the United States to the United Kingdom (Graph 1, top left-hand panel).<sup>3</sup> Banks in the United Kingdom reduced their claims on non-banks in the United States by \$26 billion, reflecting a drop in loans (\$39 billion) and equity claims (\$23 billion).<sup>4</sup> This contributed to the first significant decline (\$56 billion) in their net claims on these non-banks, which had been growing steadily since 2002. Overall, net claims of banks in the United Kingdom (including islands) on non-banks (worldwide) have grown by an estimated \$1 trillion since end-1999, much of which was denominated in US dollars.<sup>5</sup> At the same time, their net liabilities to banks increased by a similar amount, a sectoral transformation which is shown in Graph 1 (bottom left-hand panel).<sup>6</sup> Growing net liabilities to banks in Switzerland, the euro area, Asian offshore centres and oil-exporting countries have presumably been used to

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<sup>2</sup> Data reported by the United States indicate a \$72 billion increase in claims on own offices abroad booked by UK-headquartered banks located in the United States.

<sup>3</sup> This includes loans to corporate borrowers and non-bank financial institutions as well as investment in debt and equity securities. Across all reporting countries, debt security claims on non-banks have grown from \$1.2 trillion (or 35% of total claims on non-banks) in the first quarter of 2000 to \$4.3 trillion (or 37%) in the third quarter of 2007.

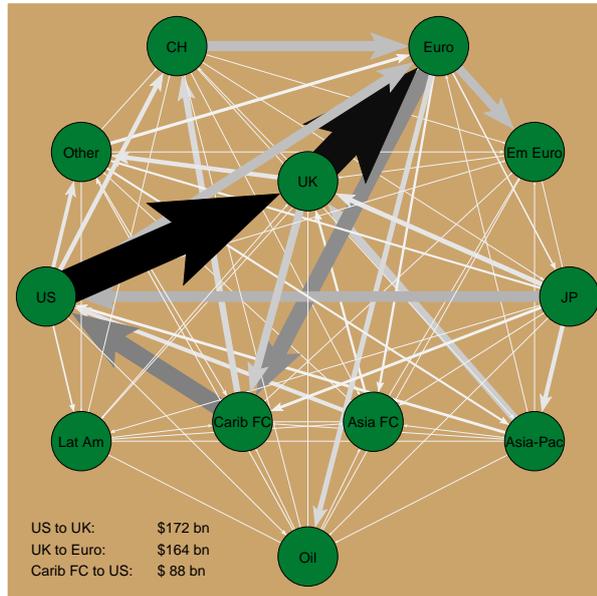
<sup>4</sup> This was partially offset by greater investment in debt securities (\$37 billion), which possibly reflected a shift into US Treasury securities. While impossible to identify precisely, the BIS consolidated banking statistics indicate that claims on the US public sector booked by French, German and UK banks rose by an aggregate \$71 billion.

<sup>5</sup> On a gross basis, banks in the United Kingdom reported \$3 trillion in claims on non-banks in the third quarter of 2007, roughly half of which was denominated in US dollars.

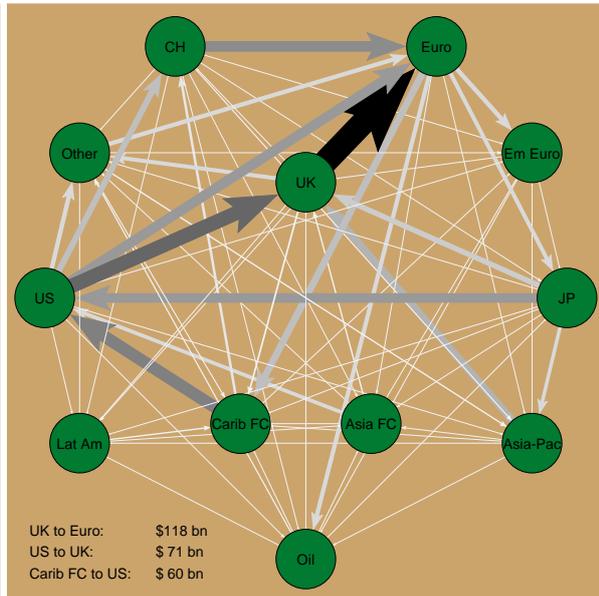
<sup>6</sup> Liabilities to banks include positions vis-à-vis own offices, other banks and official monetary authorities. In the BIS statistics, uncollateralised interbank positions cannot be distinguished from collateralised (ie repo) transactions.

# Net flows of funds through the international banking system<sup>1</sup>

Total net flows<sup>2</sup> during 2007 Q3

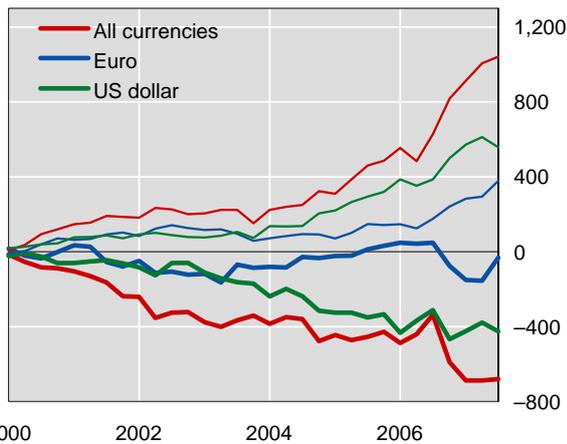


Interbank net flows<sup>2</sup> during 2007 Q3

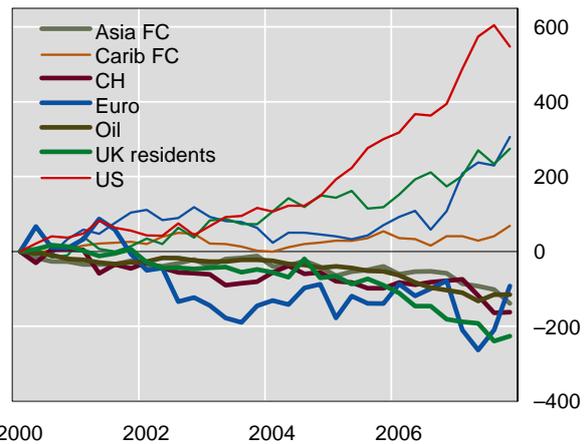


Cumulative net flows through banks in the United Kingdom<sup>3</sup>

By currency and sector



By counterparty and sector



Asia FC = Asian financial centres (Hong Kong SAR, Macao SAR and Singapore); Asia-Pac = China, India, Indonesia, Korea, Malaysia, Pakistan, the Philippines, Taiwan (China) and Thailand; Carib FC = Caribbean financial centres (Aruba, the Bahamas, Bermuda, the Cayman Islands, the Netherlands Antilles and Panama); CH = Switzerland; Em Euro = emerging Europe (Bulgaria, Croatia, Cyprus, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia, Slovenia, Turkey and Ukraine);

