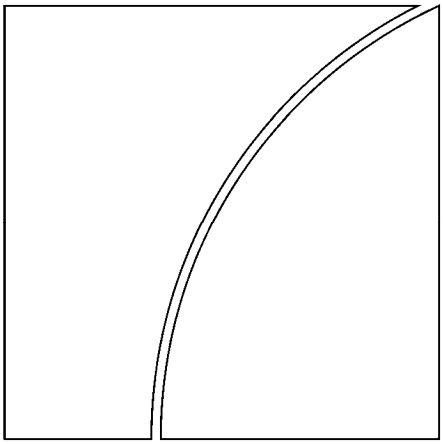
BANK FOR INTERNATIONAL SETTLEMENTS

BIS Quarterly Review

March 2010



International banking and financial market developments

BIS Quarterly Review
Monetary and Economic Department

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Special features

Notations used in this Review

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

Differences in totals are due to rounding.

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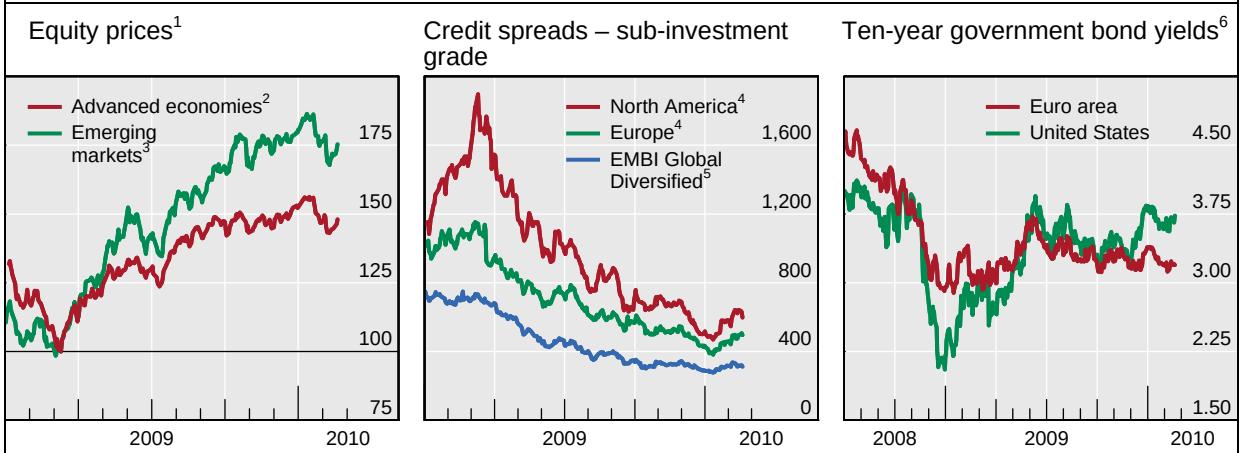
Overview: sovereign risk jolts markets

The rise in risky asset prices ran out of steam at the beginning of 2010. After 10 months of substantial increases, equity prices in both advanced and emerging economies started falling from mid-January (Graph 1, left-hand panel), while credit spreads widened (Graph 1, centre panel). With volatility and risk aversion rising, increased demand for government bonds pushed benchmark bond yields downwards (Graph 1, right-hand panel). Towards the end of the period under review, markets stabilised and some of the losses were reversed.

The apparent reduction of appetite for risky assets seen during much of the period was the result of a number of factors. In an environment where uncertainty about growth prospects persisted, mixed news on the economic recovery in Europe and the United States weakened investors' confidence. The unevenness of the global economic recovery added to the uncertainty. Moreover, concerns about sovereign credit risk intensified as market participants increasingly focused on the fiscal woes of Greece. These worries spilled over to a number of other countries in the euro area, and generally intensified the downward pressure on prices of risky assets. These sudden market pressures served as a warning about the financial risks of prolonged

Major market developments



[1] 3 March 2009 = 100. [2] Average of S&P 500, DJ EURO STOXX, TOPIX and FTSE 100 indices. [3] Average of Asian, European and Latin American emerging market equity indices. [4] Five-year on-the-run credit default swap (CDS) mid-spreads on sub-investment grade (CDX High Yield; iTraxx Crossover) quality, in basis points. [5] Stripped spreads, in basis points. [6] In per cent.

Sources: Bloomberg; Datastream. Graph 1

fiscal deficits. Against this backdrop, the euro fell significantly against other major currencies. In addition, market interpretations of steps and future plans to normalise very expansionary policies seemed to amplify investors' unwillingness to take on risk. Global equity prices fell following decisions by the Chinese authorities to raise the reserve requirement ratio for large depository institutions. Moreover, bond yields rose and equity prices fell after the US Federal Reserve announced an increase in the discount rate in the second half of February.

Asset prices retreat as investors shun risk

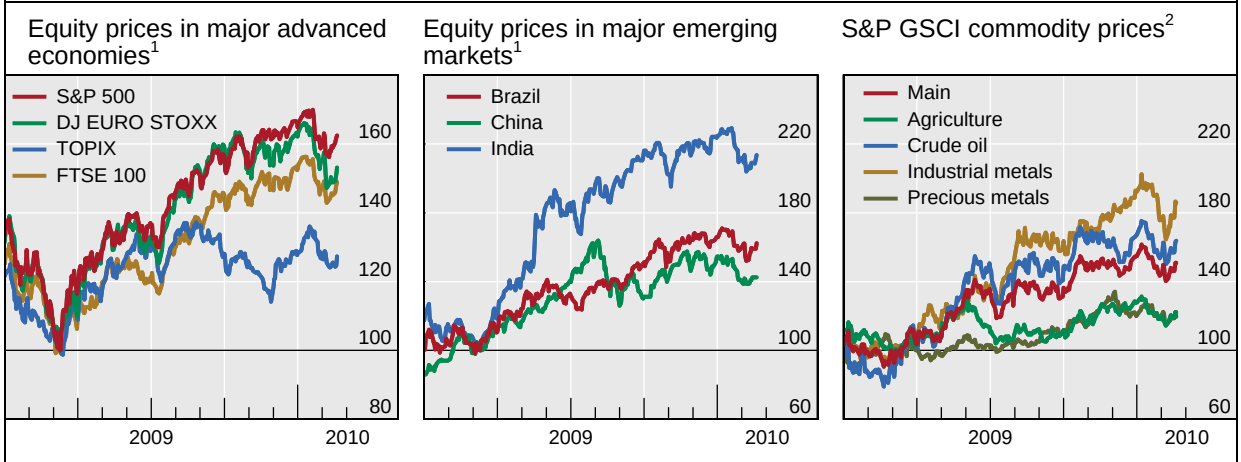
Investors sell off risky assets …

While prices of risky assets generally continued to rise until around mid-January 2010, a broad-based pullback subsequently took place. Equity prices fell throughout the major advanced economies and larger emerging markets (Graph 2, left-hand and centre panels). Towards the end of the period under review, markets stabilised and recovered some of these losses. Still, by 17 February, stock indices in both advanced and emerging economies were more than 5% lower on average than their local peak levels in mid-January. These declines were, however, relatively minor compared with the surge in equity prices seen since early March 2009, which – up until mid-January – amounted to around 55% in the advanced economies and 85% in the emerging markets. Credit markets were also affected, with spreads widening across the board. Commodity prices, which had risen strongly throughout much of 2009, fell back in tandem with other markets, but recovered somewhat towards the end of the period (Graph 2, right-hand panel).

… as uncertainty and risk aversion rise

Perceptions of greater uncertainty about future market price developments and higher aversion to risk among investors were important ingredients in recent market dynamics. Implied equity index volatilities, which by around mid-January had dropped to their lowest levels since the Lehman collapse, subsequently spiked up by about 5–10 percentage points in advanced as well as emerging market economies, before decreasing again gradually in February

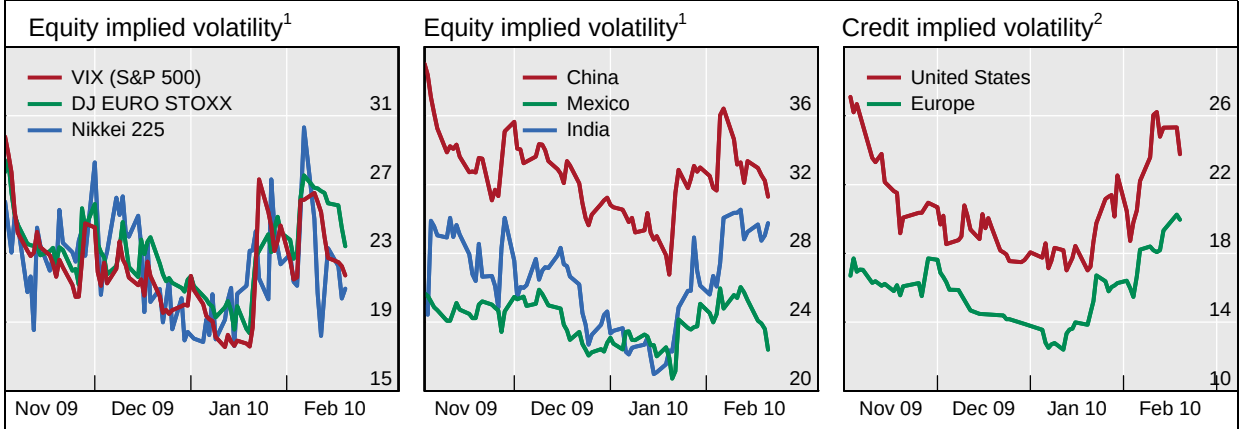
Equity and commodity markets



[1] In local currency; 9 March 2009 = 100. [2] Goldman Sachs Commodity Index; 9 March 2009 = 100.

Sources: Bloomberg; Datastream. Graph 2

Implied volatility



[1] Volatility implied by the price of at-the-money call option contracts on stock market indices, in per cent. [2] Volatility implied by the price of at-the-money one- to four-month option contracts on CDS indices (CDX High Yield; iTraxx Crossover), in basis points.

Sources: Bloomberg; BIS calculations. Graph 3

(Graph 3, left-hand and centre panels). In credit markets, implied CDS index volatilities edged upwards from mid-January after almost a year of more or less steady declines (Graph 3, right-hand panel).

Euro area sovereign debt concerns

Concerns about the market implications of large fiscal deficits came to the fore in late 2009 and early 2010. Investors' attention was first drawn to the issue of sovereign risk by the financial difficulties encountered by the government-owned Dubai World in late November. More recently, the focus has shifted to the euro area, where large budget deficits led to the prospect of rapidly increasing government debt/GDP levels in several countries (Graph 4, left-hand panel).

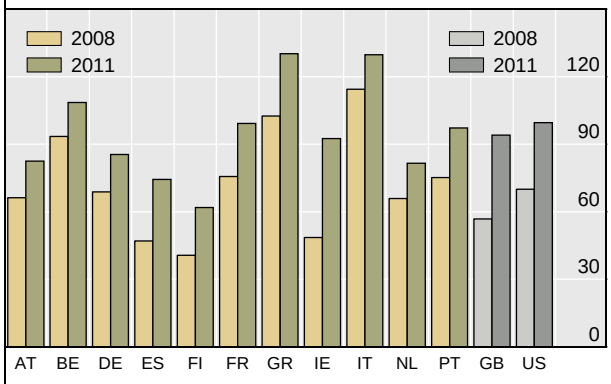
Greek fiscal difficulties drive sovereign spreads higher

Worries about the difficult fiscal situation in Greece, soon followed by similar concerns about Portugal and Spain, led to much wider credit spreads in both bond and CDS markets for these sovereign borrowers (Graph 4, right-hand panel). The credit spreads for some other euro area sovereign borrowers also rose. The more pronounced spread widening for Greece and, to a lesser degree, Portugal clearly reflected more imminent investor concerns. In contrast, Irish, UK and US spreads have changed little over recent months.

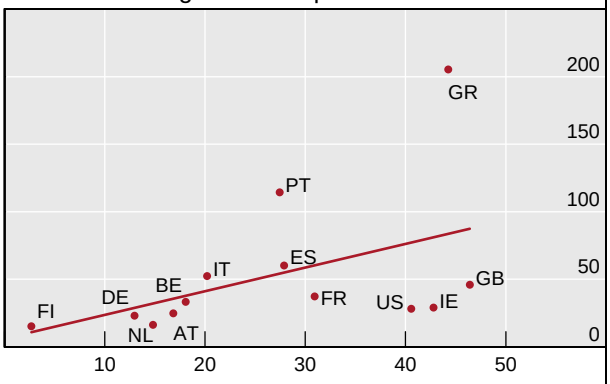
Activity in the CDS market for developed country sovereign debt increased significantly as investors adjusted their exposure to sovereign risk. This market was virtually non-existent only a few years back, when sovereign CDS were mostly on emerging market economies, but has since grown rapidly. This increase in activity resulted in significantly higher outstanding volumes of CDS contracts (Graph 5, left-hand panel). Nevertheless, the amount of sovereign risk which is actually reallocated via CDS markets is much more limited than the gross outstanding volumes would suggest. The sovereign reallocated risk is captured by the net outstanding amount of CDS contracts, which takes into account that many CDS contracts offset each other and therefore do not result in any actual transfer of credit risk. Net CDS positions on Portugal amounted to

Government debt, deficits and sovereign credit premia

Government debt/GDP[1]



Deficits vs changes in CDS premia[2]



AT = Austria; BE = Belgium; DE = Germany; ES = Spain; FI = Finland; FR = France; GB = United Kingdom; GR = Greece; IE = Ireland; IT = Italy; NL = Netherlands; PT = Portugal; US = United States.

[1] Actual data for 2008 and projections for 2011. [2] Horizontal axis shows the sum of government deficit as percentage of GDP for 2007–11; vertical axis represents change in CDS premia between 26 October 2009 and 17 February 2010. Actual data for 2007–09 and projections for 2010–11 for government deficit as percentage of GDP.

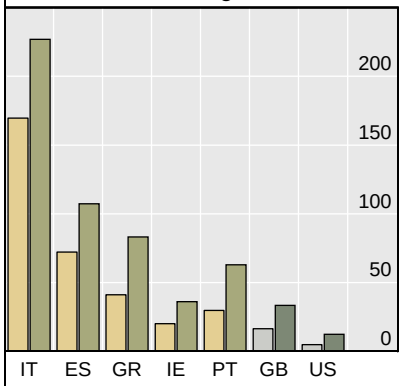
Sources: OECD; Markit; national data. Graph 4

only 5% of outstanding Portuguese government debt. For other countries, including Greece, the ratio of sovereign CDS contracts to government debt was even lower (Graph 5, right-hand panel).

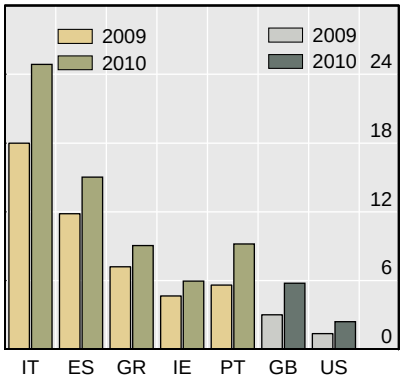
Investor attention was first drawn to the fiscal situation in Greece in October 2009, when it became clear that the budget deficit for 2009 would be significantly higher than expected. This prompted rating agencies to reassess the outlook for Greek public finances. Moody's initiated a review for a possible downgrade in late October and S&P followed suit on 7 December. On the following day, Fitch downgraded Greece's government debt to BBB+ from A– with a negative outlook. Downgrades by the other two agencies followed later in the month, with S&P and Moody's downgrading Greek government bonds to

Gross sovereign CDS

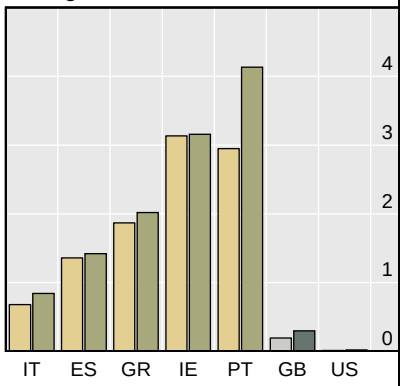
Gross outstanding volume[1]



Net outstanding volume[2]



CDS/government debt[3]

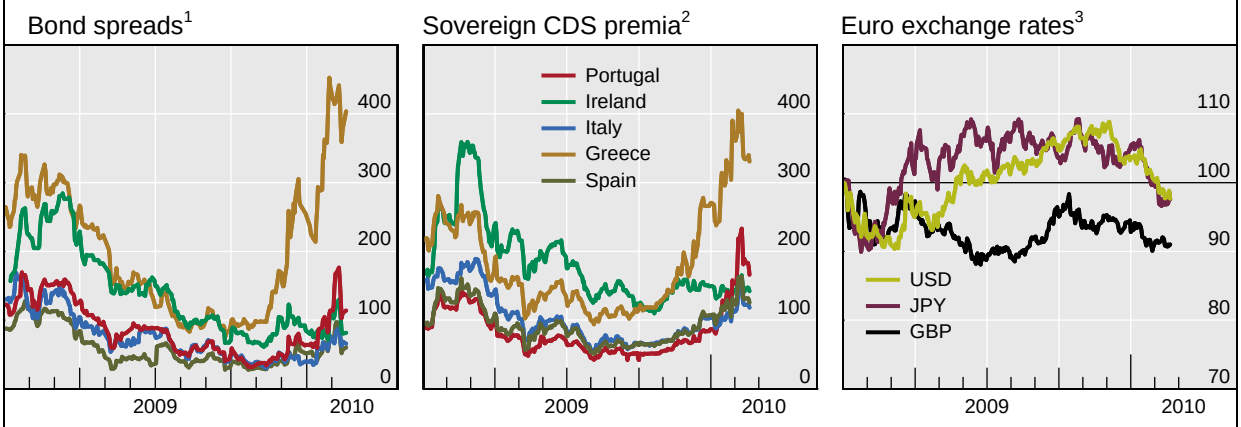


For country codes, see Graph 4.

[1] Gross notional values are the sum of CDS contracts bought or sold for all warehouse contracts in aggregate; in billions of US dollars. [2] Net notional values are the sum of net protection bought by net buyers; in billions of US dollars. [3] Net notional CDS volume as a percentage of government debt.

Sources: OECD; Depository Trust & Clearing Corporation. Graph 5

Sovereign bond yields, CDS premia and euro exchange rates



[1] Spread between five-year nominal yields and German five-year yields, in basis points. [2] In basis points. [3] Exchange rate against euro; 1 January 2009 = 100.

Sources: Bloomberg; Markit; BIS calculations. Graph 6

BBB+ and A2, respectively. In the days following the Fitch downgrade, the credit spread for bonds as well as Greek sovereign CDS premia increased significantly, with five-year CDS premia for Greece widening by around 30 basis points to more than 200 basis points (Graph 6, left-hand and centre panels).

Rating downgrades for Greece and Greek banks …

The lowering of Greece's sovereign rating was accompanied by rating cuts for a number of Greek banks. The combined impact of these downgrades was clearly visible in equity markets, where equity prices for major Greek banks declined by almost 20% in one week. One concern was that Greek banks – which, according to analysts and rating agencies, depended more on ECB funding than institutions in other countries did – would no longer be able to post Greek government bonds as collateral in the ECB's refinancing operations. At present, the ECB requires a minimum rating of BBB– for its collateral, but the ECB has indicated that it is likely to revert to the pre-crisis level of A– at the end of the year. The current A2 rating from Moody's ensures that Greek government bonds would still be acceptable as collateral even after such a change, but this would no longer hold in the case of further downgrades.

… increase counterparty risk concerns

The possible loss of this funding source for Greek banks pushed up CDS premia and yield spreads on Greek government debt even further, as it increased the perceived financial risks for the government. On 25 January, the Greek government sold €8 billion of five-year bonds at 380 basis points above German government bonds and 30 basis points above similar outstanding Greek government bonds. The issue was highly oversubscribed, with bids totalling €25 billion. This was viewed as a positive development by investors, and resulted in a brief drop in the CDS premia. The respite was, however, only temporary. Despite new plans to cut the budget deficit and other efforts by policymakers to reassure markets, investor confidence remained fragile.

Clear signs of wider market impact by late January …

Market reactions were not confined to Greece. By late January, there were clear signs of spillover effects to other markets as stock prices of European banks declined and sovereign spreads widened for a number of other

European countries. Portugal and Spain were the most directly affected, but the impact was felt more broadly. A small but unsuccessful auction of Portuguese government debt in early February accentuated concerns. Equity prices fell around the globe and corporate credit spreads increased, while safe haven flows pushed down the government bond yields of several major countries. Sovereign credit spreads on a number of other countries widened. The sovereign CDS index for western Europe (which measures the cost of insuring against the risk of default for a basket of western European sovereigns) rose above 100 basis points for the first time amid increased activity in the sovereign CDS market. The growing unease also weighed on the euro, which by early February had declined against other major currencies to levels not seen since early or mid-2009 (Graph 6, right-hand panel). Markets did, however, calm down in the weeks that followed, leading to a fall in Greek, Portuguese and Spanish credit spreads from their previous highs. Nevertheless, uncertainty remained despite EU governments pledging "determined and coordinated action" to ensure financial stability in the euro area. This uncertainty was perhaps most clearly reflected in continued high sovereign credit spreads for a number of euro area countries.

… lead to a weaker euro

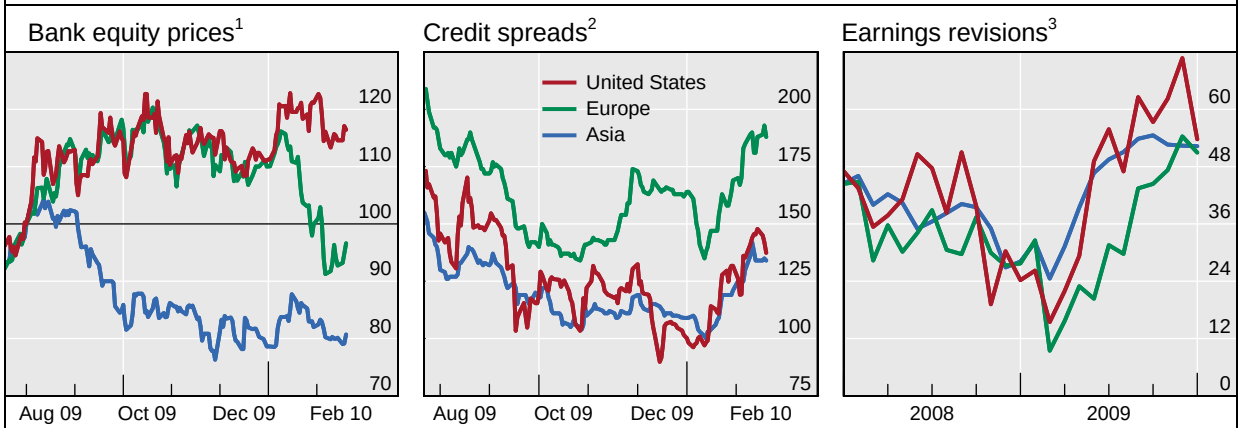
Banks, sovereign risk exposures and post-crisis regulation

Investor concerns about sovereign exposures weighed on banks' equity prices in late 2009 and early 2010, particularly in Europe (Graph 7). That said, bank credit spreads and equity prices also reflected financial statements posted in January and February that continued to report positive, albeit moderate, profits. Sovereign risk had the strongest impact on equity prices and credit spreads for banks in Greece, Portugal and Spain, but other euro area banks were also affected (Graph 8). An important aspect was the extent to which a bank was exposed to Greek, Portuguese or Spanish sovereign risk. Overall, BIS data suggest that euro area banks are markedly more exposed than non-euro area

Sovereign risk exposures weigh on bank equity prices …

… particularly for European banks

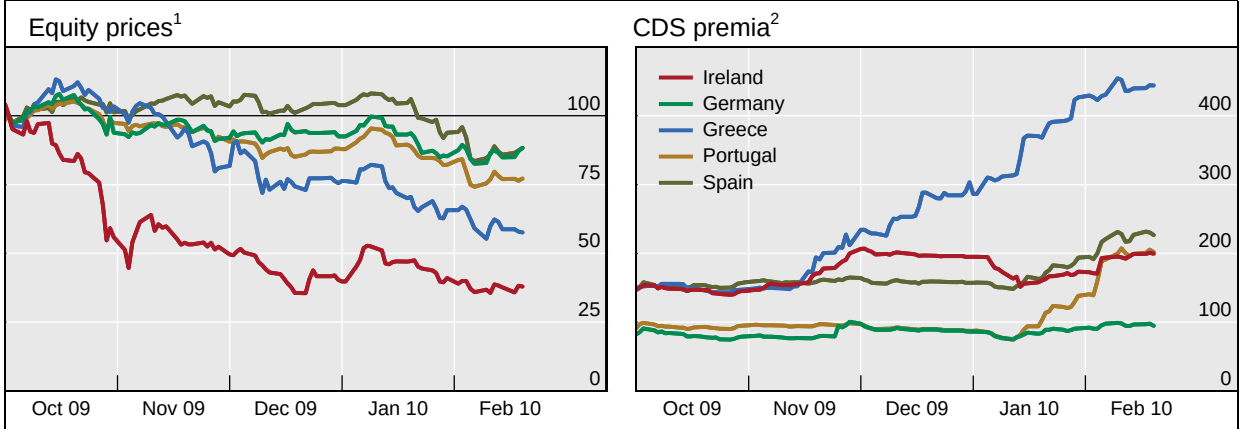
Bank equity prices, CDS premia and earnings revisions



[1] In local currency; 31 July 2009 = 100. [2] Equally weighted average senior five-year CDS spreads for the banking sector. [3] Diffusion index of monthly revisions in forecast earnings per share, calculated as the percentage of companies for which analysts revised their earnings forecast upwards plus half of the percentage of companies for which analysts left their forecast unchanged.

