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The BIS Global liquidity indicators

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A. Conceptual background¹

The term *global liquidity* is used in a variety of ways. Here, it is used to mean the *ease of financing* in global financial markets (or the ease with which perceptions of value can be turned into purchasing power). Defined this way, global liquidity depends primarily on the actions of private investors and financial institutions.

Financial institutions provide market liquidity to securities markets through their trading activities, and provide funding liquidity to borrowers through their lending activities. The conditions under which these intermediaries can fund their own balance sheets, in turn, depend on the willingness of other market participants to interact with them. Macroeconomic and prudential policies are another factor, including the terms and conditions at which central banks provide funding.

It is the interaction between these private and official factors that determines the economy's overall ease of financing that then contributes to the build-up of financial system vulnerabilities in the form of asset price inflation, leverage, or maturity or funding mismatches. Indicators will tend to measure these "footprints" of liquidity rather than global liquidity itself.

On this basis, and seen from a financial stability perspective, *global credit* is among the key indicators of global liquidity. The *stock* of credit outstanding captures the extent to which ease of financing has led to the build up of exposures. In other words, global private sector credit reflects the outcome of financial intermediation activity in global markets. *Changes* in these stocks are closely associated with the build-up of vulnerabilities, providing the financial stability focus. When considering these flows, there is both a domestic and an international element.

Of particular interest for the assessment of global liquidity is the international component of credit (lending across borders to non-residents or lending in foreign currency). It is this cross-border element that regularly provides the marginal source of financing in the run-up to crises. Although often small relative to the total stock of credit, swings in these international components can amplify domestic trends and are highly correlated with booms and busts in global financial conditions.

Assessment of global liquidity conditions requires putting measures of global (bank) credit into perspective. A range of supplementary price and quantity indicators can be used to capture specific aspects of global liquidity that are relevant for financial stability. These include measures of financing conditions in key financial markets and incentives for position-taking across market segments. Key indicators in this regard are proxies of risk appetite, which is a major driver of leverage and the willingness of private investors to provide funding.

Together with measures of global credit, these indicators can help identify unsustainable lending booms or undue risk taking in specific markets or on a global scale. The information content of these indicators changes over time, implying that the approach taken in assessing global liquidity must remain flexible.

The BIS regularly compiles and updates a wide range of indicators that are collectively referred to as the "Global Liquidity" indicators. These feed into research done at the BIS and are regularly used to facilitate policy discussions. A subset of these indicators are published on the BIS website (<http://www.bis.org/statistics/gli.htm>). In the remainder of this note, we highlight a few of the key indicators, in particular those that rely heavily on the use of the various BIS statistics (ie the BIS banking statistics and the international debt securities database). Sections B and C discuss how these are used in compiling global credit aggregates, and in capturing system-level funding needs in particular currencies, respectively. Sections D and E then present some of the highlights in the broader set of indicators.

¹ This material draws on CGFS (2011): "Global liquidity – concept, measurement and policy implications", CGFS papers no. 45, Borio, McCauley and McGuire (2011): "Global credit and domestic credit booms", BIS Quarterly Review, September, pp 43-57; Domanski, Fender and McGuire (2011): "Assessing global liquidity", BIS Quarterly Review, December, pp 57-71; and Eickmeier, Gambacorta and Hofmann (2013): "Understanding global liquidity", BIS Working Papers no 402, February.

B. The international element in domestic credit booms

An empirical regularity of domestic credit booms, especially when they go hand-in-hand with asset price booms, is that the growth of credit to the private sector outpaces monetary growth². This is true for both bank credit and broader credit aggregates.³ For one, non-bank credit channels tend to be especially active. Examples include finance companies in the Nordic credit boom of the late 1980s; housing finance companies (*Jusen*) in Japan during the same period, and the so-called shadow banking system in the United States more recently. More importantly for present purposes, *international* sources of finance become more important. This applies to both *interbank lending* and *direct cross-border ("offshore") lending to non-banks*.