Euro = euro area member states excluding Slovenia; JP = Japan; Lat Am = Argentina, Brazil, Chile, Colombia, Mexico and Peru; Oil = OPEC member states (excluding Indonesia) plus Russia; Other = Australia, Canada, Denmark, New Zealand, Norway and Sweden; UK = United Kingdom, Guernsey, the Isle of Man and Jersey; US = United States.

<sup>1</sup> Exchange rate adjusted flows, expressed at constant end-2007 Q3 exchange rates. <sup>2</sup> The thickness of an arrow is proportional to the amount of net bank flows between countries/groups, and is comparable across panels. An arrow points from A to B if net flows in this direction are positive, calculated as net interbank claims (assets minus liabilities) of banks in A on banks in B, plus net claims of banks in A on non-banks in B, minus net claims of banks in B on non-banks in A. (This last component is missed if B is not a reporting country.) The graph does not show intraregional flows or reporting banks' lending to domestic residents. See also P McGuire and N Tarashev, "Tracking international bank flows", *BIS Quarterly Review*, December 2006. <sup>3</sup> UK as defined above, in billions of US dollars. Thick lines refer to interbank net flows, thin lines to non-bank net flows.

Source: BIS international locational banking statistics on a residence basis.

Graph 1

finance their net claims on non-banks, primarily in the United States (Graph 1, bottom right-hand panel).

### *US dollar funding in the interbank market*

The sectoral transformation taking place in banks in London is analysed in more detail in this section, with an eye towards identifying the national banking systems involved. Market commentary has suggested that European banks had difficulty obtaining US dollar funding as the tensions in the interbank market grew in the second half of 2007. The BIS locational statistics *by nationality* allow for a (partial) reconstruction of the global balance sheets of banks of a given nationality, thus providing some information, albeit incomplete, on these banks' net funding requirements in a particular currency.<sup>7</sup>

Overall, these data suggest significant differences in the global funding patterns of European and US banks. The top panels of Graph 2 portray aggregated net claims, broken down by sector, booked by offices of US and European banks located in various reporting countries (as detailed in the lower panels).<sup>8</sup> As shown in the top left-hand panel, US banks have borrowed US dollars from non-banks, and have channelled these funds to unaffiliated banks through the interbank market. By the third quarter of 2007, their total net claims on other banks (excluding inter-office claims) reached \$442 billion, up from virtually nil in 1999.

US banks channel  
US dollars to the  
interbank market ...

At the same time, European banks have borrowed from other banks to fund US dollar claims on non-banks (Graph 2, top right-hand panel). Since 1997, their net liabilities to banks, which include both uncollateralised loans and repo financing, have grown to more than \$800 billion, much of this to unaffiliated banks and official monetary authorities. European banks have booked a substantial portion of their claims on non-banks from their offices in London (Graph 2, bottom right-hand panel), with German, UK and, to a lesser extent, Dutch and Swiss banks increasing their net claims the most. German banks' US dollar-denominated net claims on non-banks grew from \$50 billion in 2000 to \$463 billion in the most recent quarter.

... to fund European  
banks' investment  
in non-banks

These diverging positions of US and European banks suggest that the latter face relatively large US dollar funding requirements, which may help in understanding the liquidity squeeze in the interbank market during the second half of 2007. Interbank borrowing tends to be short-term, whereas banks' investment in non-banks is of varying maturities. While the associated term risk may have been hedged, the build-up of European banks' US dollar liabilities to other banks presumably used to fund their US dollar non-bank assets may

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<sup>7</sup> The *BIS locational statistics by nationality* provide a breakdown of banks' total cross-border positions (in all currencies) and positions vis-à-vis residents (in foreign currencies), broken down by the *nationality of the parent bank* in each reporting country. Positions are further broken down by sector (non-bank, other bank and inter-office) and by currency, but not by vis-à-vis country.

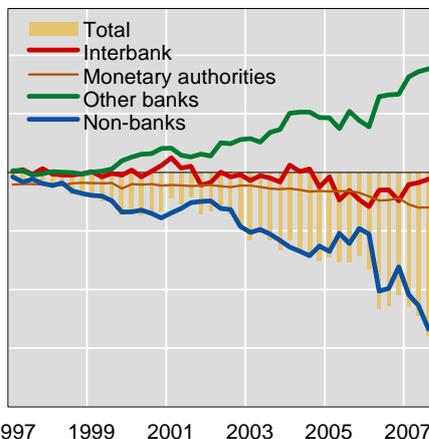
<sup>8</sup> These data should be interpreted with caution since they exclude US dollar-denominated claims on residents booked by offices in the United States and claims on all counterparties booked by offices in non-reporting countries. The figures presented in Graph 2 tracking net claims on "other banks" exclude inter-office borrowing. However, the US dollar positions reported by France and Germany do not distinguish these from inter-office positions, and are treated as positions vis-à-vis "other banks".