Sources: Bloomberg; Datastream; I/B/E/S; JPMorgan Chase; Markit. Graph 7

Bank equity prices and CDS premia



[1] 1 October 2009 = 100. [2] Equally weighted average CDS premia for major banks in each country, in basis points.

Sources: Datastream; Markit; BIS calculations. Graph 8

institutions to the public sector debt of these countries (Graph 9; see also Highlights section).

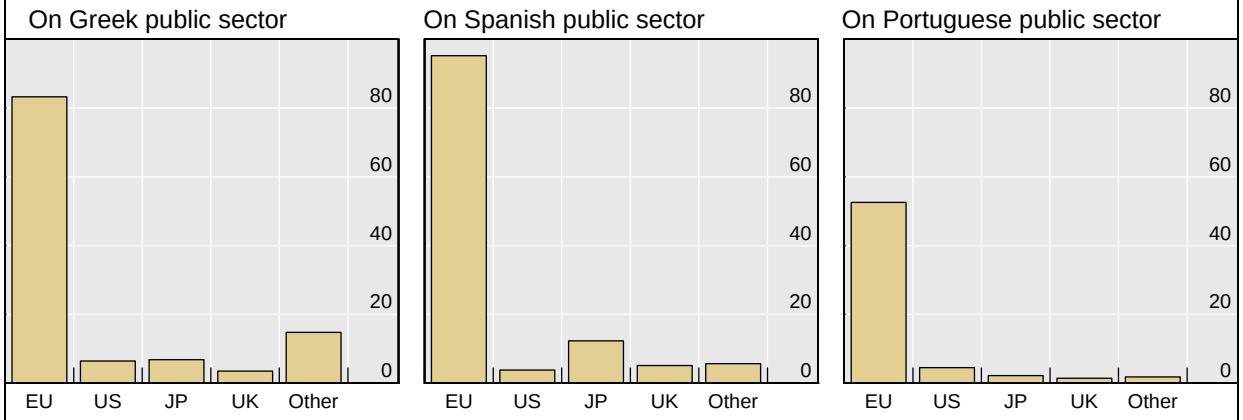
Basel proposals for post-crisis bank regulation ...

Market reaction to new information on the likely post-crisis regulatory framework for banks was mixed. On 17 December, the Basel Committee on Banking Supervision published an important set of proposals designed to strengthen the sector's resilience.[1] Analysts took these proposals to mean that banks would be required in future to operate with more capital and less leverage. In principle, this would in the long run reduce their return on equity but also diminish the credit risk. However, the immediate impact on bank equity prices and credit spreads was slight. European banks, thought to be more affected by simple limits on leverage, saw a brief dip in their stock prices after the announcement. Meanwhile, stock prices for US banks, which are already subject to such limits, hardly moved at all.

... evoke limited market reaction ...

Claims on public sector in Greece, Spain and Portugal by nationality of banks[1]

End-Q3 2009; in billions of US dollars



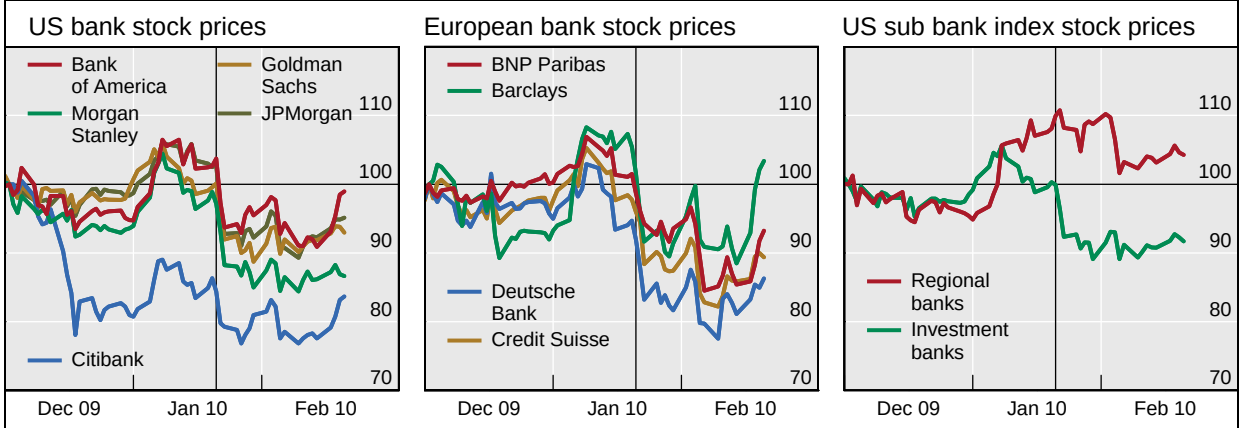
[1] Public sector comprises general government sector, central banks and multilateral development banks; claims on the public sector of each country are assumed to be denominated in the currency of the respective country.

Source: Consolidated international banking statistics (ultimate risk basis). Graph 9

[1] See www.bis.org/press/p091217.htm.

Bank prices and the “Volcker rule”

In local currency; 1 December 2009 = 100



Vertical lines indicate 21 January 2010.

Source: Bloomberg.

Graph 10

A speech given by the US President on 21 January elicited a more notable market response. The proposals put forward – quickly labelled the “Volcker rule” – envisaged that commercial banks with a large deposit base should face limits to their proprietary trading and similar activities. The proposals also provide for limits on the size of individual firms relative to the overall system. The shares of large banks with significant earnings from US financial market activities, whether or not they were headquartered in the United States, tended to weaken (Graph 10, left-hand and centre panels). In contrast, equity prices for US regional banks – which rely less on earnings from financial market activities – were less affected (Graph 10, right-hand panel).

… while “Volcker rule” elicits stronger response

Divergent monetary policies reflect the uneven recovery

A number of emerging market countries took initial steps to tighten monetary policy or signalled that such steps were forthcoming. This reflected increased credit expansion and growing inflationary pressures amid brisk economic growth (Graph 11, left-hand panel). It also demonstrated that the recovery in these countries was well ahead of the cycle in mature economies.

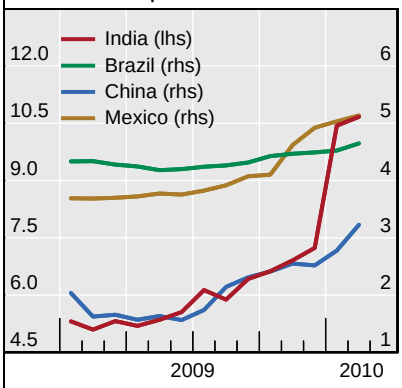
Emerging market countries take tightening steps …

In some countries, such as China and India, a strong expansion of bank credit combined with rising asset prices prompted monetary tightening. The People’s Bank of China announced on 12 January that it would raise the renminbi reserve requirement ratio for large depository financial institutions by 50 basis points (Graph 11, centre panel). Following the announcement, the Shanghai Composite Index fell by 2.3%. One month later, the Bank announced a second tightening of the reserve requirement, again of 50 basis points. While Chinese stock markets were closed at the time for the new year holiday, equities elsewhere dropped significantly following this news. On 29 January, the Reserve Bank of India announced that it was increasing banks’ cash reserve ratio by 75 basis points, in order to reduce excess liquidity and help anchor inflation expectations (Graph 11, centre panel). In addition to these moves, market analysts expected short-term interest rates to rise significantly

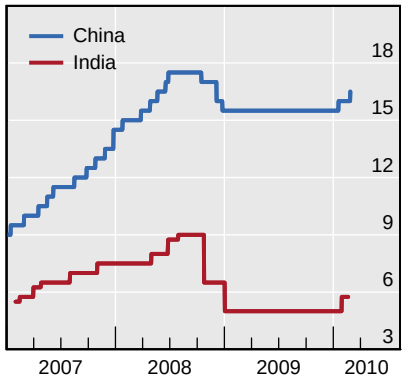
Expected inflation and monetary policy in major emerging markets

In per cent

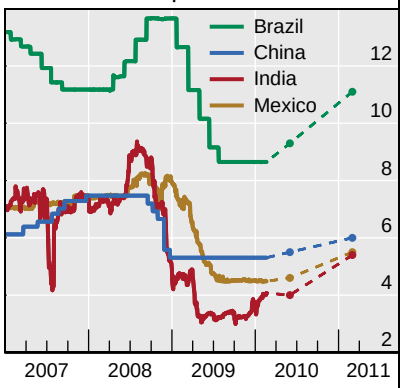
Inflation expectations for 2010[1]



Reserve requirement ratio



Interest rate expectations[2]



[1] Based on survey data from Consensus Economics. [2] For China, one-year lending rate; for India, 91-day treasury bill rate; for Brazil, SELIC overnight interest rate; for Mexico, 28-day CETES. Dashed lines represent approximate interest rate expectations based on survey forecasts for rates in May 2010 and February 2011 (indicated as dots), as reported by Consensus Economics.

Sources: Bloomberg; © Consensus Economics. Graph 11

in these and other major emerging economies (Graph 11, right-hand panel). Nevertheless, the timing of possible interest rate hikes still remained uncertain. A key complication in this regard is the risk that rising interest rates might have destabilising effects in those countries where capital inflows are already high.

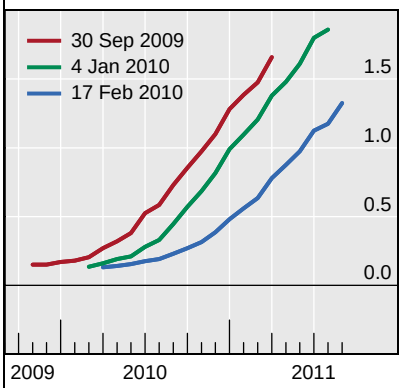
... in contrast to major developed countries ...

In recent months, by contrast, market participants generally revised their expectations about monetary policy in major mature economies such that rate hikes were expected to occur later or at a slower pace than previously thought (Graph 12). This was partly because major central banks continued to signal that interest rate increases were not to be expected in the near term. Moreover, investors' policy expectations also reflected a perception that the recovery in major advanced economies was still in its early stages.

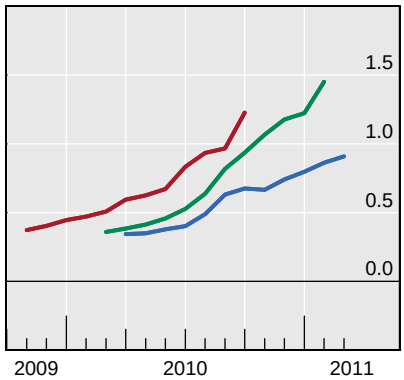
With investor confidence on the retreat, market participants were more sensitive to unfavourable than to positive economic news. In the United States, recent labour market figures were seen as less encouraging than markets had

Implied forward curves

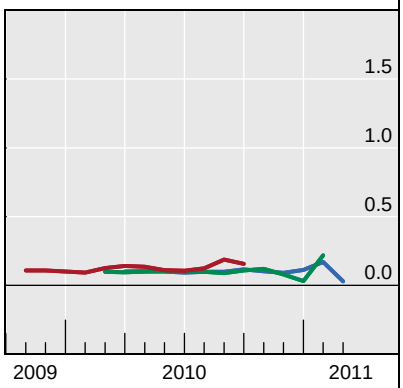
Federal funds futures



EONIA forward rates[1]



JPY OIS forward rates[1]



[1] One-month rates implied by overnight index swaps.

Sources: Bloomberg; BIS calculations. Graph 12

anticipated: initial jobless claims remained stubbornly high and non-farm payrolls continued to decline, albeit at a much reduced pace. Moreover, although fourth quarter US real GDP growth surprised on the upside, consumer spending growth, viewed as an important ingredient for the recovery in the United States, slowed to an anaemic 0.1% in the last month of 2009. Europe also saw its share of weak economic data. Retail sales and industrial production figures fell short of expectations, and fourth quarter GDP figures were weaker than expected in the euro area and the United Kingdom, triggering declines in European equity prices and benchmark bond yields following the release of these statistics.

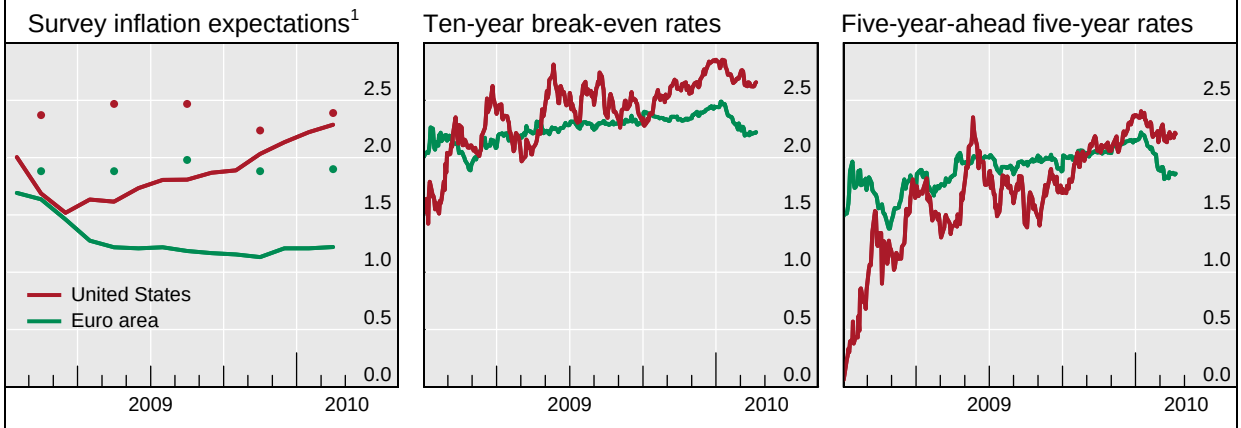
In line with investors' monetary policy expectations, the inflation outlook remained benign. Survey data pointed to well contained inflation expectations in the United States and in the euro area, both in the near term and over longer horizons (Graph 13, left-hand panel). The pricing of inflation swap contracts seemed to be broadly consistent with this information. Both long-term spot and distant forward break-even rates had gradually risen in the course of 2009, as market conditions normalised. However, at the beginning of 2010 these rates dipped downwards again (Graph 13, centre and right-hand panels). Hence, despite unprecedented monetary and fiscal stimulus in recent months, market participants showed few signs of concern that long-term inflation expectations might become unanchored.

… where record low rates fuel yield curve carry trades

Expectations that exceptionally low policy rates would prevail for some time in major developed economies meant that banks and other investors could continue to exploit cheap funding and invest in higher-yielding assets. In fixed income markets, yield curves remained extraordinarily steep, highlighting the potential profit from investing long-term with short-term financing (Graph 14, left-hand panel). The taking of such positions may also have contributed to recent downward pressure on long-term yields. Implied volatilities on interest rate derivatives contracts declined further, suggesting that the perceived risk associated with such investments continued to drop (Graph 14, centre panel).

Inflation expectations and inflation swap break-even inflation rates

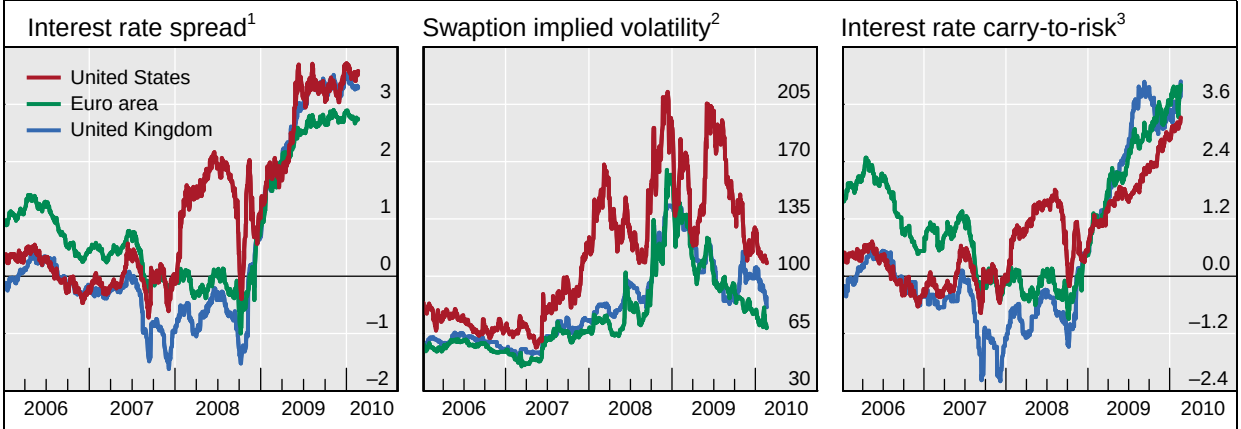
In per cent



[1] The dots correspond to survey expectations of inflation during the next 10 years (for the United States) and five years ahead (for the euro area), as reported in the Survey of Professional Forecasters of the Federal Reserve Bank of Philadelphia and the ECB, respectively. The lines correspond to 2010 inflation expectations based on survey data from Consensus Economics.

Sources: ECB; Federal Reserve Bank of Philadelphia; Bloomberg; © Consensus Economics; BIS calculations. Graph 13

Interest rate spreads, implied volatilities and carry-to-risk



[1] Ten-year swap rates minus three-month money market rates, in per cent. [2] Volatility implied by three-month swaptions on 10-year swap contracts, in basis points. [3] Defined as the differential between 10-year swap rates and three-month money market rate divided by the three-month/10-year swaption implied volatility.

Sources: Bloomberg; BIS calculations. Graph 14

The combination of higher returns and lower risk meant that such positions were gaining in attractiveness from a risk-adjusted perspective too. Notably, measures of "carry-to-risk", which gauges return in relation to a risk measure, reached new highs for this type of position (Graph 14, right-hand panel). Given such incentives, one concern was that financial institutions could be taking on excessive duration risk. Once expectations change and interest rates begin to rise, the unwinding of such speculative positions could reinforce repricing in fixed income markets and result in yield volatility.

Central banks gradually withdraw emergency support

Emergency liquidity measures are scaled back …

Further improvements in the functioning of financial markets, and, in particular, in money market conditions, meant that monetary authorities were able to gradually continue withdrawing extraordinary support (see also the discussion by P Gerlach in this issue). Accordingly, a number of major central banks announced in late January that they would discontinue the temporary liquidity swap lines with the Federal Reserve on 1 February. The ECB conducted its last 12-month refinancing operation in mid-December 2009 and decided to carry out its last six-month operation at the end of the first quarter of 2010. The US Federal Reserve proceeded with the planned closing of the Asset-Backed Commercial Paper Money Market Mutual Fund Liquidity Facility, the Commercial Paper Funding Facility, the Primary Dealer Credit Facility and the Term Securities Lending Facility on 1 February. The scaling-back of extraordinary measures also extended beyond liquidity support schemes; the Federal Reserve confirmed plans to end the process of purchasing $1.25 trillion of agency mortgage-backed securities and $175 billion of agency debt by the end of the first quarter, and to wind down its Term Auction Facility and the Term Asset-Backed Securities Loan Facility in the course of the first half of 2010. Meanwhile, the Bank of England's Monetary Policy Committee

decided in early February not to increase the Bank's programme of asset purchases beyond the total of £200 billion that had already been completed.

… and largely anticipated by markets …

This scaling-back of supportive monetary measures was widely anticipated, in line with earlier announcements or signalling by central banks. As a result, it had no significant impact on asset prices. However, investors did react to new statements about possible future policy action. Specifically, UK gilt yields fell sharply on 10 February – by as much as 10 basis points at the short end of the maturity spectrum – following remarks by the Governor of the Bank of England that it was "far too soon" to conclude that no further central bank purchases will be needed in sterling bond markets. On the same day, Federal Reserve Chairman Bernanke mentioned in testimony to Congress that an increase in the spread between the discount rate and the target federal funds rate might be considered "before long", and he discussed the sequence of steps that the Federal Reserve might follow to exit from its very accommodative policy stance. Following these statements, US Treasury yields rose by some 5 basis points across the curve. Despite this signalling, markets were surprised by the Federal Reserve's 18 February announcement of a 25 basis point increase in the discount rate, which was intended as a step towards further normalising its lending facilities. After the announcement, bond yields rose and equity prices fell.

… although other actions surprise investors

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Highlights of international banking and financial market activity[1]

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 2009. The discussion on international debt securities and exchange-traded derivatives draws on data for the fourth quarter of 2009.

Banks' international balance sheets continued to contract in the third quarter of 2009, although at a much slower pace than in the preceding three quarters. Total gross international claims of BIS reporting banks decreased by $360 billion. Cross-border claims on borrowers in emerging markets rose slightly for the second quarter in a row, mainly reflecting increases in claims on residents of Asia-Pacific and Latin America and the Caribbean. Exchange rate adjusted local lending in local currencies also expanded in these two regions, while declining in emerging Europe. Reporting banks' international portfolios continued to shift towards claims on the public sector, which increased in both relative and absolute terms during the third quarter.

Activity in the primary market for international debt securities weakened markedly in the final three months of 2009. Announced gross issuance declined by 10% quarter on quarter to $1,778 billion. Net issuance dropped to $303 billion, well below the $485 billion recorded in the third quarter.

Trading activity on the international derivatives exchanges expanded at a modest pace in the fourth quarter. Turnover measured by notional amounts went up by 5% to $444 trillion between October and December, 22% higher than at the trough in the first quarter but still well below its peak ($690 trillion) in early 2008.

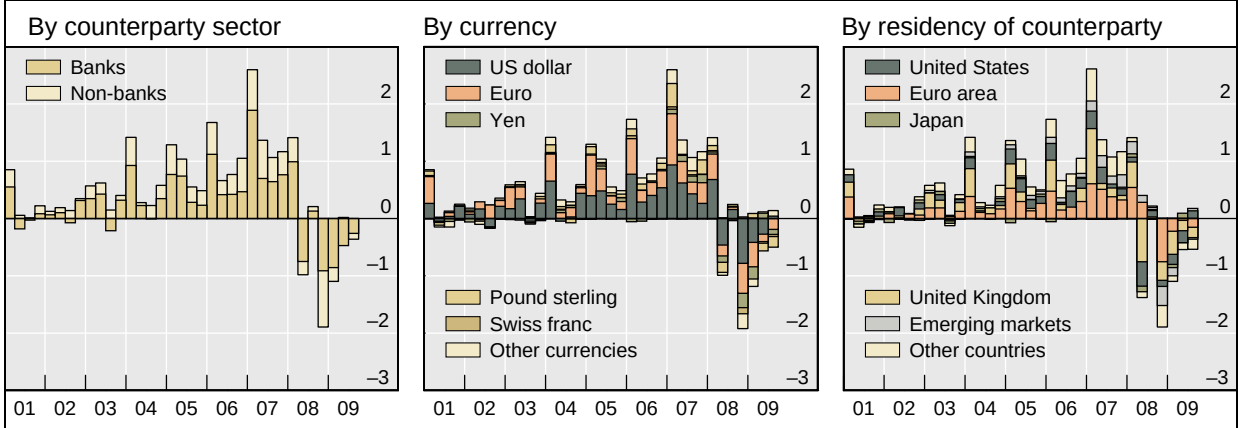
The international banking market

Banks' international balance sheets contracted again in the third quarter of 2009, although the pace of the decline was much slower than in the preceding

[1] Queries concerning the banking statistics should be addressed to Stefan Avdjiev, and those relating to the international debt securities and derivatives statistics to Christian Upper.

Changes in gross international claims[1]

In trillions of US dollars



[1] BIS reporting banks' cross-border claims (including inter-office claims) in all currencies plus locally booked foreign currency claims on residents of BIS reporting countries.

Source: BIS locational banking statistics by residence. Graph 1

three quarters. Total gross international claims of BIS reporting banks fell by $360 billion (Graph 1, left-hand panel), the smallest decline since the start of the crisis. The bulk of the contraction (71%) was due to a shrinkage in interbank claims (–$257 billion), while the rest was generated by a fall in claims on non-banks (–$103 billion). Reporting banks' international portfolios continued to shift towards claims on the public sector. Cross-border claims on borrowers in emerging markets increased slightly for the second consecutive quarter, mainly reflecting growth in claims on residents of Asia-Pacific and Latin America and the Caribbean. Exchange rate adjusted local lending in local currencies in these two regions also expanded, but declined in emerging Europe.

US dollar-denominated claims increase for the first time in four quarters

US dollar-denominated claims expand

US dollar-denominated international claims expanded for the first time since the third quarter of 2008, while international claims denominated in all other major currencies fell (Graph 1, centre panel). This is a sharp reversal of the pattern observed during the crisis, when dollar claims contracted much more rapidly than those denominated in other currencies. The $45 billion expansion of reporting banks' US dollar positions was driven by an increase in claims on banks ($121 billion), the first in four quarters and the largest since early 2008. This was partially offset by a decrease in US dollar claims on non-banks ($76 billion). At the same time, claims denominated in sterling recorded their largest contraction in a decade (–$183 billion) and euro-denominated claims shrank for the fourth quarter in a row (–$191 billion).

Claims on residents of the United Kingdom and the euro area contract

The breakdown by counterparty residence largely mirrors that by currency (Graph 1, right-hand panel). A large part of the overall contraction in international claims was driven by declines in claims on residents of the United Kingdom (–$183 billion) and the euro area (–$151 billion). Conversely, international lending to residents of the United States expanded by $134 billion.