Graph 1 documents this regularity.⁴ In selected economies, during booms the two international components supporting credit expansion tend to grow faster than the credit granted by banks located in the country. The recent case of Ireland is striking: direct cross-border credit to non-banks in the country (dark shaded area) grew at roughly 40% year-on-year in the three years preceding the crisis (right-hand panel), a full ten percentage points higher than the rate of growth of domestic bank credit. Moreover, since domestic bank credit grew faster than domestic (non-bank) deposits, banks in Ireland drew heavily on cross-border sources of funds (both from banks and non-banks) to finance credit growth at home (left-hand panel, dashed brown line).⁵ Combined, these two cross-border components accounted for more than half of total bank credit to non-banks in the country in 2008. In the case of Thailand around the time of the Asian financial crisis, indirect offshore financing of domestic lending by banks on the ground was even larger than direct cross-border loans to non-banks in the country.

In some cases, the growing importance of the external components reflects regulatory arbitrage. A classic case was the resort by US banks to the Eurodollar market in 1969 following the Federal Reserve's tightening of monetary policy against the backdrop of restrictions on interest rates on domestic deposits.⁶ Similarly, offshore and domestic US dollar-denominated loans to Japanese non-banks boomed in the late 1980s to avoid the Bank of Japan's window guidance on domestic yen lending.⁷ That said, the pervasiveness of the pattern points to deeper forces at work. As the credit boom proceeds, domestic funding sources become insufficient.

Compared with the external interbank component, direct cross-border lending poses particular challenges to the authorities. First, it can evade or circumvent measures put in place to restrain lending, such as higher reserve requirements, (macro-) prudential tools (eg, tighter loan-to-value ratios), or quantitative credit limits. Indeed, the operation of the countercyclical capital buffer of Basel III envisages an explicit coordinating mechanism between home and host supervisors based on reciprocity agreements in order to prevent circumvention. Second, direct cross-border loans are harder for the authorities to track than domestic credit. They are excluded from the monetary statistics, the typical

² C Borio and P Lowe, "Securing sustainable price stability: Should credit come back from the wilderness?", *BIS Working Papers*, no 157. 2004.

³ There are several reasons. Booms in credit and asset prices tend to reinforce each other, as assets are used as collateral and credit finances their acquisition. As a result, credit tends to grow fast alongside asset prices. By contrast, the relationship between money and asset prices is more nuanced. Increases in wealth tend to raise the demand for money (wealth effect). However, the increases in expected returns on assets other than bank deposits, such as equity and real estate, as well as in the appetite for risk induce a shift away from money towards higher-yielding assets (substitution effect). This holds back somewhat the rise in the demand for money, or fall in the ratio of money to income, relative to the expansion in credit.

⁴ See Avdjiev, S, R McCauley and P McGuire, "Rapid credit growth and international credit: challenges for Asia", *BIS Working Papers* no 377, for a complete analysis.

⁵ P Honohan, "Banks and the budget: lessons from Europe", address to SUERF Conference, Dublin, 20 September 2010.

⁶ The inflow of funds from the Eurodollar market led the Federal Reserve to impose a 10% reserve requirement. See A Meltzer (2002): *A History of the Federal Reserve*, Volume 2, 1970-1986, pp 739-741.

⁷ T Fukumoto, M Higashi, Y Inamura, and T Kimura, "Effectiveness of window guidance and financial environment -- In light of Japan's experience of financial liberalization and a bubble economy", *Bank of Japan Review*, 2010-E-4, August.