## Funding in the US dollar interbank market

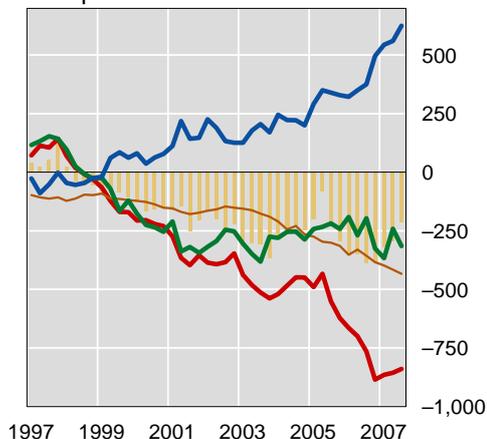
In billions of US dollars

### Net claims,<sup>1</sup> by bank nationality

#### US banks<sup>2</sup>

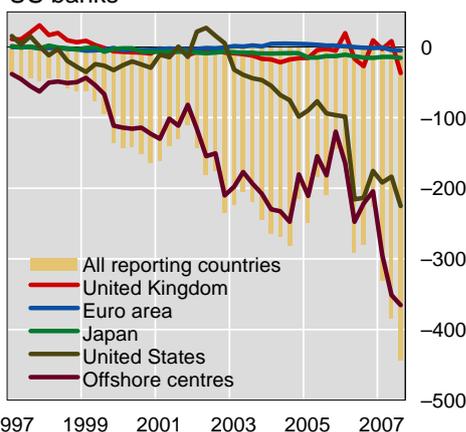


#### European banks<sup>2</sup>

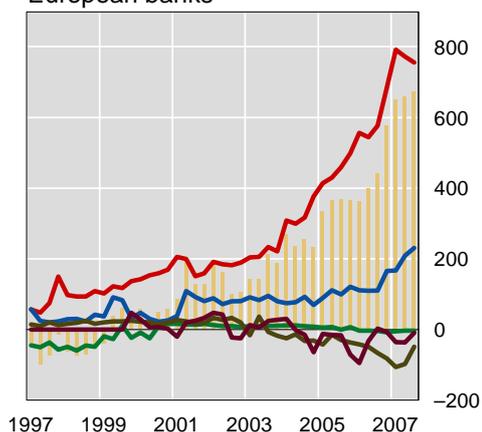


### Net claims<sup>1</sup> on non-banks, by location of booking office

#### US banks



#### European banks



<sup>1</sup> Net claims are calculated as cross-border claims minus cross-border liabilities. The interbank component is further broken down into inter-office claims (not shown), claims on other banks and claims on official monetary authorities. <sup>2</sup> Net claims of banks' offices located in all BIS reporting countries are aggregated by the parent country indicated in the panel heading.

Source: BIS locational banking statistics by nationality of ownership of reporting banks.

Graph 2

have required a frequency of rollovers in the interbank market that became difficult to maintain as market tensions increased.

### Global interbank exposures

From the preceding focus on funding and liquidity risk, this section shifts the discussion to an analysis of counterparty risk in the interbank market. From this perspective, the BIS consolidated statistics on an ultimate risk basis (UR basis) provide relevant information at the level of national banking systems, including both cross-border and local positions.<sup>9</sup> These statistics can be used to track

<sup>9</sup> The ultimate risk reporting concept, combined with the sectoral breakdown, provides a rough estimate of *bilateral* interbank exposures of national banking systems. For example, on a UR basis, interbank claims reported by the United States vis-à-vis the United Kingdom provide an estimate of US banks' global claims on UK banks (as opposed to US banks' claims on banks

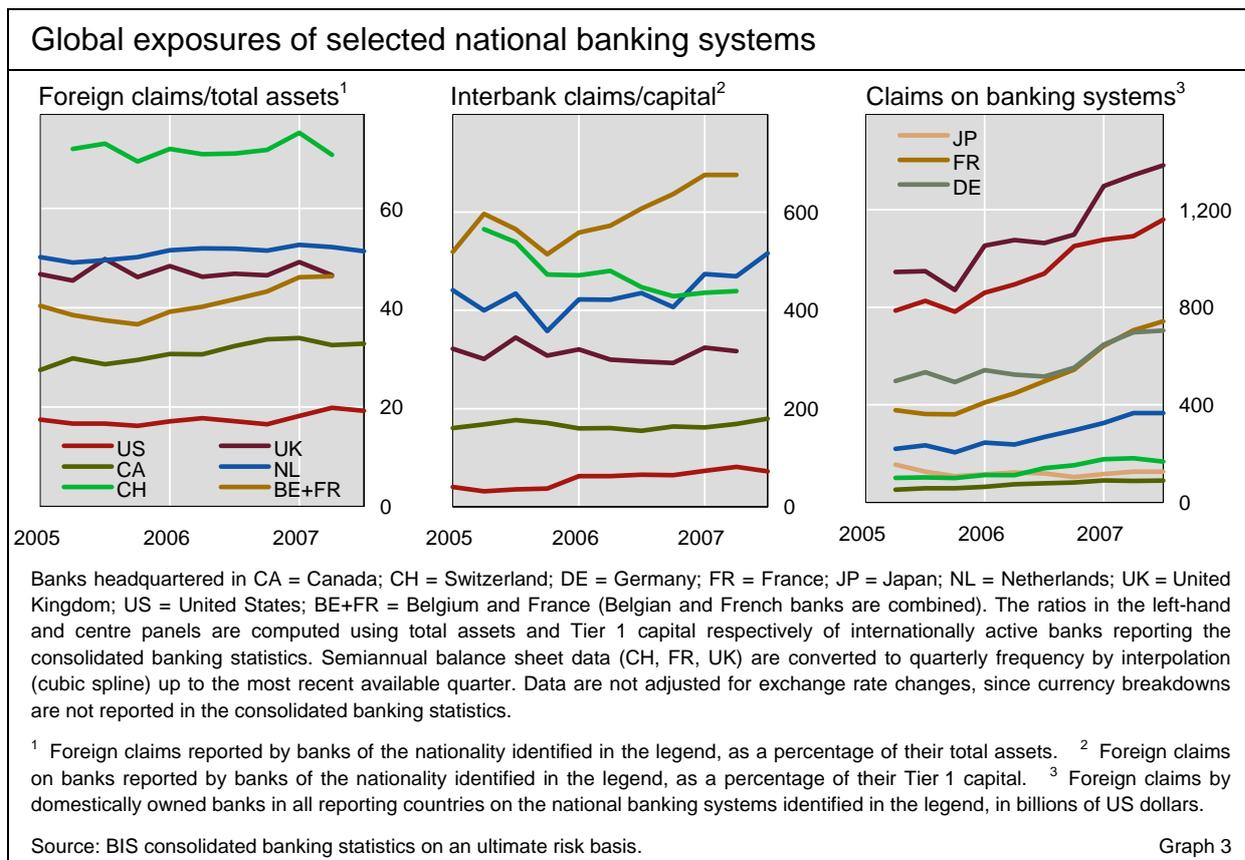
*bilateral* exposures of national banking systems (regardless of the location of their respective offices), thus shedding light on the overall structure of global interbank exposures at the onset of the turmoil.