The drop in claims on euro area borrowers was almost entirely caused by a decrease in claims on banks (–$138 billion). Interbank lending also accounted for the bulk of the decline in claims on UK residents (–$131 billion). International claims on residents of emerging markets grew by $42 billion, almost entirely driven by a $41 billion expansion in lending to non-banks.

Banks increase exposure to Asia-Pacific and Latin America, but reduce positions in emerging Europe

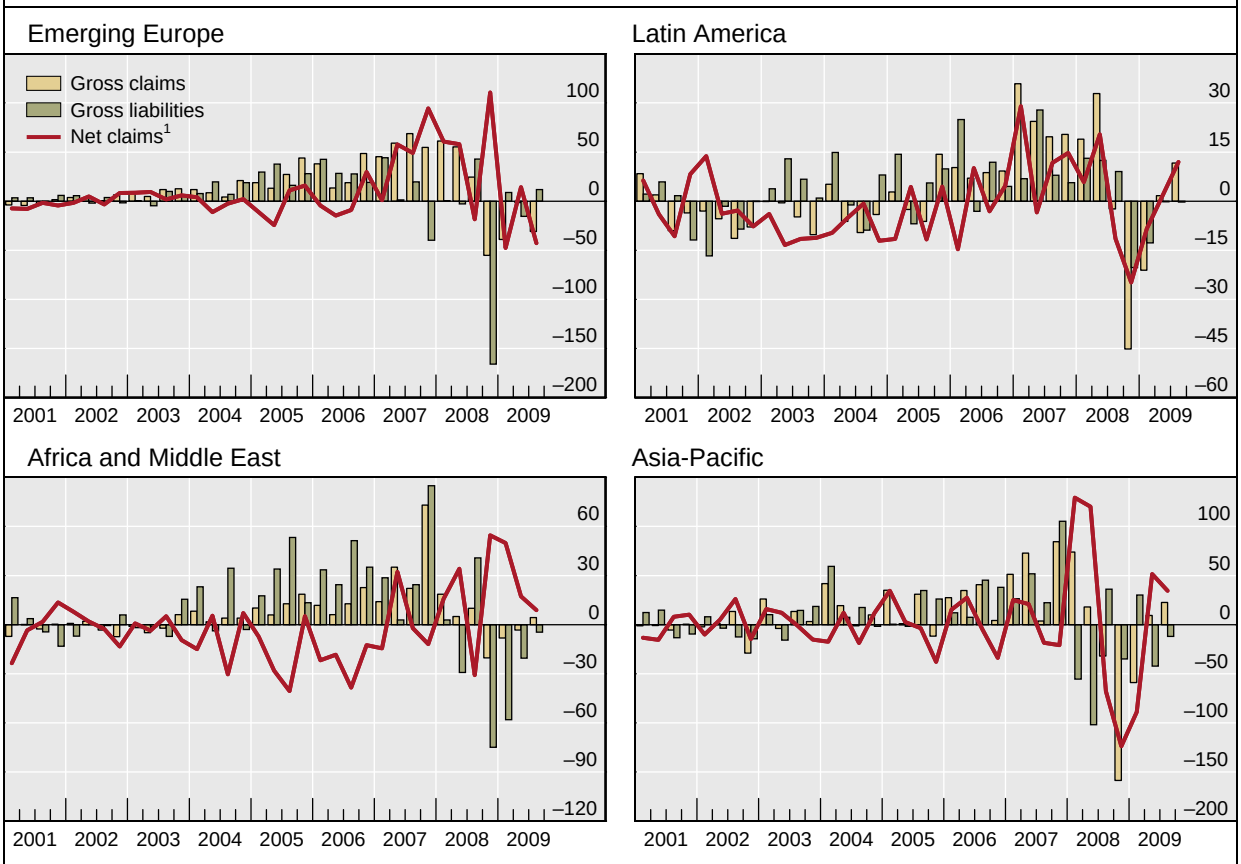
BIS reporting banks increased their net cross-border exposures to emerging markets by $12.6 billion (Graph 2). This rise reflected a combination of higher cross-border claims ($7.8 billion) and lower cross-border liabilities ($4.8 billion). Cross-border claims on non-banks expanded by $35.5 billion, the largest increase since the second quarter of 2008. Conversely, cross-border claims on banks declined by $27.7 billion.

Banks increase net exposures to Asia-Pacific, Latin America and the Caribbean ...

Lending patterns diverged significantly across regions. The BIS locational banking statistics reveal that cross-border claims on residents of Asia-Pacific and Latin America and the Caribbean grew during the third quarter of 2009 (by $22.7 billion and $11.7 billion, respectively). Moreover, the BIS consolidated banking statistics on an immediate borrower basis indicate that local lending in local currencies in these two regions, adjusted for exchange rate fluctuations

Changes in cross-border positions vis-à-vis emerging markets

In billions of US dollars



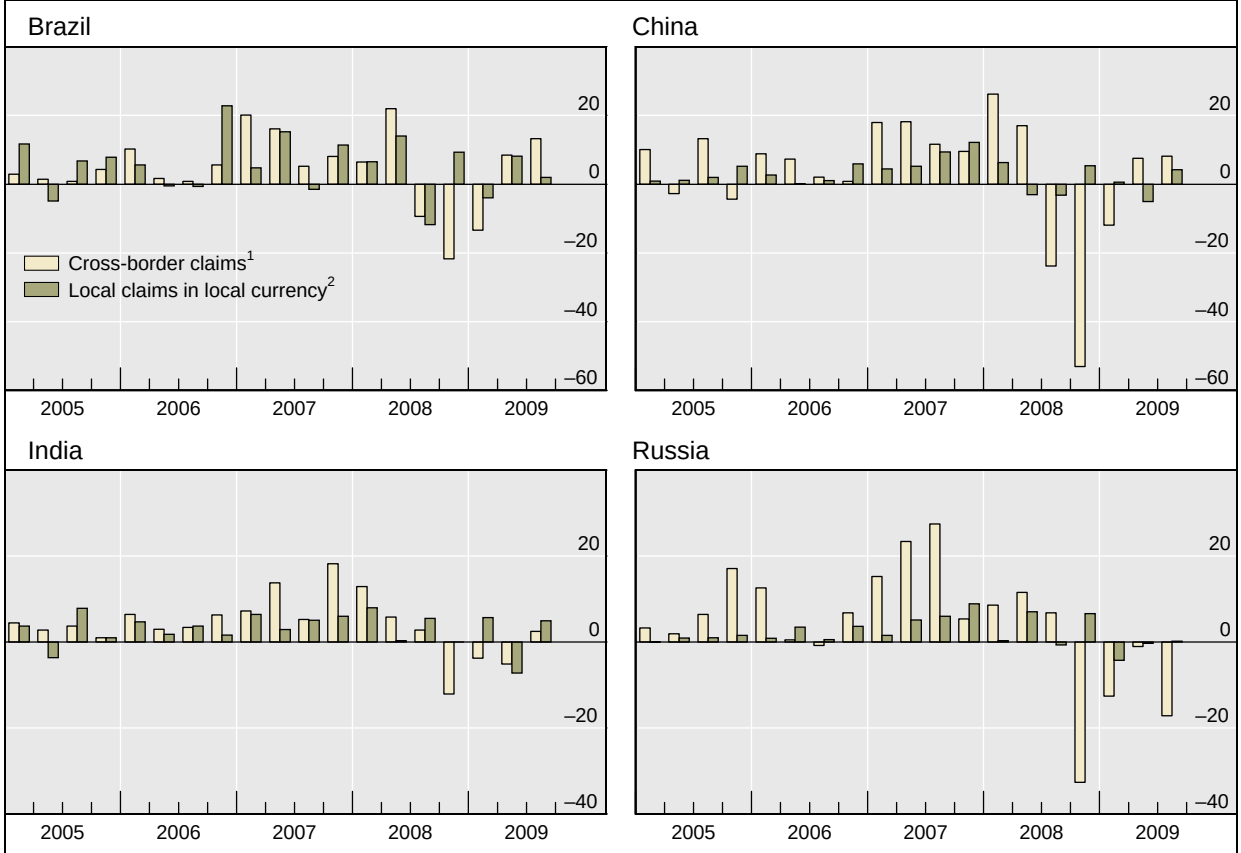
[1] Gross claims minus gross liabilities.

Source: BIS locational banking statistics by residence.

Graph 2

Local claims in local currency and cross-border claims on BRIC residents

In billions of US dollars



[1] Quarterly changes in cross-border claims obtained from the BIS locational banking statistics by residence, not adjusted for exchange rate fluctuations. [2] Quarterly changes in local currency denominated local claims, obtained from the BIS consolidated banking statistics (on an immediate borrower basis), adjusted for exchange rate fluctuations.

Source: BIS locational banking statistics by residence; BIS consolidated banking statistics (immediate borrower basis). Graph 3

and breaks in series, also expanded (by $10.9 billion and $8.2 billion, respectively).[2] Conversely, cross-border claims and local lending in local currencies in emerging Europe both declined during the period (by $30.1 billion and $6.8 billion, respectively).

… but decrease positions in emerging Europe

The decoupling between emerging Europe and the rest of the developing world could reflect both demand and supply factors in international credit markets. Lower overall output growth in emerging Europe during the third quarter of 2009 may have reduced the demand for credit in the region, thus explaining at least part of the contraction in claims on its residents. In addition, the less optimistic outlook for growth in that area could have made banks less willing to extend credit to its residents. Finally, political factors could have also had a contractionary effect on both the demand and supply of credit to the region. Uncertainty regarding the outcomes of the upcoming elections in Romania and Ukraine may have contributed to two of the largest individual

[2] A Spanish bank sold its subsidiary in Venezuela to the local government. This caused exchange rate adjusted local claims in local currency on residents of Venezuela to decline by approximately $12.1 billion. The change in local claims in local currency in Latin America and the Caribbean reported in the text is adjusted for this break in the series.

country declines in cross-border claims during the period (–$6.3 billion and –$2.9 billion, respectively).

The growth in foreign lending to Asia-Pacific and Latin America and the Caribbean during the third quarter was led by expansions in claims on the residents of the larger economies in those regions (ie Brazil, China and India). Cross-border claims on these countries registered their largest increases since the first half of 2008 (Graph 3), expanding by $13.2 billion in Brazil, $8.2 billion in China and $2.5 billion in India. Local claims denominated in local currencies also increased in these three countries (by $4.9 billion in India, $4.2 billion in China and $2.0 billion in Brazil). Meanwhile, reporting banks decreased their cross-border claims on residents of the fourth BRIC economy, Russia, for the fourth quarter in a row (–$17.1 billion).

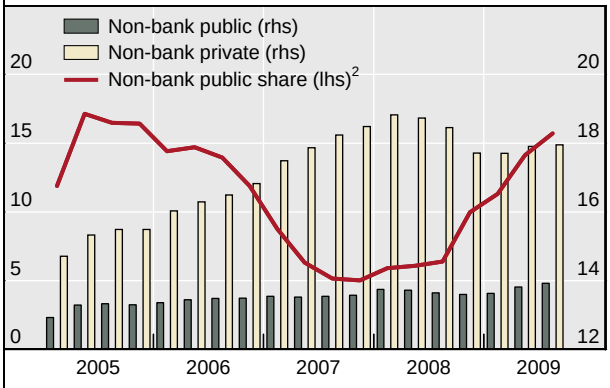
Banks shift their international portfolios towards the public sector

Foreign claims on the public sector expand

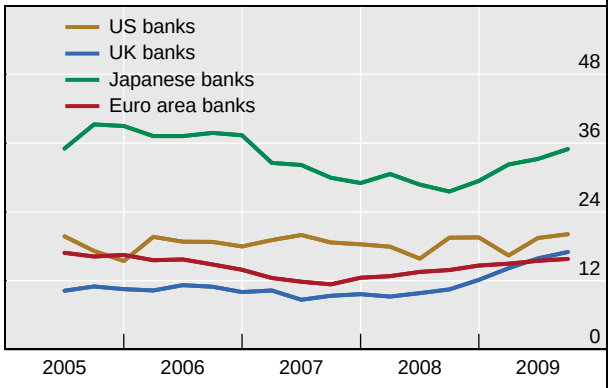
The share of BIS reporting banks' foreign claims on the public sector has increased in each of the last seven quarters for which data are available.[3] This follows a steady fall in that category which started in the first half of 2005 and lasted until the end of 2007 (Graph 4, left-hand panel). During most of 2008, foreign claims on the public sector (green bars) fell in absolute terms, but increased on a relative basis, as claims on the non-bank private sector (yellow bars) declined at an even higher rate. However, since the start of 2009, foreign claims on the public sector have increased in both absolute and relative terms. During the first three quarters of last year, they expanded by $806 billion, an

Consolidated foreign claims

By sector[1]



Share on public sector, by bank nationality[3]



[1] Bars indicate BIS reporting banks' combined foreign claims on the respective sector, not adjusted for exchange rate fluctuations; in trillions of US dollars. [2] Combined foreign claims on the public sector as a percentage of combined foreign claims. [3] Foreign claims on the public sector as a percentage of foreign claims.

Source: BIS consolidated banking statistics (ultimate risk basis). Graph 4

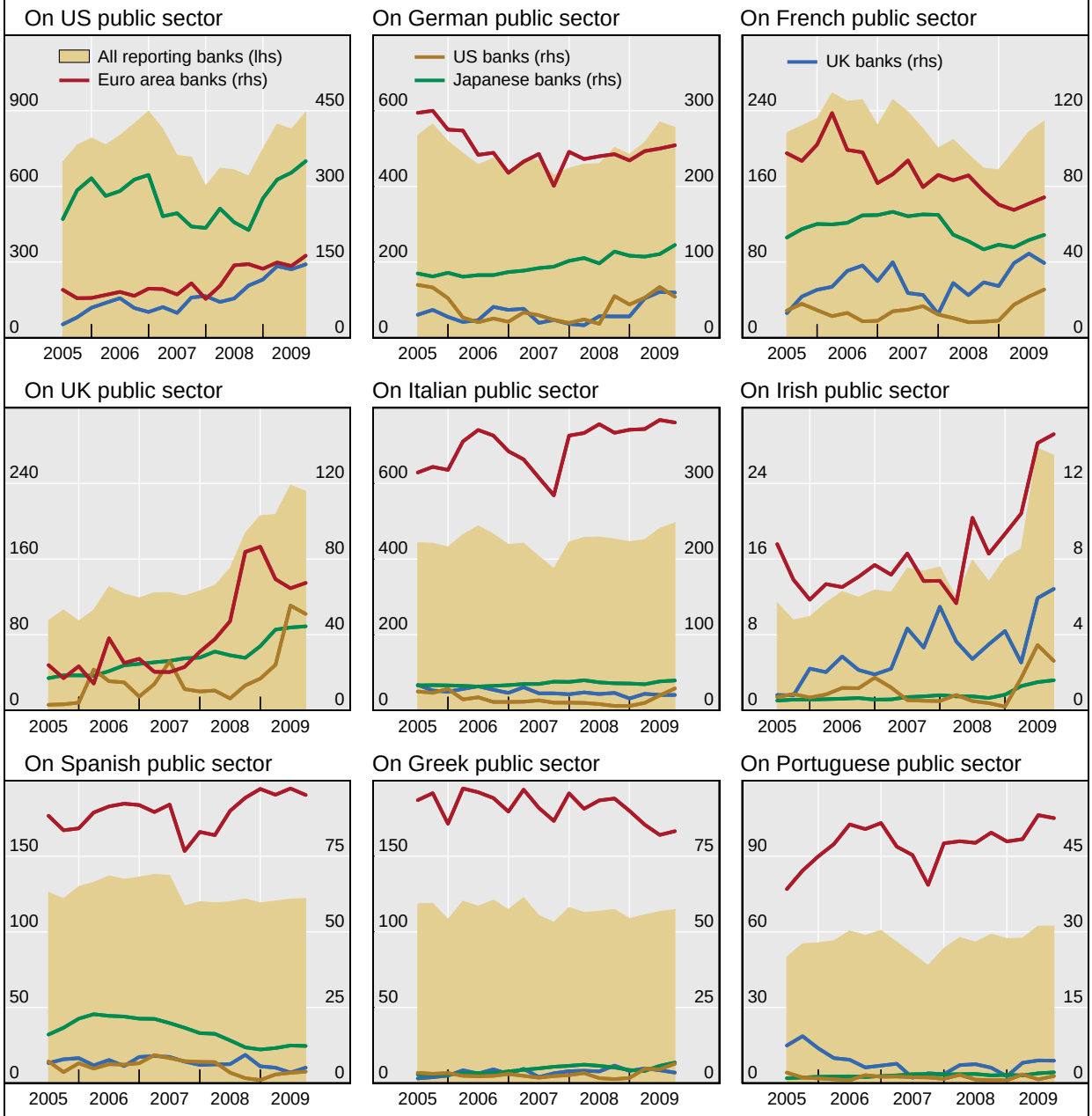
[3] Note that the figures quoted in this subsection are obtained from the BIS consolidated banking statistics on an *ultimate risk* basis. We focus on that statistic, as opposed to the BIS consolidated banking statistics on an *immediate borrower* basis, because the former offers a sectoral breakdown of *foreign* claims, whereas the latter does so for *international* claims, which do not include local claims in local currencies. As a result, foreign claims give a more complete picture of international banking developments than international claims. For example, US dollar-denominated claims on the US public sector held by the New York branch of a German bank would be included in foreign claims, but not in international claims.

upswing of over 20%. As a result, the share of foreign claims on the public sector rose from 16.0% to 18.3%.

The shift towards claims on the public sector observed in recent quarters has been quite widespread (Graph 4, right-hand panel). For example, Japanese banks, which have traditionally allocated larger shares of their international asset holdings to claims on the public sector, have increased their claims on that sector by $166 billion (or 26.4%) since the end of 2007. US and euro area banks, both of which have historically been closer to the global mean in that category, also recorded substantial increases during the same period

Foreign claims on the public sector by nationality of reporting banks[1]

At constant end-Q3 2009 exchange rates, in billions of US dollars



[1] Public sector comprises the general government sector, central banks and multilateral development banks. Claims on the public sector of each country are assumed to be denominated in the currency of the respective country.

Source: BIS consolidated banking statistics (ultimate risk basis). Graph 5

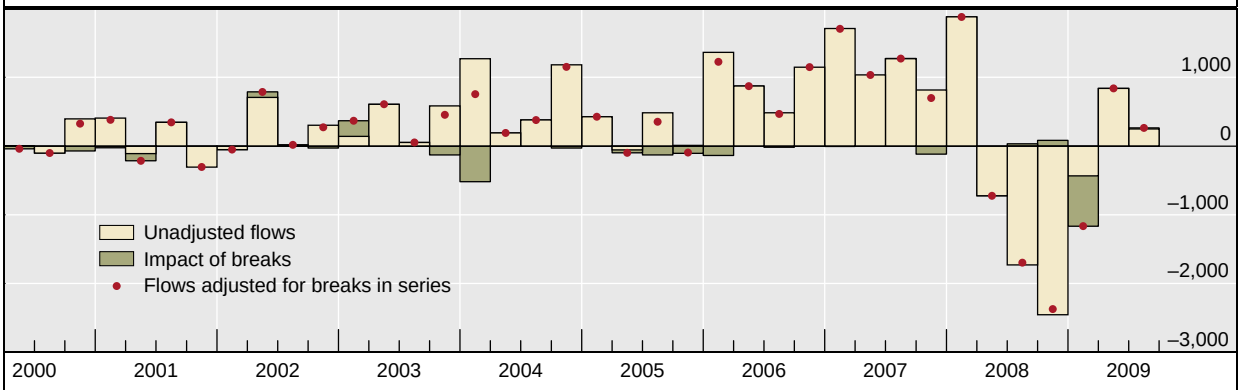
Impact of the reclassification of US investment banks

In September 2008, the remaining US investment banks became bank holding companies. As a result, the figures for the United States in the BIS consolidated banking statistics now include the international positions of these institutions. The expansion in the reporting population took place in the first quarter of 2009, and led to a $696 billion increase in aggregate international claims in the BIS consolidated banking statistics on an immediate borrower basis and a $903 billion increase in aggregate foreign claims in the BIS consolidated banking statistics on an ultimate risk basis.

In addition to that break, several smaller breaks occurred in the first quarter of 2009. In the case of the consolidated banking statistics on an immediate borrower basis, they added up to approximately $36 billion. As a result, even though aggregate consolidated claims on an immediate borrower basis were reported to have declined by $434 billion in the first quarter, the actual decline was approximately $1,166 billion, once correction is made for the changes in the reporting population that took place during that period (Graph A). In the case of the consolidated banking statistics on an ultimate risk basis, the additional breaks added up to $106 billion, resulting in an aggregate break of $1,009 billion.

Impact of breaks in series on consolidated international claims

In billions of US dollars



Source: BIS consolidated international banking statistics (immediate borrower basis). Graph A

The figures in the consolidated banking statistics published by the BIS are not adjusted for breaks in series. However, the BIS communicates all important breaks in the press release that accompanies the publication of the data. In addition, a separate document, which is updated every quarter and is available on the BIS website (www.bis.org/statistics/breakstablescons.pdf), provides details on the period of the change, the reporting country, the reason for the break and the net changes in aggregate assets and liabilities that resulted from it.

($228 billion and $171 billion, respectively).[4] Even UK banks, which have usually had low exposure to the public sector, have significantly expanded the size of their public sector claims (by $250 billion, or 64.6%) since the start of 2008.

Banks increase claims on the US and euro area public sectors

Higher holdings of the debt of the United States and of various European governments account for the lion's share of the recent expansion in reporting banks' foreign claims on the public sector (Graph 5). A large part of the overall increase recorded during the first three quarters of 2009 resulted from a $146 billion (20%) surge in claims on the US public sector. During the same

[4] About $71 billion of the increase in US banks' claims on the public sector during that period was due to the change in the US reporting population in the BIS consolidated banking statistics that occurred in the first quarter of 2009 as a result of the reclassification of the remaining US investment banks as bank holding companies (see box).

period, reporting banks also considerably expanded their claims on the public sectors of Germany ($72 billion, 15%), Italy ($49 billion, 11%), France ($51 billion, 29%), the United Kingdom ($26 billion, 13%) and Ireland ($11 billion, 68%).[5] By contrast, the increases in the levels of reporting banks' claims on the public sectors of Greece ($6 billion, 5%), Portugal ($5 billion, 9%) and Spain ($3 billion, 2%) during the first three quarters of 2009 were relatively small.

Graph 5 highlights the different degrees to which foreign claims on the public sectors of various countries and regions are concentrated in certain banking systems. For example, the largest holders of foreign claims on the public sectors of the euro area countries are banks headquartered in the euro area. As of the end of September 2009, their foreign claims on the public sectors of the area amounted to $1.2 trillion, more than 60% of all outstanding foreign claims on the public sectors of the region. Nevertheless, the strength of their presence in the area's public debt markets is not uniform. They account for 32% of the outstanding foreign claims on the French public sector and for 46% of those on the German public sector. Conversely, euro area banks hold more than 70% of all outstanding foreign claims on the public sectors of Portugal (84%), Spain (78%), Italy (77%) and Greece (73%). By contrast, no individual banking system holds more than 50% of the outstanding foreign claims on the public sectors of the United States, Japan and the United Kingdom.

The international debt securities market

Issuance boom comes to an end

Activity in the primary market for international debt securities weakened markedly in the final three months of 2009. Announced gross issuance declined by 10% quarter on quarter to $1,778 billion (Graph 6, left-hand panel). With repayments up by 4%, net issuance dropped to $303 billion, well below the $485 billion recorded in the third quarter.

Strong relationship between issuance and economic growth in mature economies …

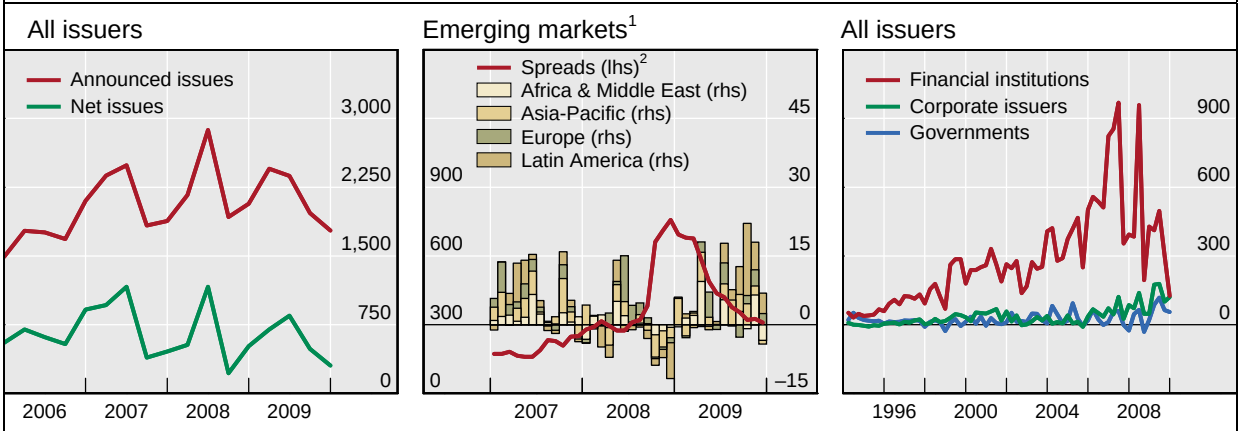
Regional issuance patterns to some extent reflected the uneven nature of the economic recovery. Residents in emerging markets raised 19% more funds in the international market than in the third quarter, whereas borrowers from developed economies reduced their issuance by 38%.