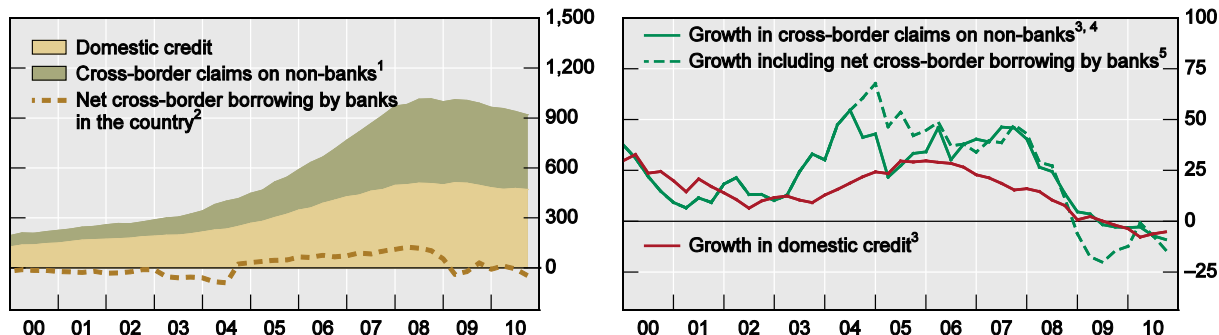
source of information for credit growth, and the sources of the primitive data, such as balance-of-payment statistics, tend to be comparatively less reliable in this area.

Graph 1

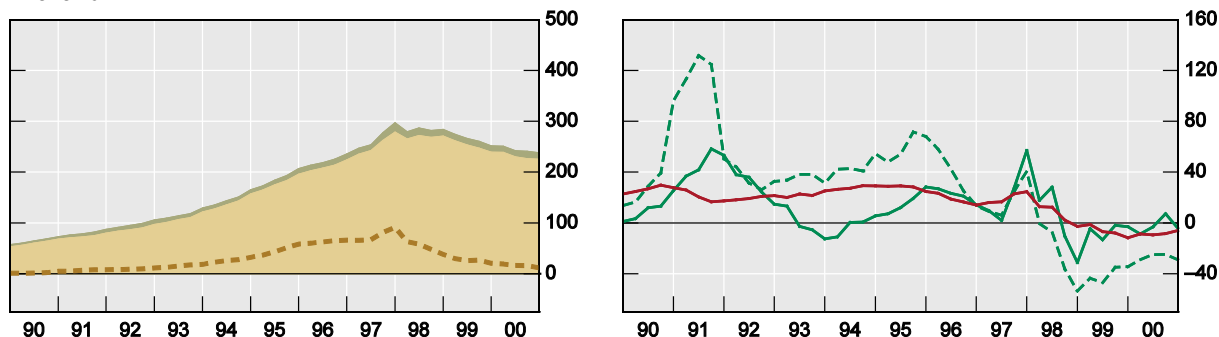
Bank credit to non-bank residents: domestic and cross-border

In billions of US dollars (left column) and per cent (right column)