The size of foreign exposures differs substantially across banking systems. UK and German banks' foreign claims (UR basis) are the largest, both standing at \$4.1 trillion, followed by French banks (\$3.2 trillion), Swiss, Dutch and Japanese banks (over \$2 trillion each) and US banks (\$1.7 trillion). Scaling these foreign exposures by banks' total assets (ie including domestic assets) yields a more comparable measure for gauging the importance of international business across different national banking systems (Graph 3, left-hand panel). So measured, foreign exposures have been relatively stable, but these ratios differ greatly across banking systems. For example, foreign claims account for less than 20% of US banks' total assets, for 30–50% of Canadian, UK, Belgian and French banks' total assets, and for over 50% of Swiss and Dutch banks' total assets.

Foreign exposures can be large relative to total assets ...

Exposures to other national banking systems make up a significant share of banks' total foreign exposures. Scaled by Tier I capital, US banks' interbank exposures are relatively small, at roughly 72% of their Tier I capital, albeit up from 40% in 2005 (Graph 3, centre panel). At the other end of the spectrum are Belgian and French banks, with their combined international interbank

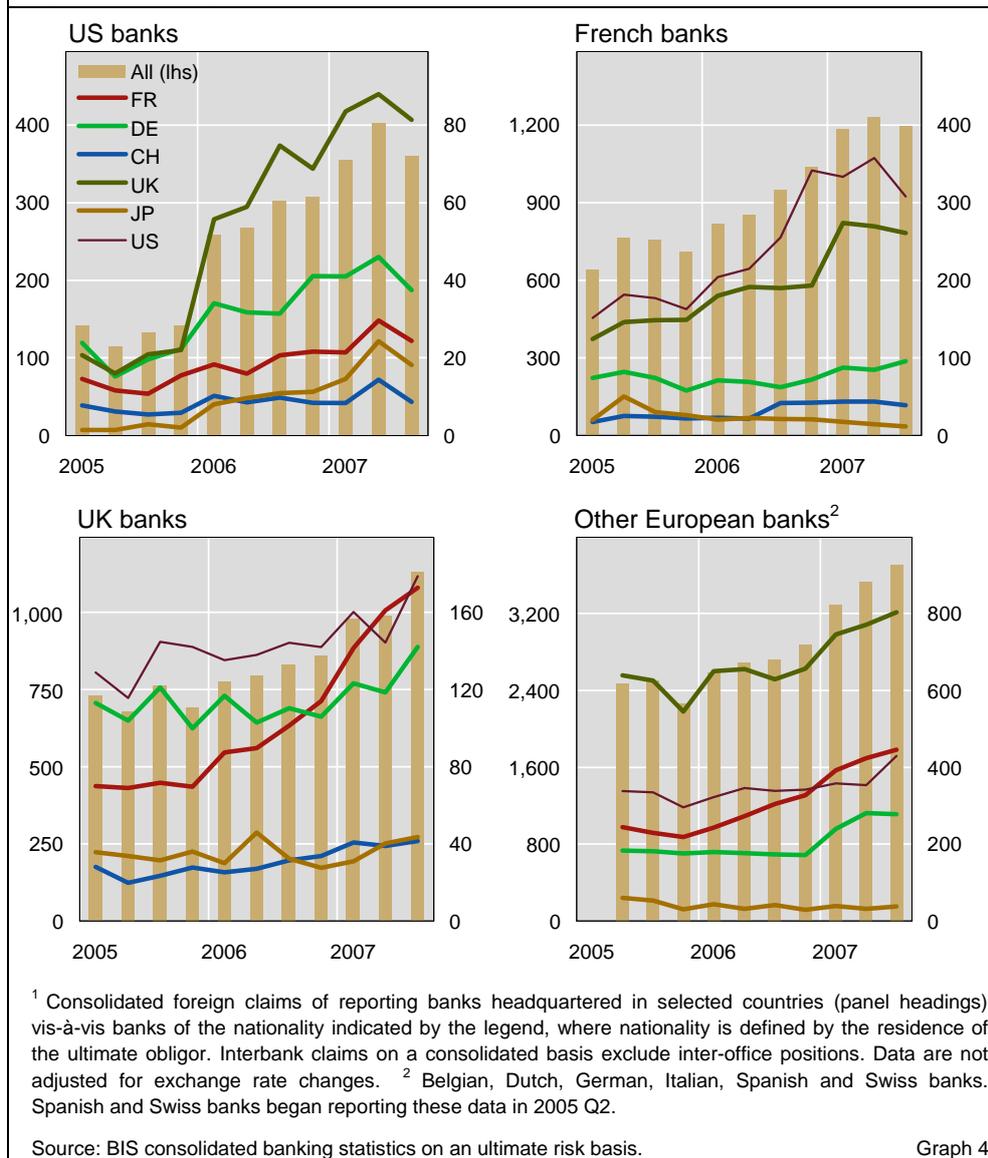
... and relative to Tier 1 capital



located in the United Kingdom, as in the BIS consolidated statistics on an immediate borrower basis (IB basis)).

## Bilateral interbank exposures of selected banking systems<sup>1</sup>

By bank nationality, in billions of US dollars



exposures nearly seven times their Tier I capital, followed by Dutch and Swiss banks at more than four times.

Since 2005, banks have built up increasingly large positions vis-à-vis some national banking systems. Foreign claims on US banks, reported by banks headquartered outside the United States, have increased since the second quarter of 2005 from \$785 billion to almost \$1.2 trillion (Graph 3, right-hand panel). This amounts to 15% of total foreign claims on the entire banking sector. Claims on UK banks have grown significantly as well, reaching nearly \$1.4 trillion by the third quarter of 2007, or 18% of total foreign claims on banks. The underlying *bilateral* exposures driving these movements are shown in Graph 4. By the second quarter of 2007, French banks' claims on US and UK banks had grown to \$357 billion and \$270 billion, respectively.