The two-speed recovery was apparent not only in the split between developing and developed economies, but also at the country level, particularly among the larger advanced economies. Residents in countries with sluggish growth generally tapped the market by a smaller amount than in the previous quarter, while borrowers from countries with higher growth raised more funds than before. For instance, issuance by euro area borrowers halved to $111 billion. Borrowers from the United Kingdom, a country that saw a tepid recovery in the fourth quarter, actually reduced their debt outstanding in the international market, with net redemptions amounting to $26 billion. This

[5] These numbers were adjusted for exchange rate fluctuations assuming that all foreign claims on the public sector of a given country were denominated in the official currency of that country.

International debt securities issuance

Net issuance, in billions of US dollars



[1] By residence of issuer. [2] Quarterly JPMorgan EMBI Global Composite index, in basis points.

Sources: Dealogic; Euroclear; Thomson Reuters; Xtrakter Ltd; BIS. Graph 6

contrasted with much stronger issuance in countries where the recovery had taken a firmer hold. Australian and Canadian borrowers stepped up their issuance to $34 billion and $28 billion, respectively. Net international issuance by US residents more than doubled to $108 billion, although it fell short of the $259 billion seen between April and June.

... but not in emerging markets

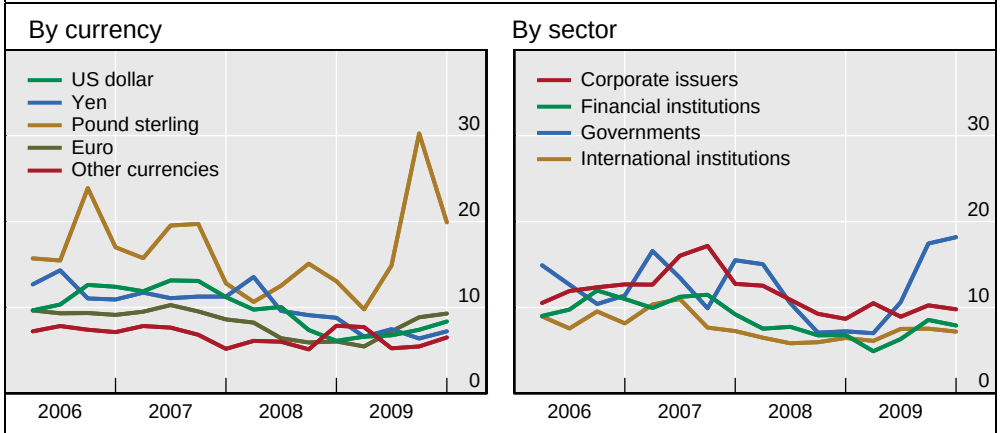
The relationship between issuance and growth was more blurred for borrowers resident in emerging market economies (Graph 6, centre panel). Issuance by Latin American entities soared to the highest level since the 1990s ($26 billion, after $13 billion between July and September), with strong borrowing by Brazil, Mexico and Venezuela. Of these three countries, only Brazil grew rapidly during the period under review. Issuance by borrowers from emerging Europe increased nearly fourfold to $8 billion, despite depressed economic activity in the region. By contrast, residents in the much faster-growing region of developing Asia and the Pacific raised $6 billion, half of the third quarter amount. Finally, borrowers resident in the Middle East and Africa issued international debt securities for $2 billion, down from $8 billion in the third quarter. Net repayments worth $5 billion by financial institutions located in the United Arab Emirates contrasted with net issuance of $7 billion by the government of Qatar, which took advantage of the favourable market conditions to pre-fund its financing requirements.

Possibility of Dubai payment delay weighs on issuance

Market conditions for emerging market borrowers deteriorated sharply in late November, with news that government-owned Dubai World had asked to delay payments on its debt. Admittedly, the impact on issuance is hard to disentangle from seasonal factors. Emerging market issuance tends to soften towards the end of the year. Even so, the decline in late 2009 was much stronger than those seen in previous years. Net issuance fell from $21 billion in October and $18 billion in November to less than $3 billion in December. Issuance decreased in all regions in December, but the drop was particularly strong in the Middle East and Africa.

International bond and note issuance[1]

Weighted average maturity, in years



[1] Announced fixed straight issues.

Sources: Dealogic; Euroclear; Thomson Reuters; Xtrakter Ltd; BIS. Graph 7

Corporate catches up with financial issuance

Issuance by non-financial corporations approached that by financial institutions for the first time since the latter started to surge in the early 1990s (Graph 6, right-hand panel). In the fourth quarter of 2009, non-financial corporations raised $121 billion, 20% more than in the previous three months and just short of the $126 billion placed by financial institutions. Financial issuance was particularly weak in emerging market economies ($0.3 billion, after $10 billion in the third quarter) and the United Kingdom (net redemptions of $37 billion, after net issuance of $78 billion in the third quarter). By contrast, it rose in Australia (up 27% to $31 billion), Canada (up 870% to $12 billion) and the United States (up 885% to $43 billion).

Some banks still rely on government guarantees

Not all financial institutions were able to access the market based solely on their own financial strength. A number continued to depend on government guarantees to issue debt (see the feature by Gerlach in this issue). The share of guaranteed paper in total financial issuance continued to decline, but at 8% of announced gross issuance it appears to be approaching a lower bound.

Shift towards longer maturities as borrowers lock in favourable terms

Borrowers adjusted their debt profile to lock in cheap funding costs. They repaid money market instruments (with maturities of less than one year) and floating rate bonds and notes by $141 billion and $71 billion, respectively. Meanwhile, they issued fixed rate bonds and notes to the tune of $492 billion. The average maturity of fixed rate bonds and notes rose from a low of 6.3 years in the first quarter of 2009 to 9.8 years in the third. It then declined slightly to 9.3 years in the final quarter. This, however, was entirely due to the extraordinarily high average maturity of sterling-denominated bonds issued in the third quarter (Graph 7, left-hand panel), when the UK government and a various special purpose vehicles securitising mortgages issued a number of very large bonds with maturities of up to 57 years. In the fourth quarter, sterling-denominated bonds still had longer maturities on average than those in other currencies, perhaps reflecting the high appetite for such paper by UK pension funds, forced to match their assets and liabilities on a mark to market

basis.[6] Governments in particular lengthened the maturities of their debt, to almost 20 years (Graph 7, right-hand panel).

Exchange-traded derivatives

Moderate increase in activity

After pausing in the previous quarter, the recovery in activity on the international derivatives exchanges continued at a modest pace in the final three months of 2009. Turnover measured by notional amounts went up by 5% to $444 trillion between October and December, 22% higher than at the trough in the first quarter but still well below its peak ($690 trillion) in early 2008. This increase was fairly evenly distributed across risk categories. Open interest, also based on notional amounts, rose in line with turnover, by 6% to $73 trillion.

Low growth in interest rate segment

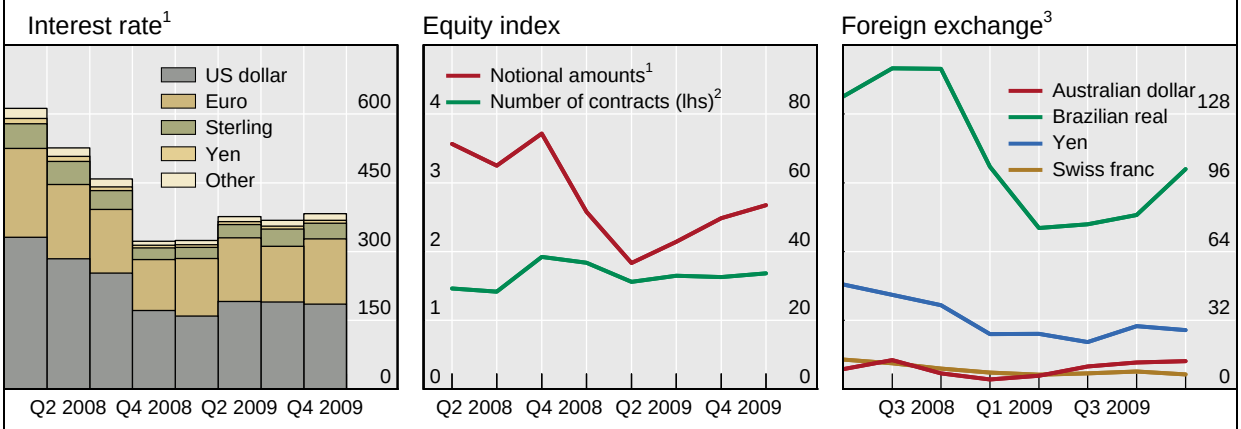
Turnover in interest rate derivatives went up by 4% to $383 trillion (Graph 8, left-hand panel), with considerable variation across currencies. Increasing turnover in contracts denominated in the euro (17%), New Zealand dollar (37%) and Canadian dollar (59%) contrasted with a 10% decline in sterling contracts and stable turnover in futures and options on US and Japanese interest rates.

Stock price increases lift turnover in equity index derivatives

Higher equity valuations drove up turnover measured by notional amounts in derivatives on stock price indices by 8%, while turnover measured by the number of contracts traded rose by only 3% (Graph 8, centre panel). Among the few markets with a genuine increase in activity was the Brazilian market, where trading volume measured by notional amounts surged by 58% to $0.7 trillion, just short of its peak of late 2007. In the first quarter of 2009, turnover in Brazilian stock index contracts stood at a mere $0.2 trillion. Much of the recovery in trading activity was driven by increases in stock prices (the Bovespa index gained 11% in the fourth quarter), but the number of contracts

Exchange-traded derivatives

Futures and options contracts



[1] Turnover, notional amounts in trillions of US dollars. [2] Turnover, number of contracts in billions of contracts. [3] Open interest, in billions of US dollars. Contracts with at least one leg denominated in any of the specified currencies.

Source: BIS. Graph 8

[6] This issue is explored in some detail in the box on page 7 of the March 2006 *BIS Quarterly Review*.

traded also went up by 21% in the last quarter, after stagnating in the first three months of the year.

Stronger activity in currency derivatives

Activity in the market for foreign exchange derivatives strengthened in the final quarter of 2009. Turnover measured by notional amounts rose by 15% to $8 trillion, the highest on record. Open interest increased by 11% to $310 billion. Turnover growth was particularly strong in contracts on the Swiss franc (38%). Most of this appears to reflect higher short-term trading rather than longer-term position-taking, as open interest in derivatives on the franc fell by 17%.

FX carry trade activity

The data provide some support for the notion of the (renewed) attractiveness of FX carry trades (see the feature by Kohler in this issue). FX carry trades can be implemented in a number of ways, one of which involves a long position in futures or options on a high-yielding currency and a short position in contracts on a low-yielding one. Admittedly, it is impossible to identify the motivations behind individual positions in the observable data. Even so, it is striking that open interest in two of the most attractive target currencies has increased considerably since the height of the crisis. Open interest in contracts on the Australian dollar (the red line in the right-hand panel of Graph 8) rose from $4 billion at the end of 2008 to $13 billion one year later, although much of this increase took place in the first half of the year. Positions in the Brazilian real (green line) also expanded considerably (by 26% in the fourth quarter of 2009 alone). The funding currencies have changed from previous episodes of high carry trade activity. Short-term interest rates are low in a number of large economies, which has expanded the number of possible funding currencies. Open interest in the two traditional funding currencies, the Japanese yen and the Swiss franc, fell in the final quarter of 2009. Unfortunately, it is hard to say on the basis of the available data which other currencies have taken their place.

Higher turnover in derivatives on precious metals offsets decline in other commodity contracts

Activity in futures and options on commodities increased at a moderate pace in the final three months of 2009. Turnover measured by the number of contracts traded (notional amounts are not available for this risk category) rose by 7%, although with considerable variation across types of commodities. Trading volumes in contracts on precious metals increased by almost 50%, driven by near doubling of trading in gold contracts on Chinese exchanges. Turnover in contracts on agricultural commodities and energy contracts increased by 5% and 2%, respectively. By contrast, volumes of derivatives on non-precious metals fell by 31%.

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The architecture of global banking: from international to multinational?

The financial crisis has led to a reconsideration of banks' global business models. This special feature uses the BIS banking statistics to distinguish between "international" and "multinational" banks and their associated funding models. The crisis put these models to the test. In the event, banks' local positions were more stable, especially in emerging markets.

JEL classification: F34, F36, G21.

Banks run special risks in lending abroad. The term "country risk" covers the potential legal, political or economic sources of loss that are common to a jurisdiction. In particular, "transfer risk" arises when an otherwise sound borrower cannot buy the foreign currency needed for debt service. When big banks stepped up their lending to emerging market governments and firms in the 1970s, supervisors started to require systematic reporting of banks' country exposures. Consistent with its origins as a transfer agent, the BIS compiled such statistics. Until 1999, the BIS collated only exposures to countries *outside* the group of industrial reporting countries: implicitly, debtors posed risks to creditors that needed to be aggregated in order to be managed.

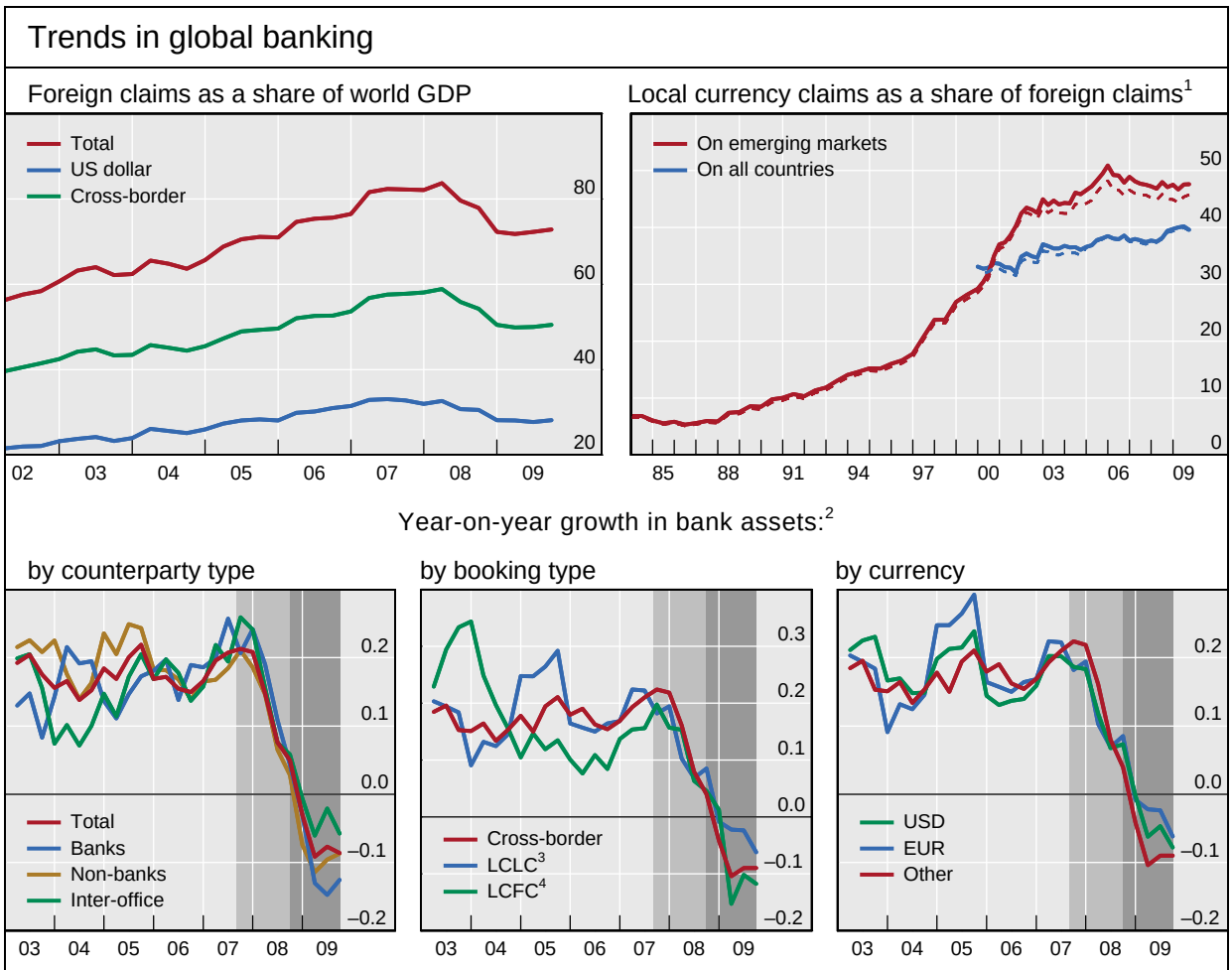
Recent events have reversed this perspective. While debtor countries pose risk to the creditor, creditors can also pose a risk to the debtor of a sudden withdrawal of credit. This risk depends on the creditor's business model. Loans may be extended in dollars or euros or in local currency. Funding may be sourced across currencies and borders, or locally. Operations may be wholesale or retail. Owing to such differences, some countries suffered a greater withdrawal of credit than others in 2008–09. Just as bank supervisors monitor (debtor) country risk, borrowers must attend to (creditor) source risk.

This special feature first characterises banks by the structure of their foreign operations. We identify a gradual long-term trend towards local banking, yet observe a persistent diversity in banks' underlying funding models that left some banks more vulnerable to the global funding disruptions during the crisis. We then analyse the stability of banks' exposures to borrowers in six host regions. We find that local positions proved to be more stable during the crisis than those funded across borders and currencies, especially in emerging markets.

Trends in the structure of global banking

For decades, the growth in banks' foreign claims has outpaced that in economic activity (Graph 1, top left-hand panel). Like other industries, banking has become more global. Banking stands out, however, in its legal form and reliance on cross-border positions. In other industries, as a firm expands from its home market, it sets up subsidiaries abroad that borrow locally to finance assets: this is the multinational model (Aliber (1993)). Accordingly, the *multinational bank* operates sizeable foreign branches and subsidiaries in multiple jurisdictions (Jones (1992)) and, in its extreme form, funds those positions locally in the host countries. In contrast, the *international bank* operates out of the home country or in a (major) financial centre and conducts mostly cross-border business.[1]

Trends in global banking



[1] BIS reporting banks' local claims in local currencies over total foreign claims, by type of borrower country. The dashed lines show the estimates holding the population of reporting banking systems constant through time. [2] Year-on-year growth rates in outstanding stocks expressed at constant end-Q3 2009 exchange rates. Shaded areas start from end-Q2 2007 and end-Q3 2008. [3] Local claims in local currency. [4] Local claims in foreign currency.

Sources: BIS consolidated banking statistics (ultimate risk (UR) and immediate borrower (IB) basis); BIS locational banking statistics by nationality. Graph 1

[1] The multinational model may (but need not) be implemented through locally incorporated, independently capitalised subsidiaries (eg to qualify for local deposit insurance). The BIS banking statistics comprise 1,764 foreign branches and 1,874 foreign subsidiaries.

After the 1980s Latin American debt crisis inflicted losses on cross-border loans, banks shifted towards the multinational model. Establishing or acquiring a local bank in order to borrow and lend locally avoided transfer risk, if not country risk. As a result, the share of local currency claims in foreign claims on emerging market economies rose from 7% in 1983 to 25–30% in the 1990s (Graph 1, top right-hand panel).[2] After the Asian financial crisis of 1997–98, the Committee on the Global Financial System widened the group of reporting jurisdictions and began to collect data on worldwide exposures. The new data showed that the local currency share of claims globally was even higher.

The shift to local banking slowed in the 2000s. In emerging markets, bank flows across borders resumed in the mid-2000s in response to higher yields and US dollar depreciation (Galati et al (2007), Gyntelberg and Remolona (2007), McCauley (2008), CGFS (2009)). Elsewhere, the introduction of the euro, spurring an area-wide interbank market, and European banks' heavy investment in US asset-backed securities had a similar effect. If these factors promoting cross-border lending prove to be transitory, then local claims as a share of foreign claims may rise from 40%, even in the absence of any regulatory changes that might favour multinational over international banking.

The global financial crisis reinforced the previous trend towards local and multinational banking, especially in emerging markets. With the drying-up of the international interbank market, claims on unaffiliated banks shrank (Graph 1, bottom left-hand panel). Cross-border claims and locally booked foreign currency claims (often funded cross-border) dropped more abruptly than local currency claims (centre panel).[3] The same pattern on the liabilities side suggests that local funding proved more resilient during the crisis. Developments by currency (right-hand panel) differed slightly, reflecting the greater dislocation in dollar funding markets and the high cost of dollars in foreign exchange swap markets (Baba and Packer (2009)).

Characterising banking systems

Despite the general trend just discussed, banking business models differ across banking systems. In order to highlight these differences, we next characterise banking systems in two dimensions.[4] In the first, we demonstrate that some banking systems approximate the *multinational* model while others

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[2] There was also a secular rise in the share of local claims in *all* currencies. Local claims refer to claims booked by foreign offices vis-à-vis *residents* of the host country. Foreign claims sum all cross-border claims and local claims booked by offices outside the home country.

[3] These series have been expressed at constant exchange rates to remove valuation effects. For example, with the appreciation of the US dollar in late 2008, stocks in other currencies translate into smaller dollar amounts, creating a spurious contraction of local positions.

[4] This analysis requires the consolidated entity to be broken down into the balance sheets of the bank offices in individual countries and jurisdictions ("locations"). To construct this dataset, we match banks' assets and liabilities in the BIS locational banking statistics (reported on a residency basis) with the consolidated banking statistics, to obtain the geographical office information separately for each banking system (ie the set of banks headquartered in a particular country). The main banking systems in the sample are shown in Table 1.

lie closer to the *international* model. In the second, we characterise banking systems by the degree of (de)centralisation. A *centralised* bank pools funds at major offices and redistributes them around the banking group; a *decentralised* bank lets affiliates raise funds autonomously to finance assets in each location. Multinational banks can stand at either end of this spectrum. By contrast, international banks by their nature tend to be more centralised.

From international banks with cross-border activity …

Banks headquartered in different countries have adopted a broad range of business models (Table 1 and Graph 2).[5] When banking systems are ranked according to the share of cross-border versus local positions, the international model of Japanese banks and, to a lesser extent, German banks stands out (Graph 2, top left-hand panel). Japanese banks not only book 80% of foreign claims as cross-border transactions, they do so predominantly out of their home offices in Tokyo. Two thirds of their foreign claims are also funded in Japan, in large measure through local deposits (bottom left-hand panel). German banks show a similar profile, though with domestic deposits used to fund claims booked in London.

… to multinational banks with local operations

At the other end of this spectrum, Spanish banks stand out with the largest share of local activity among the major banking systems. At 60% of foreign

Size and structure of banks' foreign operations

Positions at end-2007

		BE	CA	CH	DE	ES	FR	IT	JP	NL	UK	US
Number of banks[1]		18	17	23	1,801	96	135	724	106	49	17	33
Total assets ($bn)[2]		2,218	2,437	3,810	10,585	4,541	8,359	4,180	9,845	4,649	10,008	9,904
Foreign claims ($bn)[3]		1,608	912	3,390	5,177	1,416	4,456	1,543	2,571	2,962	4,378	2,285
Over total assets (%)		72	37	89	49	31	53	37	26	64	44	23
US dollar share (%)		23	70	60	33	36	31	10	48	31	42	52
Foreign claims, by office location (%)[4]	Home country[5]	42	23	18	44	27	51	39	75	27	44	22
	United Kingdom	6	18	30	22	28	6	5	6	20	.	25
	United States	6	41	23	6	9	12	3	9	12	16	.
	Euro area	37	2	4	16	10	15	35	2	23	11	7
	Offshore centres	3	9	21	7	2	6	2	6	6	14	24
	Other	6	7	4	4	24	10	17	3	13	15	22
Foreign offices (%)[6]		42	26	80	27	22	27	19	7	47	29	21

[1] Number of banking groups (headquartered in the country shown in the columns) that report in the BIS consolidated banking statistics. [2] Total assets (including "strictly domestic assets") aggregated across BIS reporting banks. For reporting jurisdictions which do not provide this aggregate (DE, ES, FR, IT, JP), total assets are estimated by aggregating the worldwide consolidated balance sheets for a similar set of large banks headquartered in the country, using BankScope. [3] Foreign claims as reported in the BIS consolidated banking statistics (IB basis) plus foreign currency claims vis-à-vis residents of the home country booked by home offices (taken from the BIS locational banking statistics by nationality). [4] Total claims (cross-border claims plus claims on residents of the host country) booked by offices in each location over total worldwide consolidated foreign claims. [5] Excludes banks' "strictly domestic" claims, or their claims on residents of the home country in the domestic currency. [6] Share of total assets (row 2) booked by offices outside the home country.

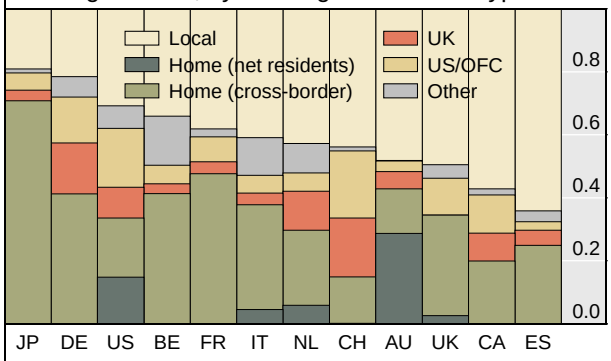
Sources: IMF, *International Financial Statistics*; BankScope; BIS consolidated banking statistics (IB basis); BIS locational banking statistics by nationality. Table 1

[5] This is in addition to the fact that smaller countries tend to have banks with a more international orientation (see foreign claims over total assets in Table 1).