## Cyclical growth in the interbank market

Patrick McGuire and Karsten von Kleist

Growth in international bank credit varies significantly over time. Using the BIS locational banking statistics, this box assesses the growth in international banking activity around periods of major stress in global financial markets and changes in underlying real economic activity. The exercise suggests that growth in international bank claims has in several cases accelerated in the years prior to a significant financial shock, particularly in the US dollar segment of the interbank market, before decelerating after the shock occurs.

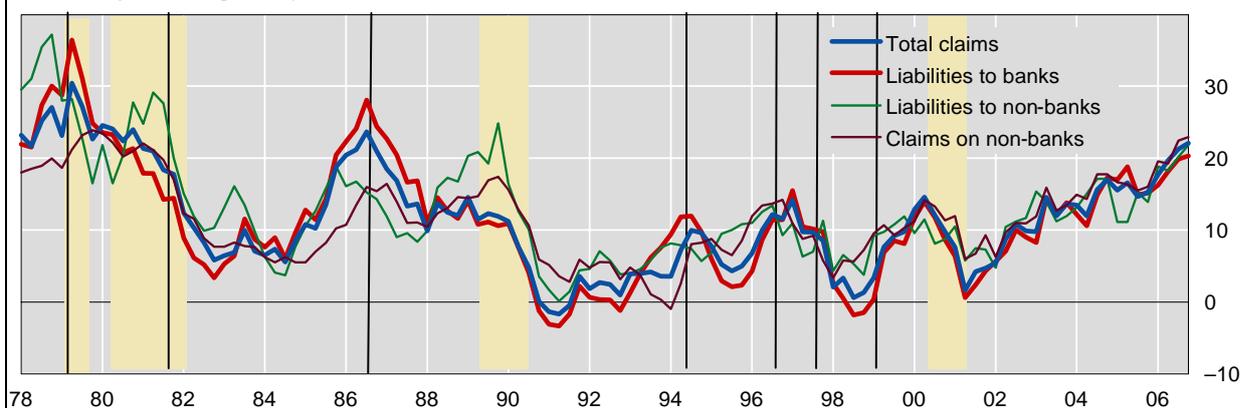
The primary measures used here are year-on-year growth rates of international positions on BIS reporting banks' balance sheets. Although simple, a long-term analysis of these series provides a convenient indicator of credit expansion in the international arena across the business cycle. Graph A plots the growth rate of total international claims and liabilities, broken down by sector.<sup>1</sup> The vertical lines represent well known economic shocks or the start of episodes of financial turmoil, and the shaded areas indicate periods of US recession using the NBER definition.

The data indicate a fairly clear relationship between these periods of global financial stress and major swings in the year-on-year growth in outstanding positions. Over the past 30 years, there were five major peaks in the growth rates of banks' total international claims. The peak followed by a deceleration in growth at the start of the period corresponds to the global slowdown following the second OPEC oil shock. As shown in the top panel of Graph B, banks recycled petrodollars into emerging economies, ahead of the Latin American debt crisis in the 1980s. Global lending peaked again in late 1987, around the time of the sharp US stock market sell-off in that year. As shown in the bottom panel of Graph B, which maps the contribution to overall growth by *nationality* of the reporting banking system, greater lending by Japanese banks contributed significantly to overall growth throughout the 1980s. The acceleration and deceleration of growth around 1987 for the most part reflected changing lending patterns of US and European banks. Growth peaked several times during the 1990s and after, roughly corresponding to the Mexican peso crisis and the bond market sell-off in 1994, the Asian financial crisis in 1997 and the bursting of the dotcom bubble in 2000 followed by recession in the United States. During these periods, lending to borrowers in the United States, United Kingdom and euro area were significant contributors to the overall growth in international banking activity (Graph B, top panel).

Historically, growth in *interbank* activity has corresponded more closely to these periods of financial stress, while the rates of growth in lending to and borrowing from non-banks have

### Growth in international banking activity<sup>1</sup>

Year-on-year changes, in per cent



The vertical lines mark: 1979 second oil shock; 1982 Mexican default; 1987 stock market correction; 1994 Mexican peso devaluation; 1997 Asian financial crisis; 1998 Russian default and LTCM; 2000 Nasdaq peak. The shaded areas mark US recessions (NBER definition).

<sup>1</sup> Growth in BIS reporting banks' cross-border claims in all currencies and foreign currency claims on residents.

Graph A

exhibited more variable patterns. This can be seen by comparing the growth rates across sectors in Graph A. In several cases, the growth in liabilities to non-banks slowed in the quarters preceding an event, even as borrowing from banks continued to grow.

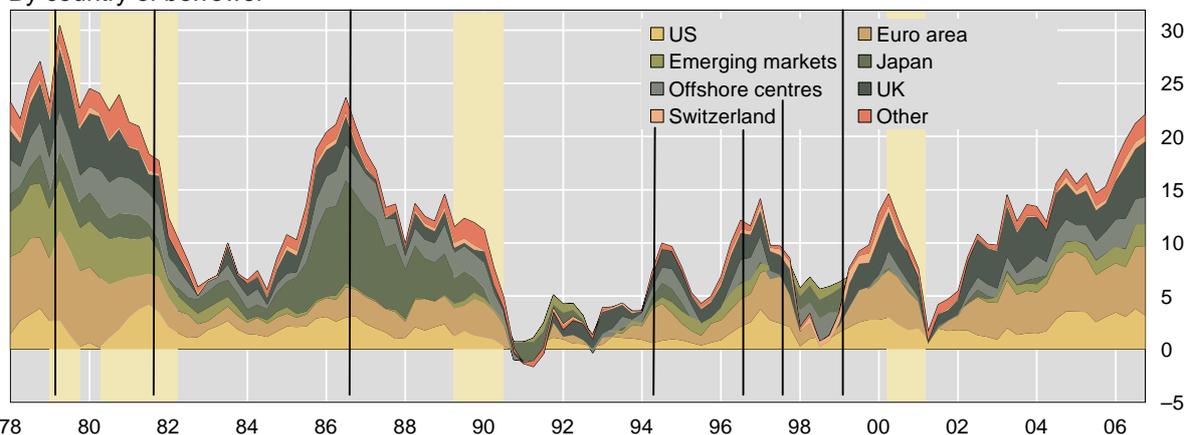
In the most recent cycle, lending to non-banks has contributed to overall growth as well. Banks' total international claims have been growing at more than 20% a year for the past three quarters, a rate not seen since the mid-1980s just before the stock market crash of 1987. Moreover, growth has accelerated since 2002, roughly at the same time as broader (scaled) measures of activity in the global banking market show a marked increase.<sup>②</sup> Since 2002, total claims on non-banks have expanded by \$8 trillion (to \$13.4 trillion), with roughly one quarter of this expansion reflecting greater credit to residents of the United States, and another quarter to residents of the euro area.

① Year-on-year changes in outstanding stocks are calculated by summing the quarterly exchange rate adjusted flows in quarters  $t$  to  $t-3$ , and dividing by the outstanding stock in quarter  $t-4$ . ② For example, Graphs 1 and 2 in McGuire and Tarashev's "Tracking international bank flows", *BIS Quarterly Review*, December 2006 indicate that the overall stock of international bank claims scaled by global GDP kinked upwards in 2000. Scaling total liabilities by M2 yields a similar picture.

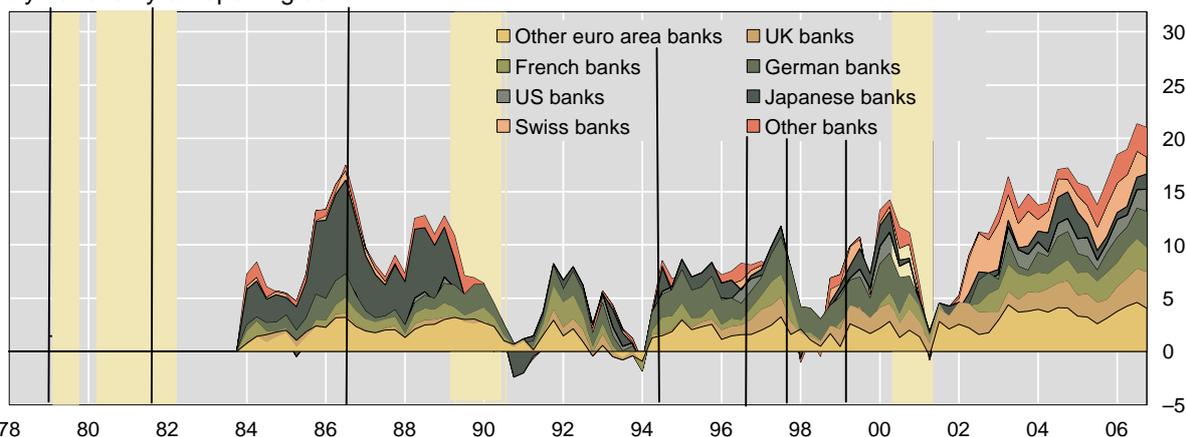
## Contributions to growth in international bank claims

Year-on-year changes, in percentage points

By country of borrower<sup>1</sup>



By nationality of reporting bank<sup>2</sup>



The vertical lines mark: 1979 second oil shock; 1982 Mexican default; 1987 stock market correction; 1994 Mexican peso devaluation; 1997 Asian financial crisis; 1998 Russian default and LTCM; 2000 Nasdaq peak. The shaded areas mark US recessions (NBER definition).

<sup>1</sup> Based on the BIS locational banking statistics by *residence*. <sup>2</sup> Based on the BIS locational banking statistics by *nationality*, which start in 1983. The overall growth rate implied by these data differs from the top panel due to a smaller reporting population and because inter-office positions are excluded.

Graph B

US-headquartered banks' foreign claims on other banking systems have grown significantly since 2005 to reach \$403 billion by the second quarter of 2007, of which UK banks accounted for \$88 billion.

Tentative signs of a credit contraction in some segments of the interbank market emerged in the third quarter. US banks trimmed their exposures to almost all major banking systems, reducing foreign claims on banks by an estimated \$42 billion (Graph 4, top left-hand panel). This was the largest decline in interbank claims reported by US banks since the inception of the statistics on a UR basis (first quarter of 2005), and occurred in spite of a positive valuation effect.<sup>10</sup> Swedish banks also reduced their foreign interbank exposures by \$43 billion (–17%), of which half vis-à-vis German banks. The single largest bilateral reduction in interbank exposures (\$49 billion, –14%) was reported by French banks vis-à-vis US banks (Graph 4, top right-hand panel).

US banks reduce exposure to other banking systems

### The international debt securities market

Borrowing in the international debt markets remained sluggish amid the turmoil in financial markets. It rebounded somewhat in the fourth quarter of 2007 from the previous one, but was still well below prevailing levels before the turmoil. Net issuance of bonds and notes increased to \$487 billion from \$399 billion. The year-on-year growth rate, which has averaged 20% since 2000, plunged to –45%, down even further from the –23% recorded in the previous quarter.

Net issuance of bonds and notes remains sluggish

The increase from the third quarter came mostly from euro-denominated bonds and notes: net issuance increased to \$207 billion from \$90 billion. By contrast, net issuance of US dollar- and sterling-denominated bonds and notes was \$203 billion and \$30 billion, down from \$221 billion and \$48 billion, respectively. Net issuance of yen-denominated bonds and notes changed less markedly, from \$18 billion to \$14 billion. Gross issuance of yen-denominated bonds by non-Japanese issuers in the Japanese local market (samurai bonds) increased from \$3 billion to \$5 billion and posted a year-on-year growth rate of 27%, perhaps reflecting the relative stability of Japanese credit markets.