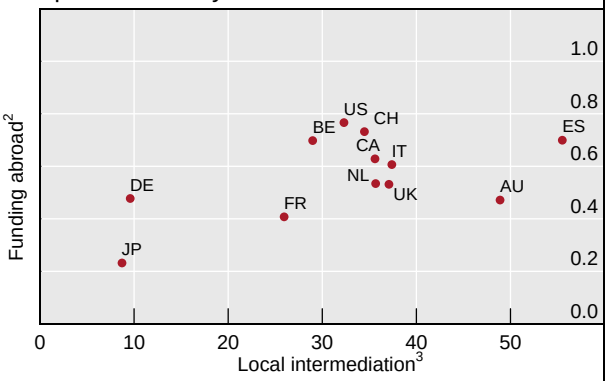
Multinational versus international banking

Positions at end-Q4 2007

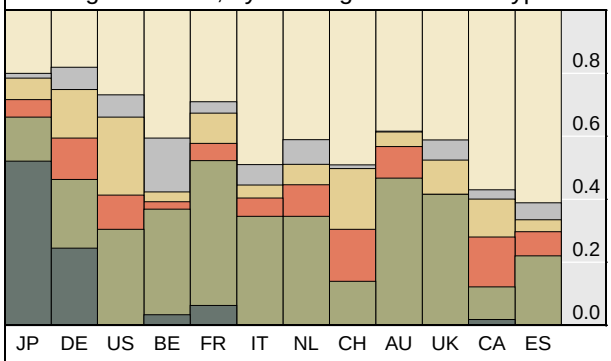
Foreign assets, by booking location and type[1]



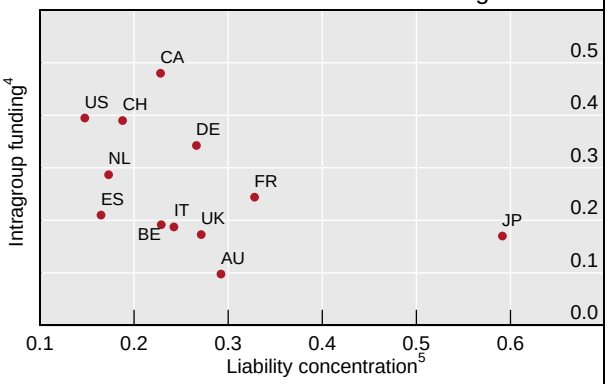
Operations away from home



Foreign liabilities, by booking location and type[1]



Concentration and distribution of funding



[1] The panels divide total foreign positions into local and cross-border positions for those banking systems identified under the bars. Cross-border positions are further broken down into positions *booked by* offices in various countries. The size of the bars indicates the share of total foreign positions. "Local" = *local positions* (in all currencies), or positions vis-à-vis residents of the host country; "Home (cross-border)" = *cross-border positions* booked by the home office; "Home (net residents)" = *net positions* vis-à-vis residents of the home country (in home currency) which equate total foreign assets and liabilities of the home office. This is positive on the assets side for banking systems which borrow abroad to lend at home (eg Australian, Italian and US banks), and positive on the liabilities side for banking systems which borrow at home to lend abroad (eg German and Japanese banks); "UK" = *cross-border positions* booked by offices in the United Kingdom plus positions booked by offices in the United Kingdom which are unallocated by residency (ie unclear whether cross-border position or not); "US/OFC" = *cross-border positions* booked by offices in the United States and offshore centres; "Other" = *cross-border positions* booked by other offices. [2] Share of total foreign liabilities booked by offices outside the home country. [3] Defined as in footnote 6 in the main text. [4] Share of inter-office liabilities in total foreign liabilities. [5] Herfindahl index of total foreign liabilities (both cross-border and local, including inter-office) by office location.

Sources: BIS consolidated banking statistics (UR and IB basis); BIS locational banking statistics by nationality. Graph 2

assets and liabilities (Graph 2, left-hand panels), their local operations are large and increasing. This trend reflects the expansion of their operations in Latin America (and in the United Kingdom) and pressure from home and host supervisors to fund that expansion locally.

The share of foreign liabilities booked outside the home country also usefully distinguishes international from multinational banks. This identifies Japanese, German and French banks as more international, and US, Spanish and Swiss banks as multinational (Graph 2, top right-hand panel).

A more centralised approach …

In our second dimension, centralised banks are distinguished from decentralised multinational banks by the extent to which local assets are locally funded. We compute the minimum of local claims and local liabilities across

office locations for each banking system (*local intermediation*).[6] A high score in this dimension sets Spanish banks apart from their Swiss counterparts, which tap funds in multiple locations (global wealth management) to fund assets held in other jurisdictions (top right-hand panel). The Spanish banks are decentralised in that their foreign offices raise funds autonomously in each host country. Swiss banks are more centralised, using the home office or offices in financial centres to source liabilities and to redistribute the funds across the group (Table 1); foreign affiliates thus tend to rely more on cross-border *intragroup* funding (bottom right-hand panel).[7] Extensive intragroup funding points to an even greater centralisation among Canadian and US banks. The global distribution of funding also sheds light on the degree of centralisation among banks closer to the international model. A high concentration of liabilities[8] distinguishes Japanese banks, with their reliance on home country funding, from German or French banks, with a wider spread of liabilities.

Over time, the trend from international to multinational banking is more evident in some banking systems than in others. Several banking systems have increased the extent of local intermediation abroad, including Spanish, French and UK banks (Graph 3).[9] Belgian banks also show a mild uptrend from low levels of multinationalisation. For most banking systems, the tendency to extend local credit is more pronounced in emerging market countries (dotted lines). Therefore, the overall trend towards multinational banking in part reflects the compositional effects of rising emerging market portfolio shares and faster growth among the decentralised multinational banks, rather than a universal evolution in business models. The contraction of cross-border lending in the crisis has given this trend a fillip (Graphs 1 and 6).

… exposes a bank to global market disruptions

This leads to the question of how the different funding models map onto vulnerability to funding disruptions. In seeking an answer, the analysis must further examine the structure of banks' assets and liabilities in individual *currencies*. Only this step allows us to measure banks' cross-currency funding and their reliance on foreign exchange swaps. For non-US banks, US dollar positions typically exceed US dollar funding, and large foreign exchange swap

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[6] Formally, $\sum_i \min\{LC_{ni}, LL_{ni}\}/\mathrm{FC_n}$, where LC_{ni} stands for local claims in country *i* booked by banks headquartered in country *n*, and LL_{ni} likewise stands for local liabilities. This indicator remains close to zero if banks from *n* are mostly in the business of sourcing liabilities in one country with the aim of transferring them to another.

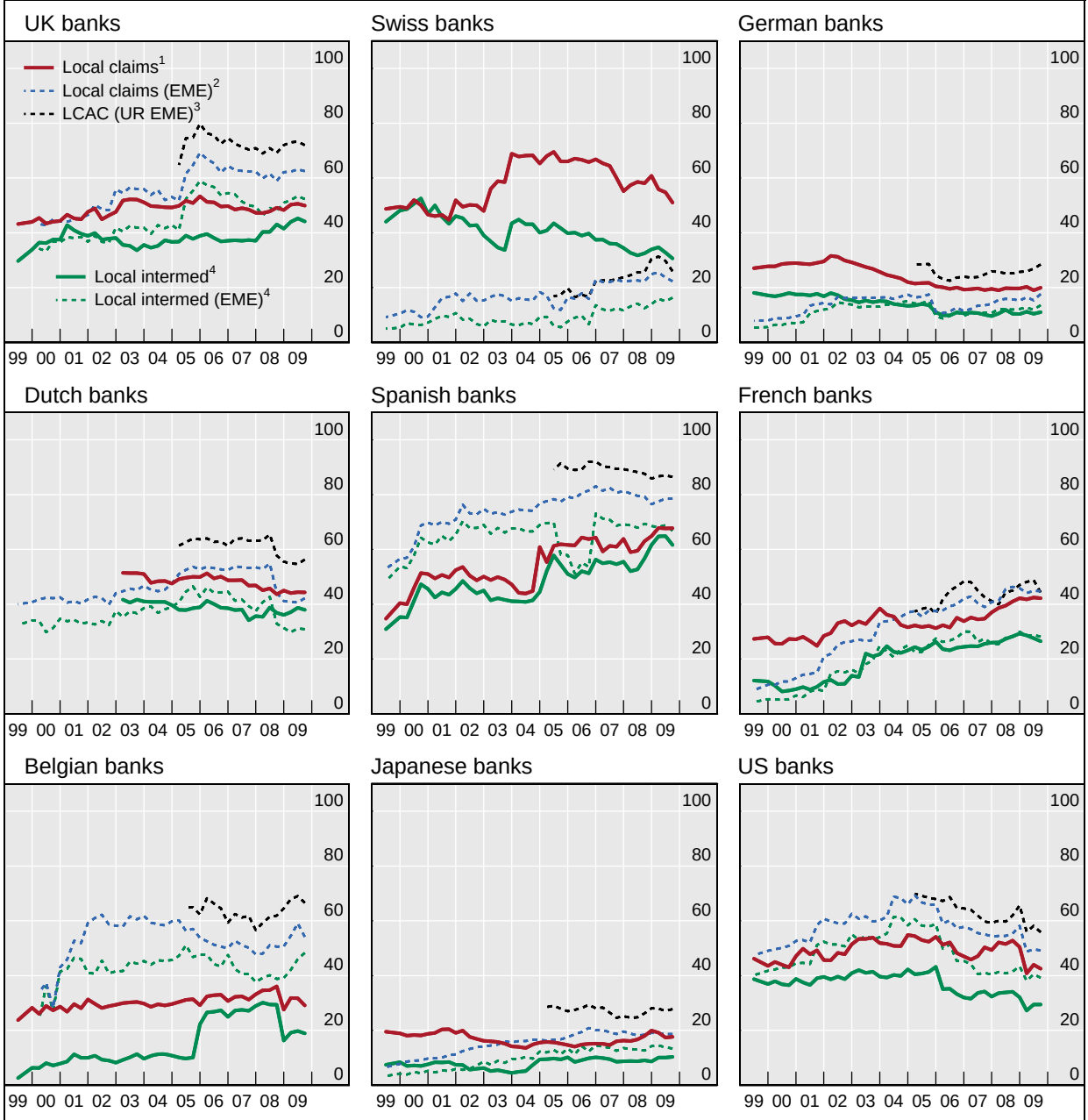
[7] Using bank-level data, de Haas and van Lelyveld (2010) find evidence of internal capital markets in multinational banks whereby parent banks manage the credit growth of their subsidiaries.

[8] This can be measured with the Herfindahl index on booking office liabilities, $\sum_i \left(FL_{ni} / FL_n\right)^2$, where FL_{ni} represents foreign liabilities in country *i* booked by banks headquartered in country *n*. The index approaches unity as all funding is concentrated in one office location.

[9] An admitted data limitation is that aggregation across countries in the BIS statistics obscures differences among individual banks. In the case of UK banks, the "colonial" banks HSBC and Standard Chartered differ from Barclays in terms of funding models and organisational forms.

Local positions as a share of foreign positions

In per cent



[1] Local claims as a percentage of total foreign claims, where local claims are claims (in all currencies) booked by foreign offices vis-à-vis residents of the host country (ie excluding cross-border positions). [2] Local claims in local currencies (LCLC) on emerging markets over total foreign claims (IB basis) on emerging markets. [3] Local claims in all currencies (LCAC) on emerging markets over total foreign claims (UR basis) on emerging markets. [4] Measure of the amount of business that is locally intermediated, calculated as described in footnote 6 in the main text. The dashed green line is the measure for offices in emerging markets only.

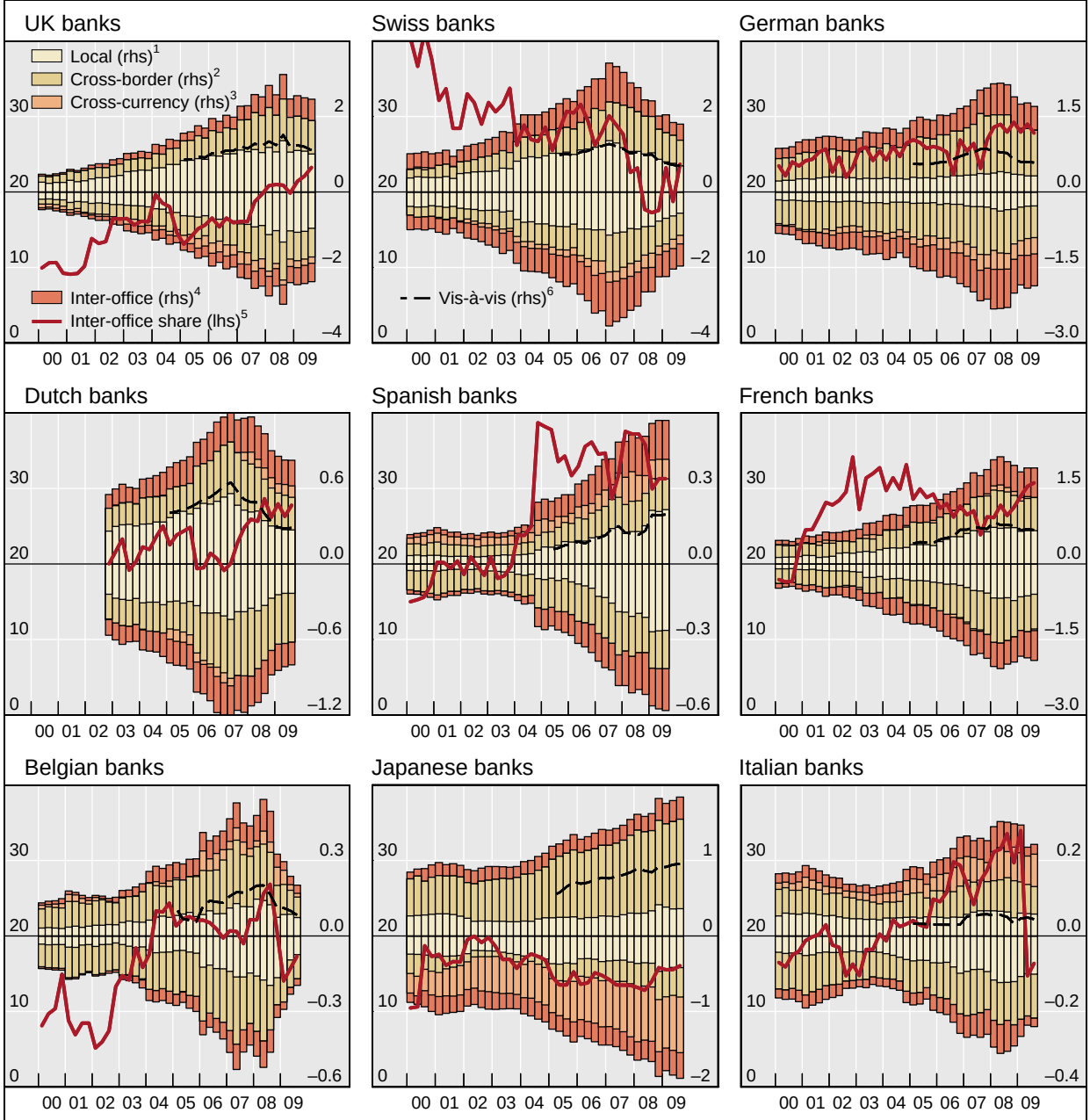
Sources: BIS consolidated statistics (IB and UR basis); BIS locational statistics by nationality. Graph 3

positions are taken to convert funding in other currencies into US dollars (Graph 4).[10] Such hedging exposed Japanese, German, Swiss and (some) UK

[10] Claims on US entities make up little more than half of the US dollar business across all banking systems shown, illustrating the leading role of the US currency for denominating financial instruments. Non-US banks' consolidated foreign claims (IB basis) on the United States have fallen by roughly $1 trillion since end-Q3 2008, reflecting asset writedowns,

Reporting banks' US dollar foreign claims, by type

In trillions of US dollars



[1] Local positions are positions that are booked by a bank office in a given jurisdiction vis-à-vis residents of that jurisdiction. [2] Cross-border positions are positions that are booked by a bank office in a given jurisdiction vis-à-vis residents of other jurisdictions. [3] Cross-currency funding position implied by the balance sheet identity. [4] Cross-border positions vis-à-vis offices within the same banking group. [5] Share of gross US dollar inter-office assets in total US dollar assets. [6] Foreign claims (UR basis) on US residents.

Sources: BIS consolidated banking statistics (UR and IB basis); BIS locational banking statistics by residency. Graph 4

banks, in particular, to swap market dislocations (McGuire and von Peter (2009)). Banks pursuing a more decentralised multinational model were somewhat less exposed to disruptions in wholesale funding and swap markets.

reductions in lending and sales of securities. Roughly $600 billion of this total is the result of a contraction in banks' local claims booked in the United States.

The dollar book mirrors many regularities noted earlier. German and Japanese banks conduct their dollar business cross-border, while Spanish and UK banks lend and fund more locally even in this global currency.[11] German banks rely more on inter-office activity to redistribute US dollars (red bars), while Japanese banks convert yen to fund cross-border dollar claims (vis-à-vis unaffiliated entities). Banks' global euro books admit similar conclusions, though the contraction during the financial crisis was less pronounced. This points to currency-specific effects, whereby adverse funding conditions in the US dollar wholesale markets (and dysfunctional swap markets) have driven the contraction of dollar-denominated positions (among Swiss and German banks, for example).

The host country perspective and credit stability

The stability of cross-border lending matters because cross-border borrowing can be substantial in relation to a country's international balance sheet (Table 2). In the case of Belgium, Switzerland and the United Kingdom, banks' cross-border positions accounted for 40–60% of each country's external liabilities at end-2007, and for a quarter or more in the case of France, Italy and

Bank liabilities as a share of total external liabilities

Positions at end-2007

	BE	CA	CH	DE	ES	FR	IT	JP	NL	UK[4]	US
Gross external liabilities ($bn)[1]	2,266	1,340	2,596	6,418	3,206	7,383	2,946	3,160	3,781	13,357	20,419
Net external assets ($bn)	141	–127	635	949	–1,081	375	–119	2,195	14	–586	–2,442
Cross-border bank liabilities (in billions of US dollars)[2]											
All banks	970	263	1,393	1,993	704	2,810	942	712	1,436	8,118	3,716
Domestic banks	721	218	1,118	1,614	405	2,375	608	546	1,169	2,366	1,928
Foreign banks	249	45	275	379	299	435	334	166	267	5,752	1,788
Cross-border bank liabilities as a share of external liabilities (in per cent)[3]											
All banks	43	20	54	31	22	38	32	23	38	61	18
Domestic banks	32	16	43	25	13	32	21	17	31	18	9
Foreign banks	11	3	11	6	9	6	11	5	7	43	9

[1] Stock of international liabilities held by residents (banks and non-banks) of the country listed in the column heading. [2] Cross-border liabilities (including inter-office liabilities) booked by banks' offices located in the country in the column heading. [3] Ratio of cross-border bank liabilities to gross external liabilities (row 1). [4] Banks located in the United Kingdom reported roughly $800 billion in liabilities for which the residency of the counterparty is unknown. The figures in the table assume that these "unallocated" liabilities are held by *non-residents*. Were we to assume that they were held by residents, then the cross-border liabilities of domestic (foreign) banks would change from $2,366 billion ($5,752 billion) to $2,014 billion ($5,291 billion). The figures on banks' cross-border liabilities should therefore be interpreted with caution.

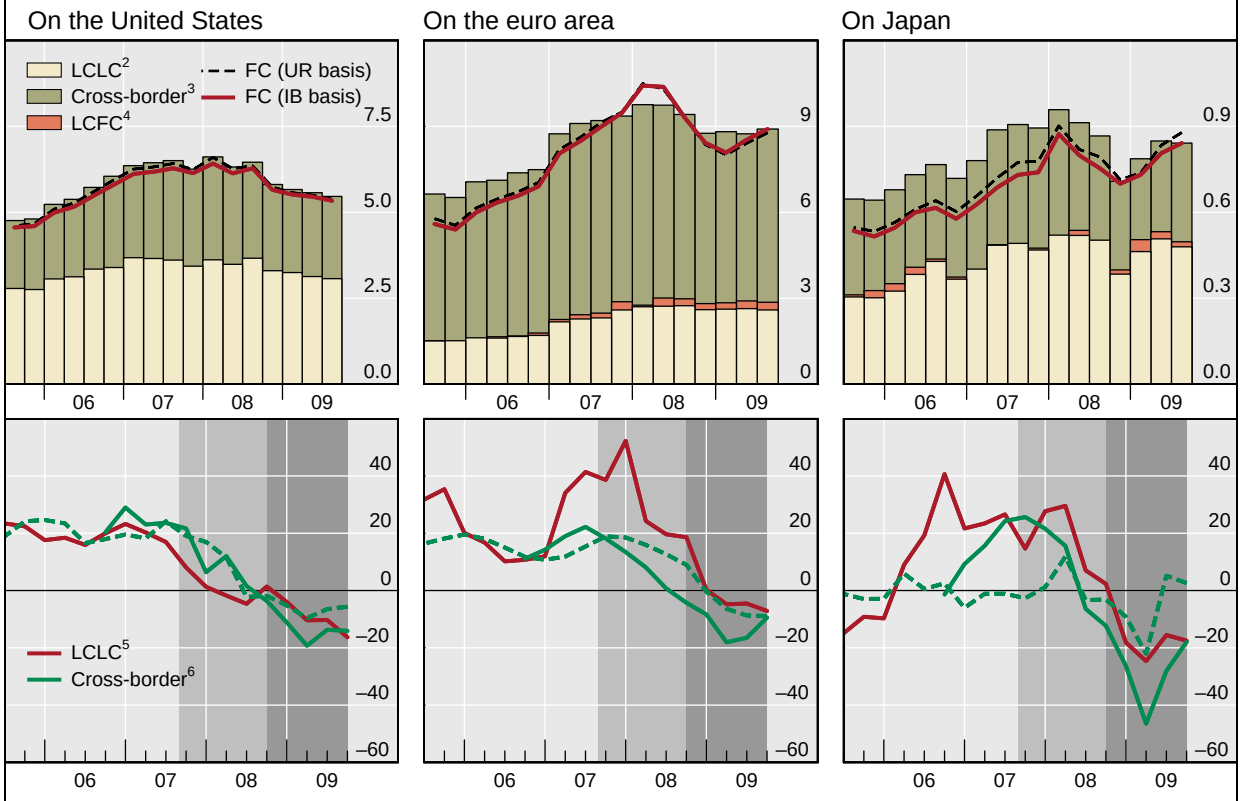
Sources: IMF, *International Financial Statistics*; BIS locational banking statistics by nationality. Table 2

[11] Note that the share of local activity also serves as a proxy of how much is known about the location of the counterparties of a particular banking system. Since the counterparties of cross-border liabilities are not reported, the ultimate funding sources remain unknown for this part of banks' consolidated balance sheets. This makes it impossible to ascertain how far banks that rely extensively on cross-border funding (eg German banks) depend on particular sources such as petrodollars.

the Netherlands. The offices of *foreign* banks alone accounted for about a tenth of the external liabilities of Belgium, Italy, Spain, Switzerland and the United States.[12] A similar ratio was evident in Korea and Chinese Taipei, while Brazil, Chile and Mexico showed ratios of about half that level.

For emerging market economies, foreign bank positions on such a scale have raised policy questions. For instance, whereas *domestic* banks in Korea had run up large short-term external liabilities just before the outbreak of the Asian financial crisis, *foreign* banks in Korea had run up the bulk of such liabilities in 2007 (McCauley and Zukunft (2008)). Reporting banks, primarily continental European banks, had swapped an estimated $67 billion of these (mostly) dollar liabilities into Korean won to help finance won assets of

Foreign claims on advanced economies[1]



[1] In the top panels, the stacked bars are BIS reporting banks' total outstanding foreign claims (IB basis) on residents of the country/region in the panel title, expressed at constant end-Q3 2009 exchange rates. The solid red line and the dashed black line are the *unadjusted* stock of foreign claims on an IB and a UR basis, respectively. The growth rates in the bottom panels are corrected for the change in reporting by US banks in Q1 2009. The shaded areas start from end-Q2 2007 and end-Q3 2008. [2] Local claims in local currency. [3] Cross-border claims (UR basis) excluding inter-office positions, adjusted for exchange rate movements using the currency breakdown available for cross-border claims (including inter-office positions) from the locational banking statistics. [4] Local claims in foreign currency, estimated as the difference in international claims (IB basis) and cross-border claims (UR basis). This estimate will be increasingly biased the greater the net risk transfers (ie the gap between the red and dashed black lines). [5] Year-on-year growth in local claims in local currency. [6] Year-on-year growth in cross-border positions. The solid green line shows growth in cross-border positions (UR basis) excluding inter-office positions, while the dashed green line shows the growth in cross-border positions (including inter-office) reported in the locational banking statistics.

Sources: BIS consolidated banking statistics (UR and IB basis); BIS locational banking statistics by residency. Graph 5

[12] In contrast, positions booked by the home offices of domestic banks were much larger in the case of Belgium, Germany, Japan and Switzerland.

$165 billion at end-2007. Were concerns over the stability of such cross-border liabilities justified by subsequent events?