Euro-denominated borrowing increases

The increase in euro-denominated bonds and notes took place in several countries across the euro area (Graph 5, left-hand panel). For example, net issuance increased from \$10 billion to \$35 billion in Ireland, from \$17 billion to \$39 billion in Spain, and from \$12 billion to \$30 billion in France. For these countries, the increase in net issuance came mostly from financial institutions, whose borrowing in securities markets had largely dried up in the third quarter when the financial market turbulence commenced. In contrast, net issuance in Germany was still negative at –\$8 billion, due mainly to sluggish borrowing by public financial institutions. The decline was less marked than the –\$26 billion seen in the preceding quarter.

Most developed countries outside the euro area did not show a marked gain in borrowing from the third quarter. Net issuance in the United States and Japan was almost the same as in the third quarter, and that of the United

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<sup>10</sup> The depreciation of the US dollar over the course of the quarter tends to overstate end-of-period stocks of other currencies when expressed in dollars.

Kingdom and Australia fell to some extent. A notable exception was Canada, where net issuance increased from \$3 billion to \$19 billion, almost fully recovering from the slump in the previous quarter. Most of the increase in Canadian issuance came from financial institutions.

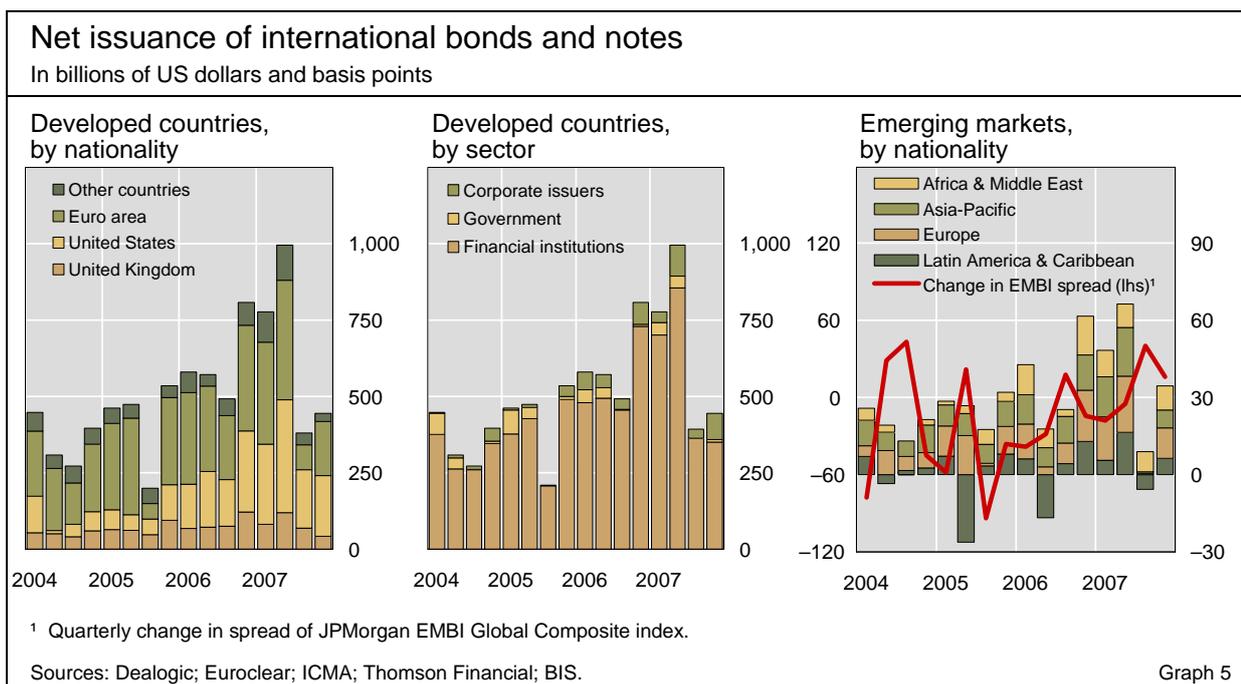
Declines seen in all credit rating categories

By credit quality class (for which only gross figures are available), declines in issuance were seen in all rating categories. Gross issuance of AAA-rated bonds decreased from the previous quarter's \$283 billion to \$255 billion in the fourth quarter, resulting in a year-on-year growth rate of -31%. Gross issuance of other investment grade and non-investment grade bonds decreased from \$279 billion and \$5 billion to \$264 billion and \$2 billion, respectively, which corresponds to year-on-year growth rates of -34% and -92%.

Distinct contrast between financial institutions and corporate issuers

By sector, there was a distinct contrast between the borrowing of financial institutions and that of corporate issuers during the period. Net issuance of bonds and notes by financial institutions in developed countries decreased further to \$351 billion in the fourth quarter from \$363 billion, which represented a year-on-year growth rate of -52% (Graph 5, centre panel). The largest contributor to this development was declining issuance by US private financial institutions. By contrast, net issuance by corporate issuers increased to \$86 billion from the previous quarter's \$30 billion, which corresponded to a positive year-on-year growth rate of 21%. The growth came chiefly from an increase in borrowing by US and European corporations.

Emerging economies showed gains from the third quarter. Net issuance of bonds and notes increased from \$3 billion to \$34 billion in the fourth quarter, albeit still below the \$66 billion achieved in the second quarter (Graph 5, right-hand panel). The bounce was due to a recovery in offerings from Latin America (from -\$6 billion to \$6 billion), emerging Europe (from \$1 billion to \$12 billion) and Asia (from \$1 billion to \$7 billion). The rebound in emerging market net issuance coincided with some narrowing of emerging market bond spreads, which had widened significantly in the third quarter.



## Derivatives markets

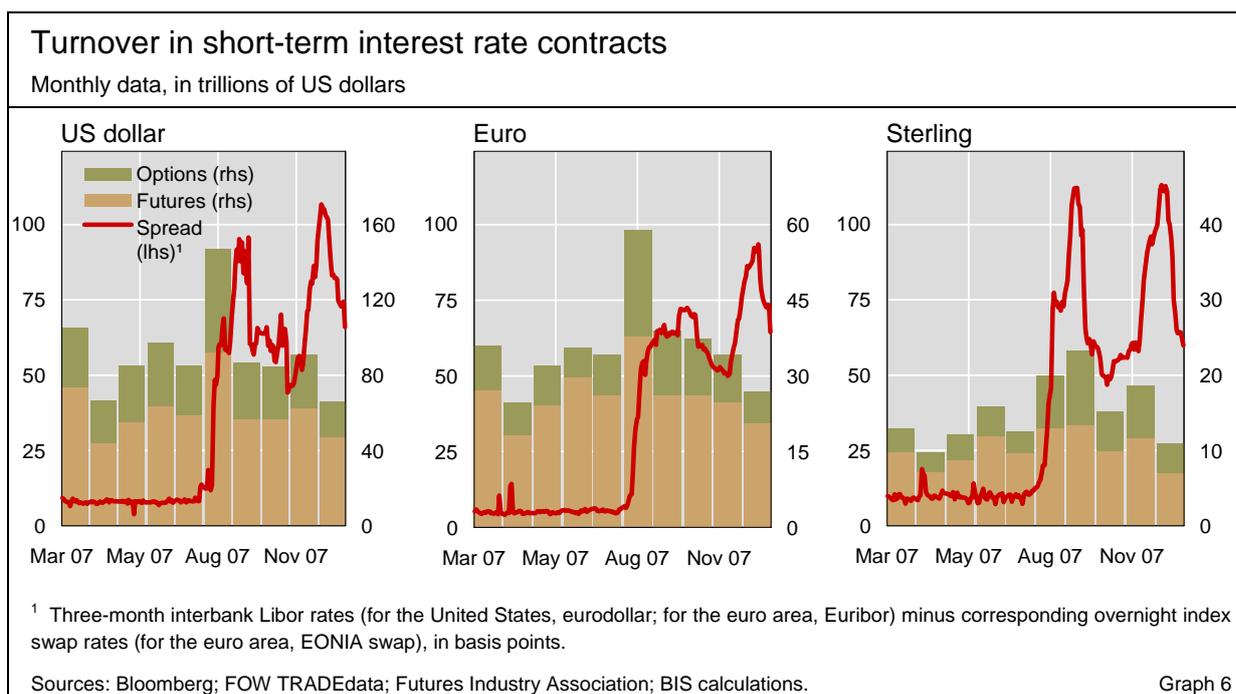
The fourth quarter of 2007 saw a substantial decline in activity on the international derivatives exchanges. This marked a reversal from the third quarter, in which the turmoil in financial markets had resulted in the highest turnover on record. The largest fall was in derivatives on short-term interest rates, whose turnover based on notional amounts decreased from the previous quarter's \$535 trillion to \$405 trillion in the fourth quarter. Declines were also evident for derivatives on long-term interest rates (from \$59 trillion to \$53 trillion) and stock indices (from \$81 trillion to \$75 trillion). Foreign exchange derivatives showed a more moderate descent from \$6.2 trillion to \$6.0 trillion. Total turnover in listed futures and options on these financial instruments fell from \$681 trillion to \$539 trillion in the fourth quarter, although the year-on-year growth rate still remained at a high level of 25%.

A large decline in turnover ...

The decline in derivatives on short-term interest rates followed a quarter in which heightened hedging needs by financial institutions had contributed to the active use of futures and options (Graph 6). Although money market turmoil continued into the fourth quarter, as evidenced by a widening of the spread between three-month interbank rates and overnight index swap rates, sharp falls were seen in currency segments heavily affected by the recent financial market turmoil. The largest decrease came in the US dollar segment (from \$319 trillion to \$241 trillion), followed by the euro (from \$131 trillion to \$98 trillion) and sterling (from \$55 trillion to \$44 trillion). Rapid declines were also recorded in short-term interest rate derivatives denominated in the Japanese yen (from \$10 trillion to \$7.4 trillion), Australian dollar (from \$8.1 trillion to \$6.5 trillion) and Swiss franc (from \$2.9 trillion to \$1.8 trillion).

... particularly in money market contracts

While turnover in futures and options on three-month eurodollar rates dropped substantially from \$266 trillion to \$187 trillion in the fourth quarter,



turnover in those on federal funds rates showed an increase from \$34 trillion to \$41 trillion. This suggests that hedging needs and speculative activity by financial institutions and other investors were skewed to some extent towards overnight rates instead of term rates, possibly reflecting heightened expectations of policy rate cuts in the United States. In addition, the impairment of liquidity that was reported in the term money markets may have been a factor dampening turnover in futures and options on the term rate segment.

Activity in equity derivatives on stock indices also declined, from the third quarter's \$81 trillion to \$75 trillion in the fourth quarter, although the year-on-year growth rate was still very high at 66%. By currency of denomination, South Korean won-denominated contracts decreased the most, from \$21 trillion to \$17 trillion, followed by contracts in the US dollar (from \$30 trillion to \$27 trillion) and the euro (from \$18 trillion to \$17 trillion). Conversely, the largest increase was in Indian rupee-denominated contracts (from \$2.0 trillion to \$2.5 trillion), followed by sterling (from \$2.0 trillion to \$2.3 trillion).

Trading in FX derivatives declines slightly

Trading in foreign exchange derivatives declined slightly from \$6.2 trillion to \$6.0 trillion in the fourth quarter. The main contributors were contracts in the yen (from \$1.1 trillion to \$890 billion), Swiss franc (from \$464 billion to \$353 billion) and sterling (from \$740 billion to \$652 billion). The large decline in yen and Swiss franc contracts is broadly in line with reports of less active position-taking on carry trades after the large-scale unwinding in August and September. By contrast, increases were reported for currencies such as the euro (from \$2.0 trillion to \$2.1 trillion), Australian dollar (from \$251 billion to \$286 billion), US dollar (from \$562 billion to \$596 billion) and Brazilian real (from \$611 billion to \$630 billion).

Commodity derivatives continue an uptrend

In contrast to financial derivatives, activity in commodity futures and options continued an uptrend in the fourth quarter. Global turnover in commodity derivatives measured in number of contracts (notional amounts are not available) increased from 456 million to 528 million, owing largely to the rapid expansion in agricultural commodities (from 257 million to 296 million), followed by energy products (from 140 million to 160 million) and precious metals (from 25 million to 34 million). A large contributor to this development was Chinese commodity exchanges, whose turnover increased from 203 million to 255 million in the fourth quarter, posting a year-on-year growth rate of 112%.