Local positions contract less than cross-border positions …

The evidence speaks for the greater stability of the decentralised multinational model, especially outside the major currency areas. As observed above, local assets, in particular local claims in *local currency*, proved to be more stable in aggregate in the recent financial crisis than did cross-border claims.[13] Here we assess the consistency of this finding across six countries/regions: the United States, the euro area, Japan, Latin America, emerging Asia and emerging Europe. The finding does not hold for the epicentre of the crisis, the United States, where foreign banks' asset-backed securities holdings fell through sales, writedowns or rebookings. It holds most strongly for emerging markets.

With regard to obligors in the United States, non-US banks' local claims contracted at roughly the same rate as their cross-border claims (Graph 5). Much of these banks' local US claims comprised holdings of asset-backed securities that lost value. The simultaneous contraction in non-US banks' local US dollar *liabilities* suggests that these local assets were funded by short-term wholesale liabilities rather than by stable retail deposits.

In the euro area, cross-border lending decelerated and started to shrink earlier than local euro lending. While the most recent data seem to show little difference in rates of growth, mergers and acquisitions among European banks muddy the interpretation of the observations.

… particularly in emerging markets

In emerging markets, however, banks' local currency claims proved more stable than cross-border claims (Graph 6). Unlike elsewhere, the bulk of banks' local currency operations in emerging markets is usually retail and corporate lending on the assets side, funded by deposits on the liabilities side.[14] As shown in Graph 6, the year-on-year growth in cross-border lending (excluding inter-office) plunged from more than 30% in each region to –15% or less in the wake of the collapse of Lehman Brothers. In contrast, the growth in banks' local currency claims slowed much less and actually remained positive up to end-Q3 2009 in Latin America and emerging Europe.

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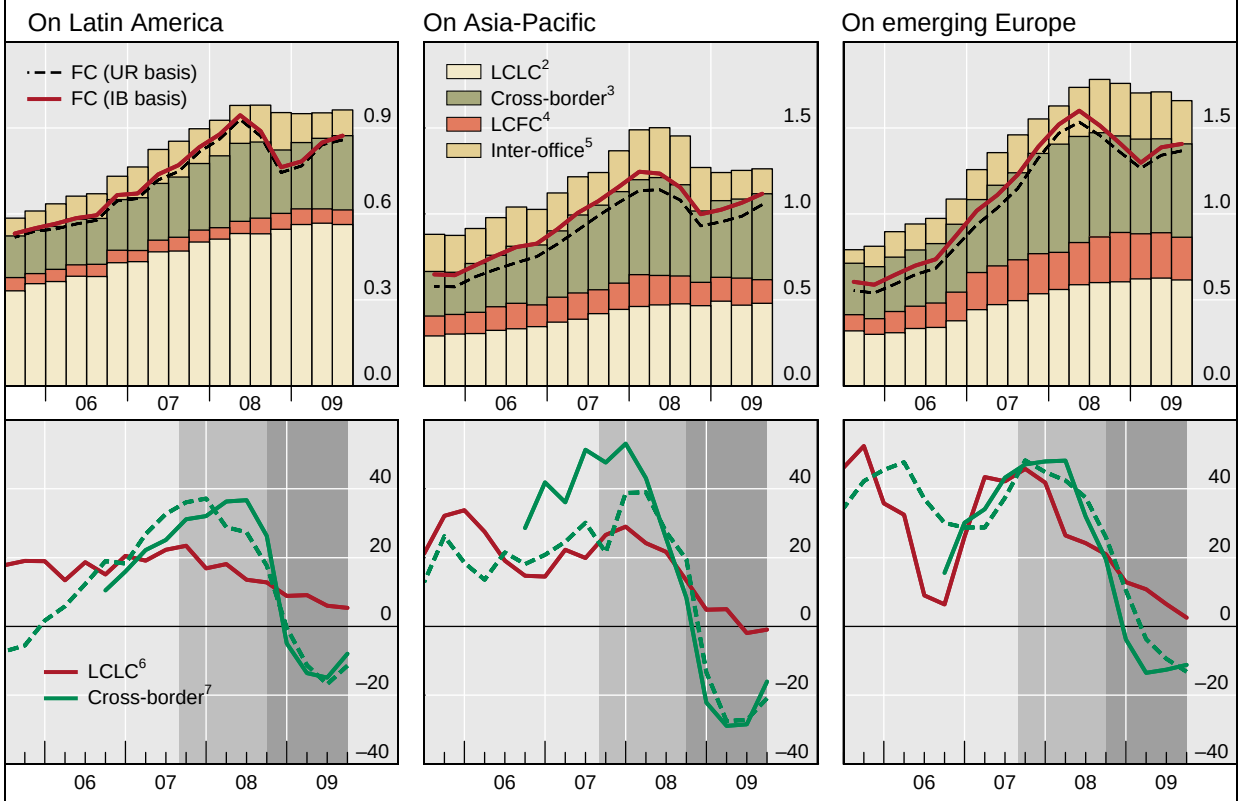
[13] Determining the size of the change in consolidated foreign positions at the global (or even regional) level is complicated by (i) changes in the reporting population, (ii) mergers and bankruptcies of banks and (iii) large exchange rate movements since the start of the crisis. On (i), the former investment banks were included as reporting institutions in the US consolidated statistics for the first time in the first quarter of 2009, which led to a large jump in US banks' outstanding positions vis-à-vis borrowers in most countries. The growth rates in the bottom panels of Graphs 5 and 6 have been adjusted for this break in series, whereas the stock figures in the top panels have not. On (ii), the break-up of ABN AMRO and Fortis banks has led to large declines in the outstanding stock of foreign claims of Belgian and Dutch banks. Some of the assets of these institutions were purchased by entities which are non-reporters, thus biasing downwards the stock of outstanding claims and the rate of contraction vis-à-vis some borrowers. The growth rates shown in Graphs 5 and 6 are similar if Belgian and Dutch banks are dropped from the sample. On (iii), see footnote 5 in Graphs 5 and 6.

[14] The relative size of local versus cross-border credit differs significantly by emerging market region. Cross-border claims accounted for roughly 40% of banks' total foreign claims on eastern Europe, and local lending in *foreign* currency (particularly important in the Baltic states) for an additional (estimated) 15%. In contrast, banks' claims on Latin American borrowers are primarily in the form of local claims in local currency, reflecting operational requirements imposed by host countries (eg Brazil, Chile and Mexico) as well as the predominance of US and Spanish banks in the region (see previous section).

Foreign claims on emerging markets[1]



Latin America = Argentina, Brazil, Chile, Colombia, Ecuador, Mexico, Peru, Uruguay and Venezuela; Asia-Pacific = China, Chinese Taipei, India, Indonesia, Korea, Malaysia, the Philippines and Thailand; emerging Europe = Bulgaria, Croatia, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Russia, Slovakia, Slovenia and Turkey.

[1] In the top panels, the stacked bars are BIS reporting banks' total outstanding foreign claims (IB basis) on residents of the country/region in the panel title, expressed at constant end-Q3 2009 exchange rates. The solid red line and the dashed black line are the *unadjusted* stock of foreign claims on an IB and a UR basis, respectively. The year-on-year growth rates in the bottom panels are based on exchange rate adjusted data, and are corrected for the change in reporting by US banks in Q1 2009. The shaded areas start from end-Q2 2007 and end-Q3 2008. [2] Local claims in local currency. [3] Cross-border claims (UR basis) excluding inter-office positions, adjusted for exchange rate movements using the currency breakdown available for cross-border claims (including inter-office positions) from the locational banking statistics. [4] Local claims in foreign currency, estimated as the difference in international claims (IB basis) and cross-border claims (UR basis). This estimate will be increasingly biased the greater the net risk transfers (ie the gap between the red and dashed black lines). [5] Inter-office claims on subs in the borrower country/region; estimated as the difference between cross-border claims from the consolidated statistics (UR basis) and cross-border claims from the locational statistics, and adjusted for currency movements using the currency breakdown available for total cross-border positions in the locational banking statistics. [6] Year-on-year growth in local claims in local currency. [7] Year-on-year growth in cross-border positions. The solid green line shows growth in cross-border positions (UR basis) excluding inter-office positions, while the dashed green line shows the growth in cross-border positions (including inter-office) reported in the locational banking statistics.

Sources: BIS consolidated banking statistics (UR and IB basis); BIS locational banking statistics by residency. Graph 6

Conclusion

This feature has highlighted an underlying trend towards multinational banking. If this is accepted, then it follows that banks are becoming more like manufacturing and other service firms in their global operations. This trend was obscured for much of the 2000s by European banks' build-up of positions in US asset-backed securities funded or held outside the United States. The writedown and sale of these positions have allowed the trend towards more multinational banking to reassert itself.

We have shown that some banking systems are international in their organisation while others are multinational, and that the multinational model can be operated with a greater or lesser degree of centralisation. While much work remains to be done in assessing the performance of various banking models during the crisis, it does appear that local assets proved more stable under stress. Cross-border claims and liabilities proved less stable. These findings hold even if account is taken of the series break represented by US securities firms becoming reporting banks, exchange rate changes and distortions from mergers and acquisitions, some of which resulted from the crisis itself.

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Exchange rates during financial crises[1]

Exchange rate movements during the global financial crisis of 2007–09 were unusual. Unlike in two previous episodes – the Asian crisis of 1997–98 and the crisis following the Russian debt default in 1998 – in 2008 many countries that were not at the centre of the crisis saw their currencies depreciate sharply. Such crisis-related movements reversed strongly for a number of countries. Two factors are likely to have contributed to these developments. First, during the latest crisis, safe haven effects went against the typical pattern of crisis-related flows. Second, interest rate differentials explain more of the crisis-related exchange rate movements in 2008–09 than in the past. This probably reflects structural changes in the determinants of exchange rate dynamics such as the increased role of carry trade activity.

JEL classification: F3, G01.

Financial crises are often associated with significant movements in exchange rates, which reflect both increasing risk aversion and changes in the perceived risk of investing in certain currencies. The global financial crisis of 2007–09 was no exception.

Previous work on exchange rate movements during the crisis has concentrated on the unusual (and unexpected) appreciation of the US dollar (McCauley and McGuire (2009), McGuire and von Peter (2009)). This feature investigates the flip side of this development and focuses on movements in the exchange rates of a number of emerging markets and small advanced economies against three major currencies: the Japanese yen, the Swiss franc and the US dollar.

During the crisis, a large number of currencies that were not at the centre of the turmoil depreciated. These movements reversed within a year or so. Both these experiences stand out when compared with those seen during the Asian financial crisis of 1997–98 or the crisis that followed the Russian debt default in mid-1998. We concentrate on two factors that can explain part of these unusual developments. First, during the most recent episode safe haven flows went against the typical crisis-related pattern: instead of fleeing the

[1] The author thanks Claudio Borio, Ben Cohen, Petra Gerlach, Corrinne Ho, Michael King, Robert McCauley and Christian Upper for useful comments and discussions. Emir Emiray and Jimmy Shek provided excellent research assistance. The views expressed in this article are those of the author and do not necessarily reflect those of the BIS.

country at the epicentre of the crisis, they moved into it. Second, interest rate differentials played a bigger role than in the past in explaining some of the crisis-related exchange rate movements. The increase in carry trade activity over the past 15 years could be one explanation for this finding. If so, the dynamics of exchange rate movements around crises may have changed more fundamentally.

In the next section, we briefly review exchange rate movements during late 2008 and 2009 and compare them with those in the Asian financial crisis and the crisis following the Russian debt default. We then analyse measures from currency options, implied volatility and risk reversals, to gauge risk aversion and market perceptions of uncertainty and "safe haven" currencies during these episodes. Extending previous BIS work, we then investigate the role of interest rates for exchange rate movements during both the crisis and its immediate aftermath. The last section concludes.

Comparison of three episodes

Three recent financial crises were accompanied by substantial movements in exchange rates: the Asian financial crisis of 1997–98, the crisis that followed the Russian debt default in August 1998 and the global financial crisis of 2007–09.

The global financial crisis was different …

Of course, the first two crises differed from the most recent one in a number of ways, including their place of origin, whether they were accompanied by currency crises and the scale of contagion. The earlier two episodes centred on emerging market economies, while in the most recent crisis the epicentre of the turmoil was the US banking system. Both the Asian crisis and the crisis after the Russian default involved speculative attacks that forced a number of countries to abandon fixed exchange rate regimes.[2] By 2008, however, many more countries had floating or managed exchange rates, limiting the pent-up need for abrupt and sizeable adjustments due to misaligned currencies in the most recent episode. And, while contagion was important in all three episodes, in the Asian crisis it was largely confined to the region and after the Russian default it concentrated on emerging market economies seen to be in a similar situation, such as Brazil. The latest crisis, by contrast, was truly global.

… including with regard to exchange rate movements

Graph 1 shows the exchange rate movements of a range of countries against three major "safe haven" currencies: the US dollar, the Japanese yen and the Swiss franc. We classify the currencies of our analysis into three groups: (i) currencies of small open advanced economies, (ii) those at the centre of the Asian crisis and (iii) currencies heavily affected by the Russian debt default.[3]

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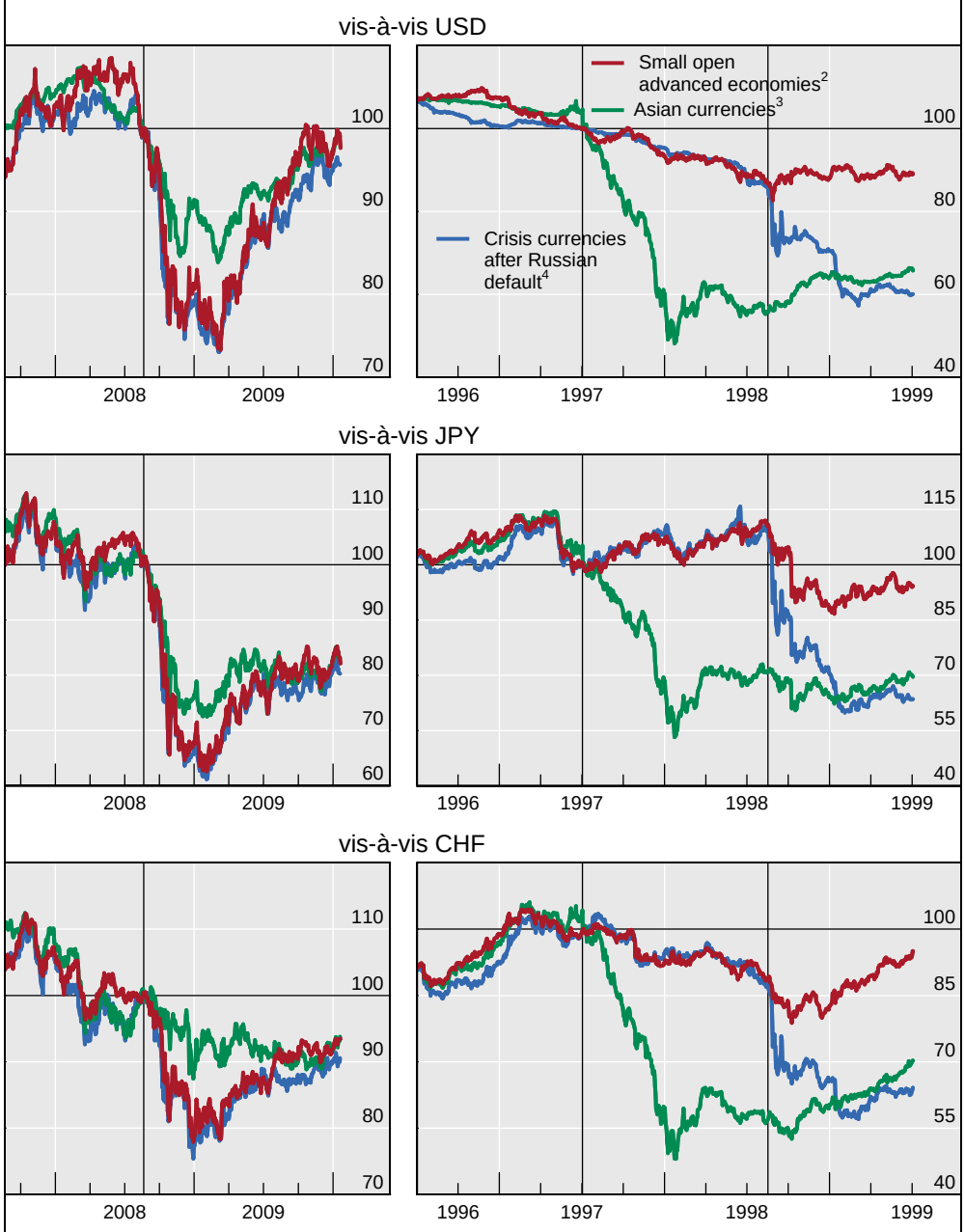
[2] For more detail on the Asian crisis, see eg Radelet et al (1998); on the Russian crisis and contagion to other countries, see eg Baig and Goldfajn (2000).

[3] The first group comprises Australia, Canada, New Zealand, Norway and Sweden, the second group Indonesia, Korea, Malaysia, Thailand and the Philippines, and the third group Brazil, Chile, Russia and South Africa.

Exchange rate movements during three financial crises[1]



[1] Rebased to crisis date = 100 in 2008 and 1997, respectively. Crisis dates are 2 July 1997, 17 August 1998 and 21 August 2008 (vertical lines). A positive number indicates an appreciation against the vis-à-vis currency. [2] Simple average of AUD, CAD, NZD, NOK and SEK. [3] Simple average of IDR, KRW, MYR, PHP and THB. [4] Simple average of BRL, CLP, RUB and ZAR.

Sources: Datastream; national data. Graph 1

Many currencies not at the centre of the crisis depreciated …

Two features of the latest crisis stand out in Graph 1. First, perhaps not surprisingly given the global nature of the turmoil, during 2008 all the selected currencies depreciated sharply against the US dollar, the yen and the Swiss franc, although the magnitudes of the declines differed. This contrasts with the previous two episodes: sharp depreciations during the Asian crisis in 1997 were largely confined to currencies in the region (green line), and mainly currencies of the third group (blue line) declined strongly after the Russian debt

default. The currencies of small advanced countries not at the centre of the crises (red line) saw little change, except for the Australian and New Zealand dollars after the Asian crisis.

… and reversed within a year

A second, more surprising, aspect of the most recent crisis is the relatively quick and strong reversal of the depreciations. While there was some reversal also during the earlier two crises, it was much less pronounced. In the case of the currencies affected during the Asian crisis, there was more of a rebound, but it was spread over several years, rather than six months, as in the most recent episode.

The role played by pre-crisis exchange rate regimes undoubtedly helps explain the limited reversal in the earlier episodes. If exchange rate levels had been out of line with fundamentals during fixed exchange rate regimes, we would not expect exchange rates to return to pre-crisis levels once the pegs were abandoned.

A factor that was particularly influential for exchange rate pressures in the most recent crisis episode was the effect of US dollar funding shortages in the non-US banking sector, which has been extensively discussed elsewhere (see, for instance, McCauley and McGuire (2009)). However, this mainly affects the US dollar exchange rate (and to a lesser extent the Swiss franc exchange rate) and is thus less likely to explain the patterns vis-à-vis the yen.

Safe haven flows and interest rate differentials could explain some of the exchange rate movements

In explaining exchange rate developments, we focus here on two factors that are common across the crises. First, the movement of exchange rates can be related to the rise and fall in uncertainty and risk aversion; flows to (and from) safe haven currencies may therefore explain some of the movements. Second, exchange rate changes can be related to interest rate differentials. One prominent channel is the impact of carry trade strategies on exchange rates both during the downturn, as carry trades unwind, and when investors seek higher-return assets once conditions normalise. We next consider each in turn.

Uncertainty, risk aversion and safe haven currencies

Uncertainty and risk aversion …

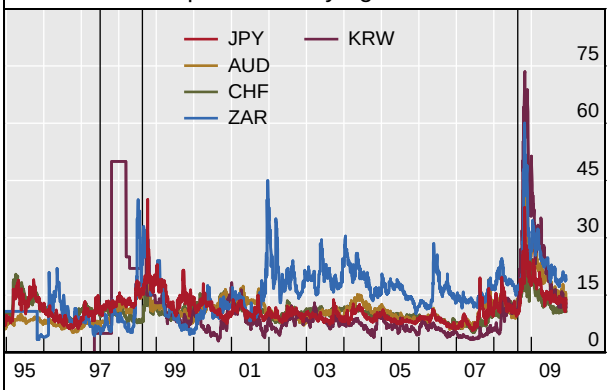
Financial crises are often associated with unusual exchange rate uncertainty and a sharp rise in risk aversion, which itself drives up the price of risk. Both factors are reflected in volatilities implied from the prices of currency options.[4] This measure increased sharply as the global financial crisis intensified in the third quarter of 2008 (Graph 2, left-hand panel). A smaller rise took place around the Russian debt default in 1998 for most currency pairs. Implied volatilities for a number of Asian currencies, such as the Korean won, increased in 1997, although there are questions about the reliability of this measure, since option markets for some of the most affected currencies were either not active or not very liquid at the time.

[4] For a discussion, see eg Neely (2005) and Bliss (2000). While the level and price of risk are difficult to disentangle in practice (see, for instance, Tarashev et al (2003) or Bliss and Panigirtzoglou (2004)), this is not an obstacle for our purposes: a rise in both factors can trigger safe haven flows.

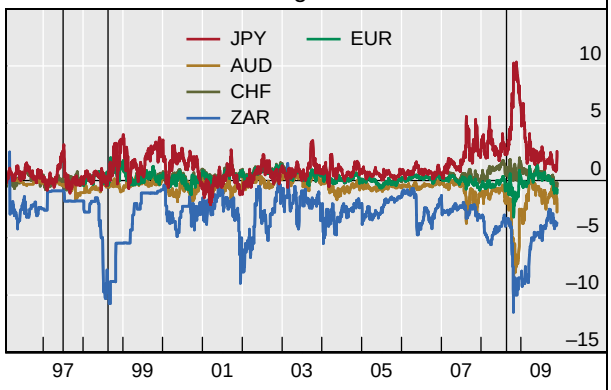
Risk aversion, exchange rate uncertainty and risk reversal

In per cent

One-month implied volatility against US dollar



One-month risk reversal against US dollar



The vertical lines mark 2 July 1997, 17 August 1998 and 21 August 2008.

Source: Bloomberg.

Graph 2

... can lead to safe haven flows

At times of high uncertainty and risk aversion, some currencies – often dubbed "safe haven currencies" – appear more attractive than others. There is no universally accepted definition of a safe haven asset – it could mean an asset with low risk or high liquidity, a hedge asset or a rainy day asset (McCauley and McGuire (2009)). All these definitions, however, have in common that one would expect the relative price of such an asset to increase during crises.

The existing literature on safe haven currencies often concentrates on *relative* effects among the five major currencies. For instance, Ranaldo and Söderlind (2007) find that periods of low risk aversion are usually associated with an appreciation of the US dollar, and periods of high risk aversion with a depreciation of the dollar against the yen and the Swiss franc. They attribute this finding to the status of the latter two currencies as safe havens. Similarly, Cairns et al (2007) find that the franc, the euro and, to some degree, the yen tend to strengthen against the dollar when volatility rises. However, they also find that the US dollar tends to appreciate during these periods against a number of *other* currencies, especially those from emerging markets, making it a safe haven relative to them. These studies rely on movements of FX spot prices to identify safe haven currencies.

Option prices suggest ...

An alternative approach is to use currency options, which embed market participants' expectations. The prices of currency options at different strikes are especially helpful. Risk reversals measure the price difference between two equivalently out-of-the-money put and call options. For freely traded currencies, an asymmetry in these prices implies that market participants pay more to insure against a sharp movement of exchange rates in one direction than an equally sized movement in the other. Since safe haven flows imply pressure on exchange rates in one direction, an asymmetry in the option prices could partly be explained by the expectation of safe haven flows.[5] Looked at in

[5] While Gagnon and Chaboud (2007) argue that movements in risk reversals tend to post-date large exchange rate movements during periods of high volatility, this is less clear for the three

reverse, such an asymmetry may therefore help *identify* safe haven currencies.[6]

The right-hand panel of Graph 2 shows risk reversals for some major currency crosses. We concentrate on crosses with the US dollar, the more liquid market segment. The results for less liquid option markets, such as those related to the South African rand, should be treated with caution. The risk reversal measures confirm the previous findings in the literature on safe haven currencies. First, during all three crisis episodes market participants disproportionately sought to hedge against an appreciation of the yen and the Swiss franc vis-à-vis the US dollar.[7]

… that the yen, the Swiss franc and, to a lesser extent, the US dollar are safe havens

Second, during the crises market participants disproportionately tried to hedge against a large depreciation of less actively traded currencies vis-à-vis the US dollar, as shown by the risk reversal measures for the Australian dollar (orange line) and the South African rand (blue line) in Graph 2. This is especially pronounced in the most recent episode, but is also evident in 1998 for the rand, and – to a lesser extent – for the Australian dollar during 1997–98.

Non-safe haven currencies depreciate during crises …

As a consequence, safe haven effects – whereby the Japanese yen, the Swiss franc and, to a lesser extent, the US dollar are more attractive than other currencies during financial crises – can partly explain why these three currencies appreciated in all three episodes.

By the same token, as uncertainty and risk aversion subside, one could expect these developments to reverse. Indeed, these factors – as measured by currency option prices – abated relatively quickly in all three crises. However, only after the latest episode, between April and September 2009, did a number of currencies appreciate sharply against the "safe haven three", reversing the crisis-related depreciations. The two earlier crises did not see such a reversal of exchange rate movements.

… and are likely to appreciate when risk aversion abates …

One factor may be that, although general risk aversion receded, during the earlier crises the perceived riskiness of the countries that depreciated initially did not reverse as quickly. After all, the countries that saw depreciations were also at the centre of these crises, and it typically took years for them to rebuild their financial systems and recover from the economic fallout. Indeed, as Graph 3 shows, sovereign bond spreads for Asian crisis economies increased

… unless country-specific risk remains

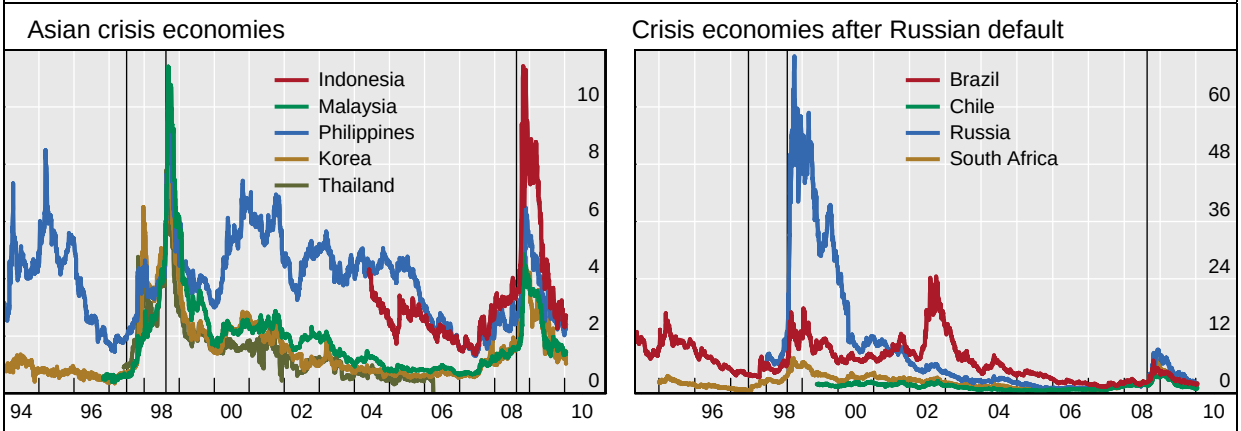
crisis episodes discussed here. Even though the risk reversals peaked after the crisis date in both 1998 and 2008, they began increasing in the run-up to those crises. Where risk reversals post-date the currency movements, one explanation could be that perceived risk associated with cumulated carry trade positions increased, as suggested by Galati et al (2007).

[6] This identification assumes that the asymmetry occurs in part because market participants think that a large appreciation of certain currencies is more likely than a depreciation of the same size. However, even when asymmetry occurs because market participants are more concerned with the effects of an appreciation than those of a depreciation, risk reversals would identify sentiment that is likely to be correlated with safe haven flows.

[7] The position of the euro is less clear. While in previous episodes the risk reversal of the franc and the euro co-moved against the US dollar, in late 2008 markets were disproportionately hedging against a depreciation of the euro against the dollar. This could, however, be due to factors specific to the 2007–09 crisis, such as the exposure of European banks to the US subprime market or the dollar shortage of European banks.

US dollar-denominated sovereign bond strip spreads

In per cent



The vertical lines mark 2 July 1997, 17 August 1998 and 21 August 2008.

Source: JPMorgan Chase.

Graph 3

even further during the Russian crisis before falling again, while those for the third group remained elevated for well over a year after the crisis date.

By contrast, after the latest crisis, as risk aversion subsided in the first half of 2009, it may have appeared attractive to invest in countries that were not at the centre of the turmoil, even if they had been negatively affected by the initial crisis sentiment. As we will argue in the next section, reduced risk aversion may have made carry trades look attractive again.

Interest rate differentials and exchange rate changes

Interest rate differentials may also contribute to exchange rate patterns around crises. A prominent channel is the effect of carry trades.

A carry trade refers to a long position in a higher-yielding instrument funded by a short position in a lower-yielding one, often denominated in a different currency. Such a trade is profitable if the interest differential is not completely offset by an appreciation of the low-yielding currency. An increase in carry trade positions tends to put downward pressure on the funding currency and upward pressure on the target currency. If exchange rates are flexible, target currencies would (other things equal) appreciate and funding currencies depreciate, making profitability self-fulfilling (for a while) and attracting further carry trades. As a result of this feedback loop, carry trades tend to be associated with a gradual appreciation of the target currency and a depreciation of the funding currency. However, this dynamic can rapidly turn if the target currency suddenly depreciates for some reason. As investors try to limit their losses and close out their carry trade positions, the downward pressure on the target currency is amplified, while the funding currency appreciates.

Carry trades, of course, are not the only reason we would expect to see a link between interest rate differentials and exchange rate movements. Any increase in (net) capital flows to economies with better growth prospects that also have higher short-term interest rates would exert upward pressure on the

higher-interest currency, similar to a build-up of carry trades. Unleveraged investments, however, are less likely to unravel rapidly in the event of market turbulence.

In the remainder of this section, we analyse the role interest rate differentials played during the initial phase of the crises and in their aftermath, with a view to explaining the unusual reversal of exchange rate movements after the latest crisis.

Exchange rates and interest rate differentials during the crises

Interest rate differentials played a much larger role in determining exchange rates in the recent financial crisis than in the previous episodes. Graph 4 shows the relationship between exchange rate changes and the level of short-term interest rates for the three crises, using a large panel of 33 economies.[8] The top panels plot crisis-related depreciations (and appreciations) vis-à-vis the yen over the two months following the crisis date against the average short-term interest rates in the *previous* six months.

In 2008, high-interest currencies depreciated by more

Two findings stand out: the slope is positive, and it increases over time. A steep upward slope is consistent with rapidly unwinding carry trades: the countries with the highest short-term interest rates in the period *prior* to the crisis date depreciate the most. Unwinding of other investments that exploit short-term interest rate differentials across countries is also consistent with an upward slope (ie capital outflow and therefore depreciation of the high-interest currency), but – to the extent that those investments are unleveraged – the unwinding could be expected to be less sudden, with a flatter slope.

This link has increased over time …

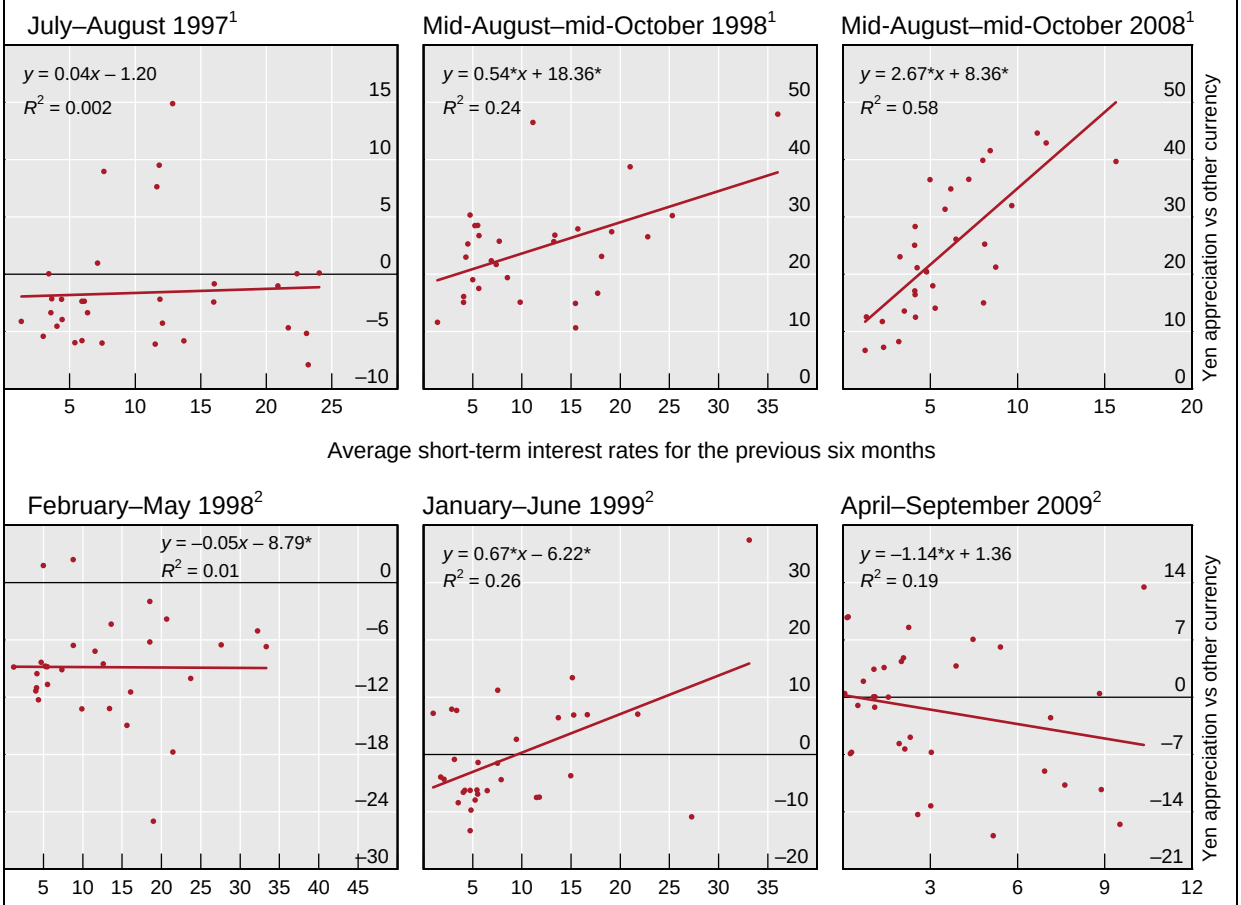
The graphs show that the link between exchange rate depreciations and higher interest rates during the crisis phase intensifies over time, consistent with an increasing role of investments related to short-term interest rate differentials. One possible explanation is the increasing role of carry trades since 1997. While the size of carry trade activity is difficult to measure, carry-to-risk ratios – measured as the short-term interest differential divided by the implied volatility from currency options – are often used as an ex ante measure of the attractiveness of carry trade. Graph 5 shows the carry-to-risk ratios for a number of countries since 1996. These ratios have been steadily rising over the past 14 years, consistent with an increasing attractiveness of yen-funded carry trades for Australia and New Zealand. The picture is, however, less clear for other popular target currencies, such as the Brazilian real, or for other funding currencies such as the US dollar.

… possibly due to carry trades

Anecdotal evidence supports the picture revealed by carry-to-risk ratios. Prior to the 1997 and 1998 crises, there were references to yen-funded carry trades, with unwinding thought to have given momentum to the appreciation of the yen in mid-1998 (Béranger et al (1999), BIS (1999)). Similarly, during 2005–07 the build-up of carry trade positions featured prominently in the

[8] Australia, Brazil, Canada, Chile, China, Chinese Taipei, Colombia, the Czech Republic, Denmark, the euro area, Hong Kong SAR, Hungary, India, Indonesia, Israel, Japan, Korea, Malaysia, Mexico, New Zealand, Norway, the Philippines, Poland, Russia, Singapore, Slovakia, South Africa, Sweden, Switzerland, Thailand, Turkey, the United Kingdom and the United States.

Exchange rate movements and interest rates around crisis periods



Excludes currencies with interest rates above 40% and those fixed to the US dollar. The HKD 12-month forward and CNY 12-month NDF are used to represent HKD and CNY respectively. For mid-August to mid-October 1998, the exclusion of Colombia (35% interest rate) yields a slope coefficient of 0.33 and an R^2 of 0.08. Regression coefficients with an asterisk denote significance at the 90% level. Interest rates are either money market rates (60b) or treasury bill rates (60c) from the IMF *International Financial Statistics*; where needed, deposit rates (60l) were used.

[1] The time periods for the crisis-related depreciations are the two months following the crisis dates, which are tied to a specific event (2 July 1997, 17 August 1998) or to a sudden increase in uncertainty and risk aversion as indicated by the VIX (21 August 2008). [2] The time periods for reversals in the aftermath of the crisis are six months long. The starting date of the six-month window is the month when exchange rates appeared to begin to reverse some of the crisis-related depreciations. For the Asian crisis, the window is only four months long, in order to avoid capturing any effects from the 1998 Russian crisis.

Sources: IMF; Bloomberg; BIS calculations. Graph 4

literature (see, for instance, Galati et al (2007)). Not surprisingly, in August and September 2008, these positions were unwound rapidly, exacerbating any crisis-related depreciations of the affected currencies (McCauley and McGuire (2009), Melvin and Taylor (2009)). Unwinding larger carry trade positions may thus partly explain why typical target currencies such as the Australian and New Zealand dollars depreciated more in late 2008 than during the previous crisis episodes.

Exchange rates and interest differentials after the crises

Interest differentials played a less consistent role in the appreciation of exchange rates after the crises than in their depreciation during these episodes. That said, during the latest crisis, their impact was more pronounced

and consistent with a larger role played by investments exploiting short-term interest differentials.

Unlike in previous crises, in 2009 high-interest currencies rebounded more strongly

The bottom panels of Graph 4 plot the changes in exchange rates vis-à-vis the yen over roughly a six-month period in the aftermath of the crises, against the average short-term interest rates over that time. There are no signs consistent with a build-up of carry trades immediately after the earlier two crisis episodes. Exchange rate movements after the Asian crisis were uncorrelated with interest rates. After the Russian turmoil waned, currencies moved into the direction predicted by the uncovered interest parity condition, ie that currencies with higher short-term interest rates should be expected to depreciate by more than those with lower rates. In contrast, from April to September 2009, exchange rate movements had a sizeable, statistically significant negative relationship with short-term interest rates: the currencies of countries with higher interest rates appreciated by more. A number of factors may have contributed to this renewed appreciation of higher-yielding currencies in 2009: a return of carry trade activity as risk aversion abated; better growth prospects in a number of higher-interest economies, especially commodity exporters; and comparatively healthy banking systems in these economies. We will discuss each in turn.

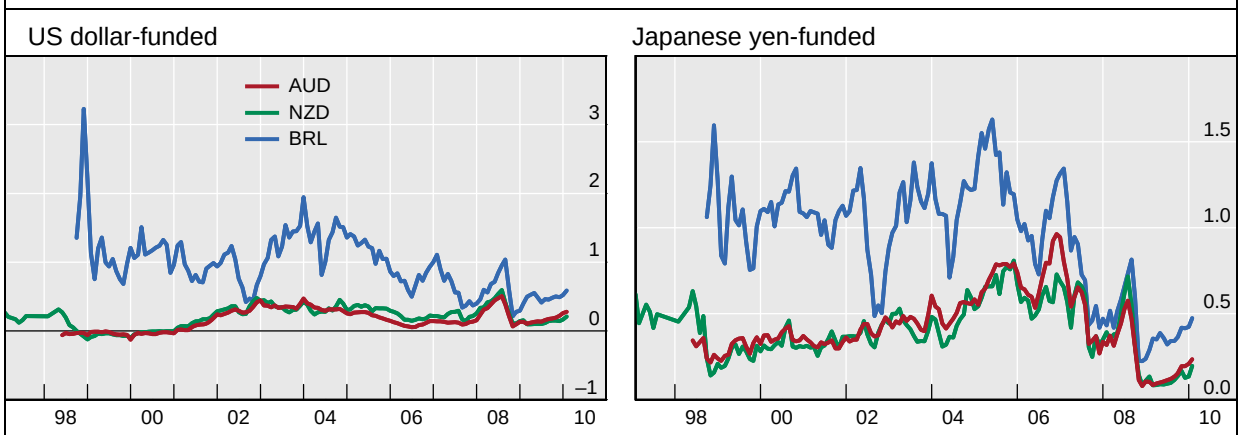
This could be due to a return of carry trade activity …

First, with extreme risk aversion abating, carry trade activity – a relatively risky strategy – may have returned in the second half of 2009. Indeed, carry trades in a number of high-yielding currencies, especially those of commodity exporters, provided extraordinarily high ex post returns over this period. Moreover, near zero interest rates prevailed in many major currencies, increasing ex ante profitability not only for traditional funding currencies such as the yen. Carry-to-risk ratios support this conclusion (Graph 5).

… better growth prospects …

Second, higher interest rates in a number of countries reflected better growth prospects, attracting foreign investment. In particular, commodity exporters, such as Australia, Brazil and Norway, recovered earlier than most other economies, profiting from the renewed strength of commodity prices and raising interest rates (or holding them at a comparatively high level) as a result.

Carry-to-risk ratios[1]



[1] Defined as the one-month interest rate differential divided by the implied volatility derived from one-month at-the-money exchange rate options.

Sources: Bloomberg; JPMorgan Chase. Graph 5

Not all investment flows seeking to achieve higher returns in these countries were necessarily leveraged carry trades.

... and comparatively healthy banking systems in these economies

Third, banking systems in these countries weathered the crisis relatively well. For instance, although a number had introduced bank debt guarantees during the crisis, none had to use large-scale bank rescue packages. A stable financial system could in turn increase expectations for output growth for these economies, thus attracting capital inflows.

Conclusion

During the global financial crisis of 2007–09, a large number of countries that were not at the centre of the crisis depreciated against three major currencies: the US dollar, the Japanese yen and the Swiss franc. Moreover, for a number of currencies, these depreciations reversed within a year or so after the crisis. Two factors can explain some of this pattern: safe haven flows and the role played by interest rate differentials.

During financial crises, capital typically flees the crisis country and moves into safe haven currencies, namely the yen, the Swiss franc and the US dollar. During the most recent crisis, however, safe haven effects led to capital flows into some of the countries most affected by the crisis. Therefore, it may not be surprising that these flows reversed as soon as risk aversion abated, with a corresponding reversal of exchange rate movements.

Comparing the latest crisis with two earlier crisis episodes, we find that the role of short-term interest rate differentials in both the depreciations and their reversal has grown over time, perhaps reflecting the increasing role carry trades play in exchange rate movements. This factor may have changed the dynamics of exchange rates around crises more generally, affecting a broader set of currencies and leading to more pronounced swings in exchange rates during and after crisis episodes.

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The dependence of the financial system on central bank and government support[1]

How much does the banking sector depend on public support? Utilisation of many support facilities has declined, due mainly to a fall in demand. Supply factors play a smaller, but not insignificant role, as governments and central banks have tightened the conditions on which certain support measures are available or have phased them out entirely. However, not all financial institutions have reduced their use of support facilities. Weaker banks especially continue to depend on public support.

JEL classification: E5, G2.

Over the past few months, authorities have taken their first steps to end some of the public support measures put in place in response to the financial crisis. For instance, the Federal Reserve completed its purchase of Treasury securities in October 2009; new issuance under the UK credit guarantee scheme ended in December; the ECB conducted a last 12-month euro repo and the Bank of Japan stopped its purchases of commercial paper and corporate bonds in the same month; and the Swiss National Bank ceased providing Swiss francs through foreign exchange (FX) swaps against euros in January 2010.

Thus, the exit has begun. This feature analyses the use of central bank liquidity facilities and government debt guarantees[2] to assess to what extent the financial system continues to depend on those measures. The take-up of many measures has declined. On the one hand, this seems to reflect better market access and hence reduced demand for government support. On the other hand, supply conditions have also become more restrictive, at least for some facilities. There is also some evidence of tiering in the use of government debt guarantees.

[1] The author thanks Bilyana Bogdanova, Thomas Faeh and Gert Schnabel for research assistance and Claudio Borio, Piti Disyatat, Ingo Fender, Corrinne Ho, Marion Kohler, Robert McCauley and Christian Upper for comments. The views expressed in this article are the author's and do not necessarily reflect those of the BIS.

[2] Other government support facilities that were widely adopted in the crisis include deposit insurance guarantees, capital injections and asset purchase guarantees. See also FSB (2009).

Extent and take-up of support

Table 1 documents the take-up of selected support measures in the United States, the euro area and the United Kingdom between March and December 2009. Many of the facilities employed by the central banks had actually been in place already before the crisis, although the terms and conditions have been changed in response to the new environment. The Federal Reserve, the ECB and the Bank of England used repurchase agreements (repos) as the standard way to provide the financial system with liquidity. Those repos tended to be of relatively short maturity (overnight to two weeks).[3] The Federal Reserve also

Selected indicators of support measures in 2009

	March	June	September	December
	Level, in billions of own currency units, end of month			
	United States			
Federal Reserve: Total assets	2,073	2,027	2,162	2,237
Repos and term auction credit	469	283	196	76
Standing facility lending[1]	81	49	28	19
Other lending[2]	249	165	85	62
FX swaps providing own currency	328	119	59	10
Securities	761	1,217	1,588	1,845
Of which: MBS and agency securities	287	564	823	1,068
Issuance of government-guaranteed debt	90	25	16	5
	Euro area			
Eurosystem: Total assets	1,803	1,997	1,790	1,905
Repos[3]	661	896	681	749
US dollar repos	166	60	44	1
Standing facility lending[4]	1	0	0	1
FX swaps providing own currency[5]	2	5	4	3
Covered bonds[6]	0	0	14	29
Issuance of government-guaranteed debt[7]	42	27	6	7
	United Kingdom			
Bank of England: Total assets	181	220	223	238
Repos[8]	130	91	39	24
US dollar repos	10	2	0	0
Operational lending facility	0	0	0	0
Securities[9]	15	99	154	190
Of which: gilts	13	96	152	188
Issuance of government-guaranteed debt	33	15	5	18

[1] Primary credit and Primary Dealer Credit Facility. [2] Term Asset-Backed Securities Loan Facility, Asset-Backed Commercial Paper Money Market Mutual Fund Liquidity Facility and Commercial Paper Funding Facility. [3] Main refinancing, long-term refinancing and fine-tuning operations in euros. [4] Marginal lending facility. [5] From swap lines providing euros to the central banks of Denmark and Sweden. [6] Held for monetary policy purposes. [7] Debt guaranteed by the governments of Germany, the Netherlands and Spain. [8] Short- and long-term repos. [9] Bought under Asset Purchase Facility.

Source: Central banks. Table 1

[3] The ECB has provided regular three-month repos since 1999 to cover longer-term liquidity needs, but has acted as a price-taker to minimise the impact on market prices.

used securities purchases and sales, a tool not employed in normal times by the ECB or the Bank of England, to influence market liquidity. Lending facilities were in place at all three central banks before the crisis, though commercial banks rarely used them.

Take-up is on the decline

During the crisis, central banks substantially increased their liquidity provision through repos and extended maturities (see also BIS (2009), Borio and Nelson (2008) and Disyatat (2009)). They allowed banks to access other lending facilities more cheaply and relaxed collateral requirements. The Federal Reserve and the Bank of England introduced several new liquidity facilities, such as the Term Auction Facility in the United States. As the crisis proceeded, all three central banks purchased large amounts of securities directly. Finally, to ease international funding shortages, central banks provided one another with currency through FX swaps (McGuire and von Peter (2009)).

From the data collated in Table 1, it is striking that asset purchases, for which the decision to act lies mainly with policymakers, increased in the course of 2009, but that the take-up of facilities where the volumes outstanding are largely driven by the decisions of financial institutions declined, albeit with some exceptions. All three central banks increased their outright holdings of securities in every quarter of 2009.[4] By contrast, the volume provided by repos and the usage of FX swap lines generally went down. The issuance of bonds covered by government debt guarantees also declined up to September 2009 but rebounded in the last quarter of the year in the euro area and the United Kingdom.[5]

Interpreting the decline in support: demand or supply effects?

To assess how far the financial system still depends on public support, it is crucial to know whether the drop in the usage of support facilities is driven by a fall in demand or by a restriction in supply. Disentangling the two is possible because support measures come in two flavours. Some measures, such as most repos offered by the ECB, are available on unchanged terms and conditions and without any restrictions in the supply of support. The take-up of these measures thus provides a direct indicator for the demand for support. Other facilities have their terms and conditions actively set by the authorities. Their take-up will therefore reflect a mixture of demand and supply factors.

Lower demand …

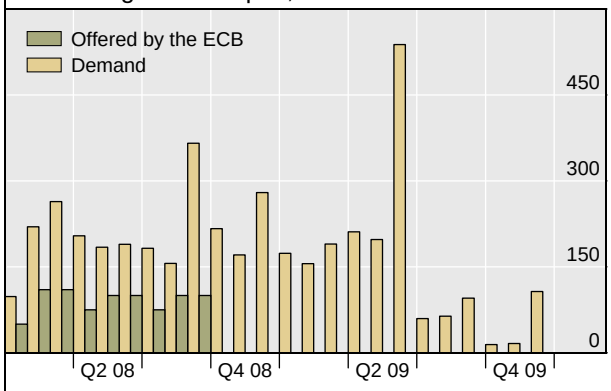
The volumes outstanding of the first type of measure clearly point towards a decline in the demand for support. The left-hand panel of Graph 1 shows that the demand for longer-term euro repos declined after September 2008, when

[4] Certain facilities are currently nearing preannounced limits. For instance, the Federal Reserve has announced that it is slowing down the process of purchasing mortgage-backed securities and expects to end the programme by the end of the first quarter of 2010.

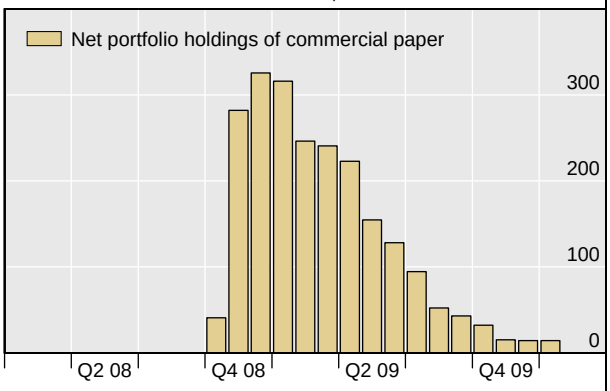
[5] In the United Kingdom, this increase seems at least partly due to last-minute demand: the credit guarantee programme ended in December 2009.

Declining demand for support

ECB longer-term repos, in EUR bn[1]



Federal Reserve CPFF funds, in USD bn[2]



[1] Longer-term repos have a maturity of one to 12 months. There has been full allotment in at least one longer-term repo auction since September 2008 and a fixed interest rate since October 2008. [2] Commercial Paper Funding Facility; month-end.

Sources: Central bank websites; BIS calculations. Graph 1

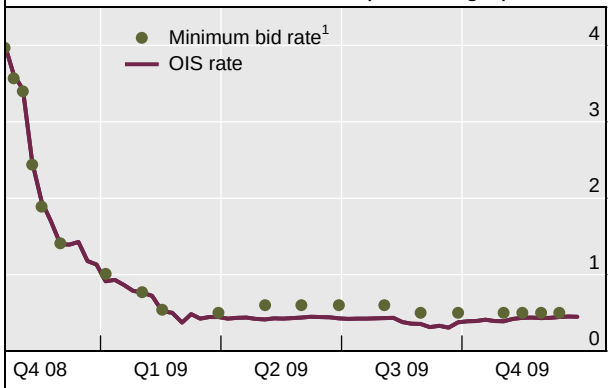
the ECB began to charge its policy rate and fully met all bids.[6] The take-up of the Commercial Paper Funding Facility (CPFF) in the United States (right-hand panel) paints a similar picture. The cost of using that facility is given by the three-month overnight index swap (OIS) rate, which reflects the expected path of the overnight market rate over the next three months, plus a constant surcharge. These terms became less attractive as risk spreads in financial markets tightened, and usage of the facility subsequently declined.

At the same time, central banks tightened the supply of other facilities. One of the few support facilities where prices have been actively managed is

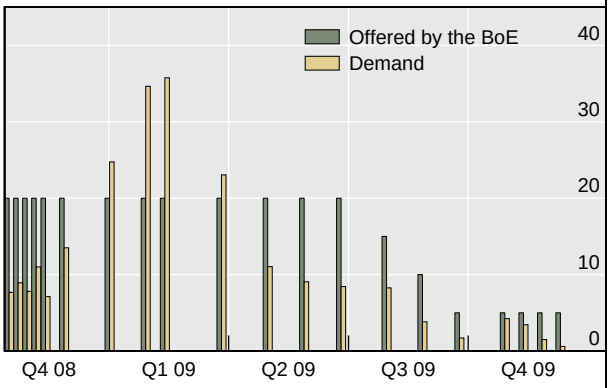
Restrictive supply of support

Bank of England three-month repos

Three-month interest rates, in percentage points



Amounts, in GBP bn



[1] The minimum bid rate is the lowest rate at which the Bank of England is ready to supply liquidity in a repo auction. The overnight index swap (OIS) rate is the average expected rate for overnight swaps over the next three months.

Sources: Central bank website; Bloomberg; BIS calculations. Graph 2

[6] The rise in demand in June and December 2009 was due to high bids in the 12-month repo auctions. The ECB announced that the December auction would be the last of its kind and adopted a new pricing mechanism.

… has been complemented by tighter supply

the longer-term repos of the Bank of England.[7] The left-hand panel of Graph 2 shows that the terms of this facility have become less attractive over time. Bids for funds dropped below the amounts offered by the Bank of England in March 2009, precisely when three-month Libor-OIS spreads fell below the minimum bid rate demanded by the Bank of England. Another example of a support measure with flexible pricing is the euro/Swiss franc swap facility that was offered by the Swiss National Bank, the ECB, the National Bank of Poland and the Magyar Nemzeti Bank. Take-up of these swaps declined considerably when the authorities tightened supply by increasing the swap price relative to the market.

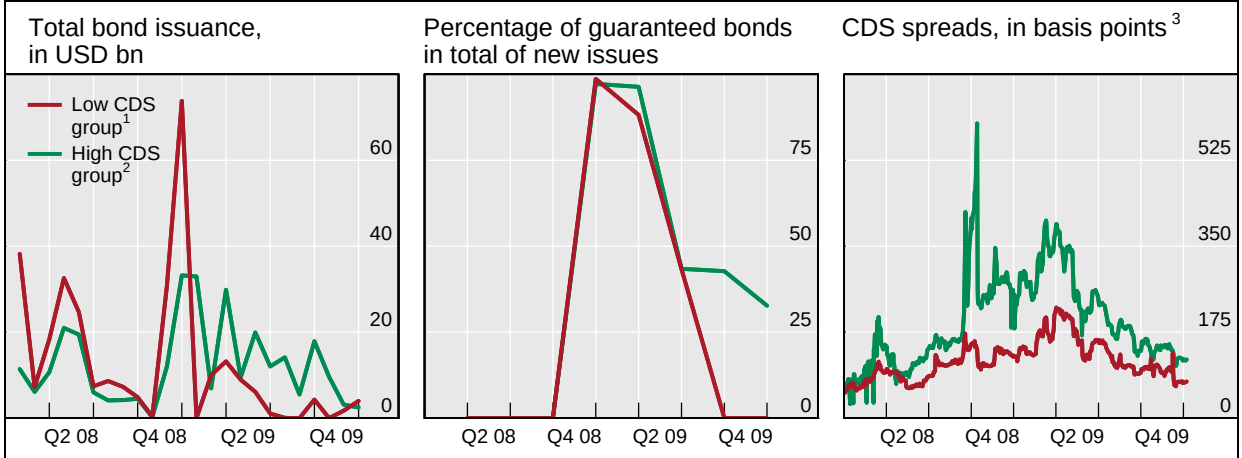
Tiering in the demand for support

A key question is whether the decline in the usage of support documented in the previous sections has been widespread or whether it is limited to stronger financial institutions. It is impossible to answer this question with regard to central bank liquidity facilities on the basis of publicly available data since monetary authorities usually do not reveal the identities of their counterparties. However, the use of government debt guarantees can provide some hints, given that guaranteed bonds are traded in public markets.

The need for support differs between banks

There is evidence for tiering at least in the US market, as some financial institutions continue to depend on government guarantees to issue debt. We proxy the riskiness of banks by the average level of credit default swap (CDS) premia on their debt between January 2008 and January 2010. Admittedly, this measure has some shortcomings. For instance, CDS spreads tend to be comparatively low for institutions that the markets perceive as too big to fail, but volatile for fundamentally strong banks that are exposed to large swings in

Tiering in US bond markets



[1] Bank of NY Mellon, JPMorgan Chase, PNC, US Bancorp and Wells Fargo. [2] Bank of America, Citibank, Goldman Sachs, Morgan Stanley and State Street. [3] Group averages of end-of-day data.

Sources: Government websites; Bloomberg; Dealogic; BIS calculations. Graph 3

[7] Issuance costs for government-guaranteed debt have also been changed in many countries (FSB (2009)).

returns. The findings therefore need to be interpreted with these caveats in mind.

The US government guaranteed essentially all bond issuance of US financial institutions, shown in the left-hand panel of Graph 3, between the adoption of the debt guarantee programme in October 2008 and mid-2009. Tiering becomes apparent from the third quarter of 2009 onwards, when the five banks with the lowest CDS premia (the "low CDS group" in the centre panel) ceased issuing government-guaranteed bonds.[8] By contrast, riskier banks (the "high CDS group") continued to use this facility: at the end of 2009, guaranteed bonds still made up a third of their new issuance.

Conclusions

The removal of support has been marginal to date, but it is likely to continue unless conditions deteriorate substantially. There are at least two reasons for phasing out support schemes. First, they may distort competition.[9] Second, continued support could induce banks to postpone necessary balance sheet adjustments and encourage additional risk-taking.[10]

The decline in demand for public support identified in this article is therefore clearly good news. The finding that some institutions rely more on support measures than others is not. This suggests that a differentiated exit strategy is desirable. Such an approach would aim for a timely discontinuation of public support while taking into account that some financial institutions remain weak.

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McGuire, P and G von Peter (2009): "The US dollar shortage in global banking and the international policy response", *BIS Working Papers*, no 291.

[8] The "low CDS group" also issued little unguaranteed debt in the second half of 2009.

[9] See Panetta et al (2009) for an analysis of domestic and international distortions. FSB (2009) notes that cross-border differences in the timing of the withdrawal of support might lead to additional problems.

[10] It is not clear whether ending the facilities in place would completely address these problems. Financial institutions may interpret the authorities' response to this past crisis as an implicit and standing guarantee to support banks in any future crisis.

Panetta, F, T Faeh, G Grande, C Ho, M King, A Levy, F Signoretti, M Taboga and A Zaghini (2009): “An assessment of financial sector rescue programmes”, *BIS Papers*, no 48, pp 59–64.

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The term "macroprudential": origins and evolution[1]

In the wake of the recent financial crisis, the term "macroprudential" has become a true buzzword. A core element of international efforts to strengthen the financial system is to enhance the macroprudential orientation of regulatory and supervisory frameworks. Yet the term was little used before the crisis, and its meaning remains obscure. This special feature traces the term's origins to the late 1970s, in the context of work on international bank lending carried out under the aegis of the Euro-currency Standing Committee at the BIS. It then describes its changing fortunes until its recent rise to prominence.

JEL classification: G20, G28.

The term "macroprudential" has become a true buzzword in the wake of the recent financial crisis, surging to prominence from virtual obscurity in the space of a few months. A quick internet search reveals no fewer than 123,000 references since January 2008. By contrast, there are only around 5,000 hits for the period between 2000 and the end of 2007. The popularity of the term is not surprising: a core element of the international policy response to the crisis is to strengthen the macroprudential orientation of financial regulation and supervision, ie an enhanced focus on the financial system as a whole and its link to the macroeconomy.[2] Yet the term's origins and its exact meaning remain obscure. Against that background, this article traces its origins and evolution to the present day.

The origins: concerns over international lending in the late 1970s

Early use of the term "macroprudential"…

It is not easy to pinpoint exactly when the term "macroprudential" was first used. BIS records suggest that its first appearance in an international context dates back to 1979, at a meeting of the Cooke Committee (the forerunner of the present Basel Committee on Banking Supervision, BCBS). The meeting, which took place on 28–29 June 1979, discussed the potential collection of

[1] The author would like to thank Edward Atkinson, Claudio Borio, Stephen Cecchetti, Ivo Maes, Tim Ng and Christian Upper for helpful comments. The views expressed in this article are those of the author and do not necessarily reflect those of the BIS.

[2] See, for instance, FSF (2009), De Larosière (2009), Group of Twenty (2009) and, among the more academic references, Brunnermeier et al (2009).

data on maturity transformation in international bank lending. The minutes read as follows:

> "*The Chairman [W P Cooke, Bank of England] said that micro-economic problems (which were of concern to the Committee) began to merge into macro-economic problems (which were not) at the point where micro-prudential problems became what could be called* ***macro-prudential*** *ones. The Committee had a justifiable concern with macro-prudential problems and it was the link between those and macro-economic ones which formed the boundary of the Committee's interest.*"[3] [emphasis added]

Although the term was in all probability new,[4] the underlying concerns were not. The authorities were increasingly worried about the implications for macroeconomic and financial stability of the rapid pace of lending to developing countries and were examining policy options to address them.

… in the context of the rapid growth in international bank lending in the 1970s

In fact, already in March 1978, echoing worries expressed in its *47th Annual Report*, the BIS had prepared a paper on the implications of rising oil prices for international bank lending and the stability of the international banking system for discussion by the Euro-currency Standing Committee (ECSC).[5] The outcome of that discussion had been an ECSC report, finalised in July 1978, that highlighted precisely this link between prudential regulation and macroeconomic concerns, and thus anticipated the statement by Cooke without actually using the term "macroprudential".[6]

The second appearance of the term "macroprudential" is in a background document, produced by the Bank of England, for a working party chaired by Alexandre Lamfalussy, BIS Economic Adviser and Chairman of the ECSC.[7] The document, dated October 1979, examines the use of prudential

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[3] "Informal Record of the 16th meeting of the Committee on Banking Regulations and Supervisory Practices held in Basle on 28 and 29 June 1979" (BS/79/42), BIS Archives [henceforth BISA] – *Banking Supervision, Informal Record*, file 2.

[4] While the initial draft report on banks' maturity transformation discussed at this meeting did not use the term "macroprudential", the final version of this report (BS/79/44, dated November 1979) did. It now had a subsection entitled "The 'macro-prudential' risks inherent in maturity transformation in banks' international business", with the use of quotation marks suggesting that the term was considered something of a novelty. That section notes: "*In addition to the risk of liquidity difficulties for individual banks there is the possibility of strains arising in the international banking system as a whole that cannot necessarily be perceived from the perspective of an individual bank and the maturity structure of its balance sheet. This type of 'macro-prudential' risk is in part related to the nature of the international banking market itself where the original suppliers of funds are linked to the end-user through an elaborate network of interbank transactions*" (p 3).

[5] Renamed the Committee on the Global Financial System (CGFS) in 1999.

[6] Specifically, the July 1978 ECSC report reads: "*The Committee considers that between the purely macro-economic issues and the purely prudential questions, which are the business of national supervisory authorities and of the Cooke Committee, there are a range of issues where the two fields overlap.*" See Euro-currency Standing Committee, "Chairman's report on policy problems related to the growth of the Euro-currency market and international bank lending since the oil price increase", p 12, in BISA 7.18(15) – *Papers Lamfalussy*, LAM20/F56.

[7] "The use of prudential measures in the international banking markets", 24 October 1979, pp 1–2, in BISA 7.18(15) – *Papers Lamfalussy*, LAM25/F67. The document was signed by

measures as one of several alternative ways to constrain lending. It contrasts the microprudential approach typical of the regulation and supervision of individual banks with a macroprudential one. Specifically:

> "*Prudential measures are primarily concerned with sound banking practice and the protection of depositors at the level of the individual bank. Much work has been done in this area – which could be described as the 'micro-prudential' aspect of banking supervision. […] However, this micro-prudential aspect may need to be matched by prudential considerations with a wider perspective. This* ***'macro-prudential'*** *approach considers* ***problems that bear upon the market as a whole as distinct from an individual bank, and which may not be obvious at the micro-prudential level***." [emphasis added]

Calls for a market-wide perspective

The document notes three examples of how the microprudential perspective may fail to take full account of larger macroprudential concerns. First, while the growth of each individual bank may look sustainable, that of aggregate lending may not be. Second, perceptions of risk may be inadequate, narrowly focusing on the (past) performance of individual sovereign loans rather than on the broader risk of sovereign borrowers. Third, individual banks tend to regard interest rate risk as critical and underestimate the importance of liquidity (funding) risk, which necessarily calls for a market-wide perspective.[8]

The term "macroprudential" appeared no fewer than seven times in the 14-page final report of the Lamfalussy Working Party to the G10 Governors.[9] The report also stressed the "*importance of effective supervision of the international banking system, from both the micro-prudential and the macro-prudential points of view*". However, the term did not survive in the press communiqué that followed the G10 Governors' meeting in April 1980; as a result, it did not emerge in the public domain.[10] Nor did the communiqué make any reference to measures to constrain the growth of international bank lending per se. Rather, it stressed "*the importance of maintaining the soundness and stability of the international banking system*" and the intention "*to strengthen regular and systematic monitoring of international banking developments*", including through improvements in international banking statistics. One factor

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David Holland, Deputy Chief of the Bank of England Overseas Department. For a more detailed discussion of this part of the story, see Maes (2009).

[8] Possible prudential measures to constrain lending included restrictions on banks' foreign exchange and country exposures, on capital (capital ratios), on maturity transformation and on entry. It was argued that these restrictions "could be a useful approach to ensure that the growth of international lending markets is soundly based", with "some, albeit modest" constraining influence on lending growth.

[9] "Report of the Working Party on possible approaches to constraining the growth of banks' international lending", 29 February 1980, in BISA 1.3a(3)J – *Working Party on constraining growth of international bank lending*, vol 2.

[10] In fact, the first draft of this communiqué did mention the "need for supervisors to take the macro-prudential view into account". This statement, however, was dropped as some felt it might give the impression that the work of the supervisory authorities had been inadequate.

supporting this outcome was the reluctance of the Cooke Committee to use prudential measures with a macroprudential focus.[11]

The first public references: concerns over financial innovations

Macroprudential concerns related to financial innovation in the 1980s–90s

The first appearance of the term in a public document seems to date back to 1986. The ECSC report on *Recent innovations in international banking* (Cross Report) devotes a few paragraphs to the discussion of the concept of "macro-prudential policy". The report defines it as a policy that promotes "*the safety and soundness of the broad financial system and payments mechanism*" (BIS (1986, p 2)).

Under this heading, the report considers how financial innovation may raise risks for the financial system as a whole. The main focus is on derivatives markets and securitisation, seen as driving the growth of capital market activities. The report highlights several vulnerabilities: regulatory arbitrage; the underpricing of risk on new instruments; the overestimation of their liquidity; the opaqueness of risk resulting from interconnections in the financial system; the danger of risk concentrations; the overloading of payment and settlement systems, reflecting a sharply higher volume of transactions; the potential for increased market volatility; and stronger growth in overall debt.

The report is at pains to draw a distinction between the concerns of the ECSC and those of banking supervisors, which focused on individual institutions and were being addressed separately by the Basel Committee.[12] Its main policy conclusions include the desirability of functional, as opposed to institutional, supervision, and the need to avoid gaps in the scope of regulation. The report goes on to explore the consequences of financial innovation for monetary policy.

In the following years, the term "macroprudential" largely disappeared from view. To be sure, it continued to be used with some regularity in internal BIS documents, primarily by the ECSC. But public documents rarely contained it. Its next appearance is in the 1992 ECSC report on *Recent developments in international bank relations* (Promisel Report, BIS (1992)). This report was prepared by a working group that had been charged by the G10 Governors to "*focus on the role and interaction of banks in non-traditional markets, notably the markets for derivative instruments, to examine the linkages among various segments of the interbank markets and among the players active in them, and to consider the macro-prudential concerns to which these aspects might give rise*".

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[11] See Committee on Banking Regulations and Supervisory Practices, "Report on the use of certain prudential measures to constrain the growth of banks' international lending", February 1980, in BISA 7.18 (15) – *Papers Lamfalussy*, LAM25/F67.

[12] "*[…] the innovations considered in this Report have important implications for supervisors – not least in ensuring that individual institutions recognise, report and control the various risks they are undertaking. However, insofar as these issues relate to the supervision of banks, they are being considered separately by the Basle Supervisors' Committee*" (BIS (1986, p 233)).

A subsequent ECSC working group chose to include the term in the very title of its report, *Issues related to the measurement of market size and macroprudential risks in derivatives markets* (Brockmeijer Report, BIS (1995)). The main policy concerns identified in the Brockmeijer Report relate to the lack of transparency in derivatives markets and the concentration of market-making functions in a few institutions, which could undermine the robustness of market liquidity. The follow-up policy efforts led to the collection of better statistics on derivatives markets.[13] The term also appears in a special chapter on the evolution of central banking in the BIS's *67th Annual Report* (BIS (1997)). In both cases, it is used to capture policies to improve the stability of the financial system as a whole, primarily by focusing "on the linkages across institutions and markets".

The IMF macroprudential analysis in the wake of the 1997 Asian crises

By the late 1990s, the term "macroprudential" is beginning to be used also outside central banking circles, with the 1997 Asian financial crisis acting as the main trigger. Thus, in January 1998 the IMF report *Toward a framework for a sound financial system* notes:

> "*Effective bank supervision must be seen by banks as a continuous presence. This is mainly achieved through off-site monitoring, both micro- and macro-prudential in scope. […] Macro-prudential analysis is based on market intelligence and macroeconomic information, and focuses on developments in important asset markets, other financial intermediaries, and macroeconomic developments and potential imbalances*" (p 13).

The main policy follow-up included the development of better statistics to evaluate financial system vulnerabilities, so-called "macroprudential indicators" (MPIs) (IMF (2000)).[14] These were subsequently integrated into the Financial Sector Assessment Programs (FSAPs), aimed at performing thorough assessments of such vulnerabilities.

Renewed prominence: concerns over procyclicality and beyond

BIS work on formalising the macroprudential approach to regulation and supervision

Another milestone in the rise to prominence of the term "macroprudential" was reached in 2000. In October of that year, the General Manager of the BIS, Andrew Crockett, delivered a speech at the International Conference of Banking Supervisors contrasting the microprudential and macroprudential approaches to regulation and supervision. The thesis was that achieving financial stability called for a strengthening of the macroprudential perspective. The speech was an attempt to provide a more precise analytical definition of the two perspectives, seen as inevitably coexisting in prudential frameworks (Crockett (2000)).

The speech singled out two distinguishing features of the macroprudential approach. First, a focus on the financial system as a whole, with the objective

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[13] See BIS (1996). This report (Yoshikuni Report), prepared by an ECSC working group and presented in July 1996, also uses the term "macroprudential".

[14] These indicators were later renamed "financial soundness indicators", following a suggestion of the IMF Board. See IMF (2001).

of limiting the costs of financial distress in terms of output (the macroeconomy). Second, the recognition that aggregate risk was dependent on the collective behaviour of financial institutions ("endogenous"). By contrast, the objective of the microprudential approach was defined as limiting the risk of failure of individual institutions – best justified in terms of depositor/investor protection. And the approach was seen as treating aggregate risk as independent of the collective behaviour of institutions ("exogenous"). Crucially, this excluded the possibility that actions could appear individually rational but, in the aggregate, result in undesirable outcomes, owing to the externalities involved. A common example was that retrenchment by individual banks at times of stress could induce firesales and a credit crunch, possibly increasing risk in the system as a whole.

The two dimensions of the macroprudential approach and their policy implications

In turn, the macroprudential approach was seen as having two dimensions, pointing to distinct policy implications. One was how risk evolved over time, with special reference to the financial cycle, ie the mutually amplifying processes between the financial system and the real economy (later termed the "time dimension"). This came to be known also as the "procyclicality" of the financial system.[15] Addressing this issue called for the prudential framework to induce a build-up of cushions in good times so that they could be drawn down in bad times, thereby acting as stabilisers. The other dimension was how risk was distributed within the financial system at any point in time (later termed the "cross-sectional dimension"). The focus here was on institutions having similar exposures within the financial system and the interconnections between those institutions. This called for the calibration of prudential tools with respect to the systemic significance of individual institutions, ie their contribution to overall risk. For example, institutions whose failure was more disruptive for the system as a whole would be subject to tighter standards.

The definition put forward in the speech to the banking supervisors was more precise and narrower than previous ones. In particular, it focused squarely on the supervision and regulation of individual institutions and the tools at its disposal. As such, it excluded general policies designed to improve the financial infrastructure; these commanded a broad consensus and were not seen as calling for any strategic adjustments. As underlined in the speech:

> "*The distinction between the micro- and macro-prudential dimensions of financial stability is best drawn in terms of the* ***objective*** *of the tasks and the* ***conception*** *of the mechanisms influencing economic outcomes. It has less to do with the* ***instruments*** *used in the pursuit of those objectives.*" [emphasis in the original].

In the years that followed, this specific definition of the macroprudential approach resurfaced regularly in BIS work and publications.[16] Subsequent

[15] See, in particular, Borio et al (2001) and, more recently, BIS (2009a).

[16] See, for instance, BIS (2001, 2002, 2008 and 2009b), speeches of senior management (eg Knight (2006), White (2006) and Caruana (2009)) and research (eg, for summaries, Borio (2003, 2009)).

research sought to refine it and to further draw out its policy implications. Until the recent financial crisis, the policy debate had focused largely on the time dimension. Accordingly, the main concerns had centred on the implications of bank capital standards for the procyclicality of the financial system and on the monitoring of financial system vulnerabilities linked to the macroeconomy. Following the crisis, however, the cross-sectional dimension also came to the fore, mainly as a result of concerns over systemically significant institutions and the associated "too big to fail" problem.

At the same time, the usage of the term in the public sphere has on occasion been loose. It is not uncommon for it to be employed almost interchangeably with policies designed to address systemic risk or concerns that lie at the intersection between the macroeconomy and financial stability, regardless of the specific tools used.

Conclusion

The term "macroprudential" has risen from virtual obscurity to extraordinary prominence following the recent financial crisis. Since its origins in the late 1970s, the term has always denoted concerns over the financial system's stability and its link with the macroeconomy. At the same time, the specific focus of those concerns has changed over time. Concerns have related successively to excessive lending to developing countries, the impact of financial innovation and the development of capital markets, the influence of regulation on the procyclicality of the financial system, and the implications of the failure of systemically significant institutions.

Over time, especially at the BIS, efforts have been made to clarify the meaning of the term and to define it with reference to its antonym, "microprudential". In this narrower sense, closer to its origin, the term refers to the use of *prudential* tools with the explicit objective of promoting the stability of the *financial system as a whole*, not necessarily of the individual institutions within it. Naturally, most of the tools lie with the regulation and supervision of individual institutions. The main challenge is to achieve a better balance in their use, with the aim of successfully marrying the two perspectives (Crockett (2000)). This is precisely the objective of efforts now under way in the international community (eg BCBS (2009)).

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