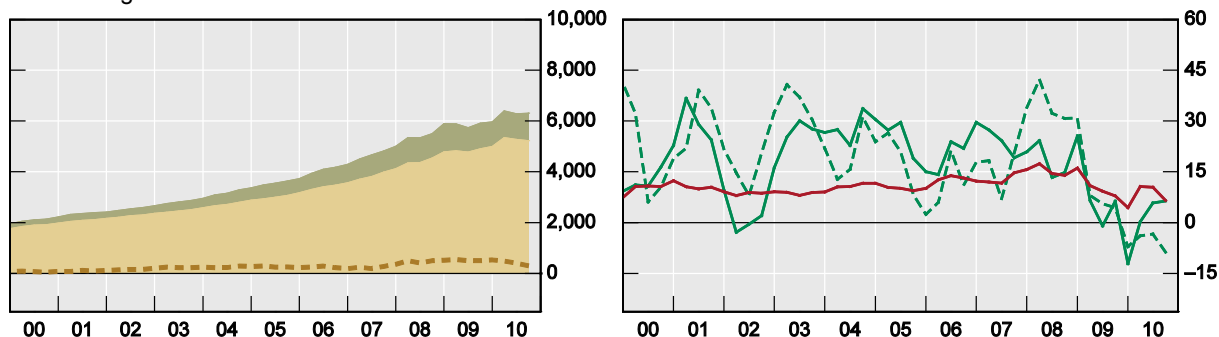
Ireland



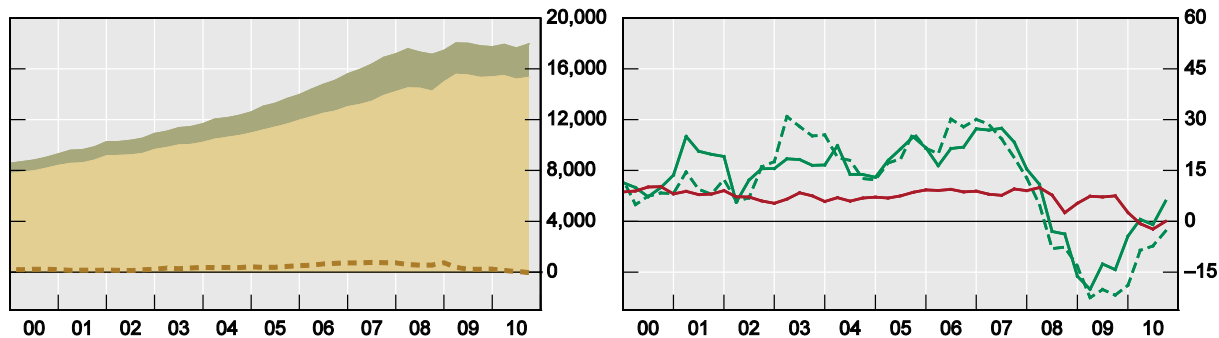
Thailand



United Kingdom



United States



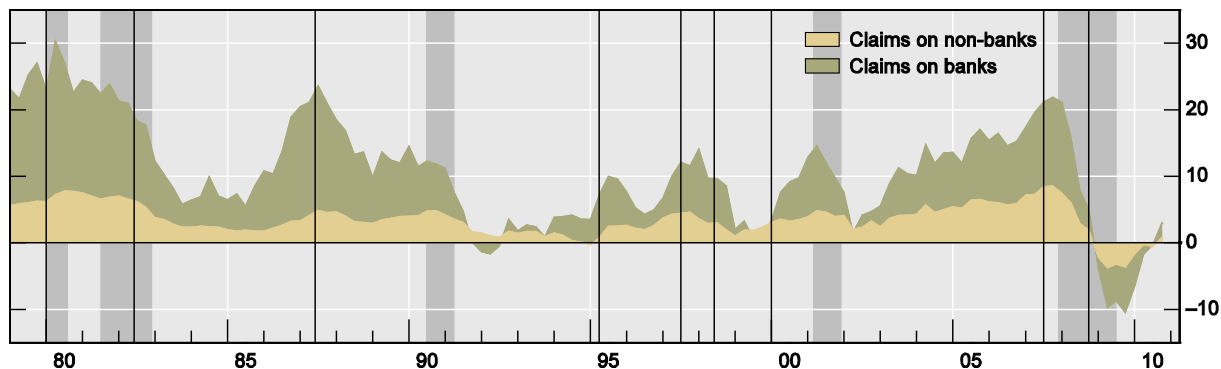
¹ BIS reporting banks' cross-border claims on non-banks. ² Net cross-border borrowing (liabilities minus claims) from all sectors by banks located in the country. For Thailand, BIS reporting banks' net cross-border claims on banks in the country. ³ Year-on-year growth. ⁴ Growth in BIS reporting banks' cross-border claim on non-banks. ⁵ Growth after first net cross-border borrowing (if positive) from all sectors by banks located in the country (dashed brown line in left-hand panels), under the assumption that this cross-border credit is ultimately passed on to non-banks in the country.

Sources: IMF *International Financial Statistics*; BIS *Locational Banking Statistics by Residence*.

What is true for individual countries seems to be true also in the aggregate of international bank credit (now excluding domestic currency credit extended by domestic banks). In particular, the growth in international bank credit exhibits boom-and-bust cycles that correspond closely to episodes of financial distress (Graph 2). Moreover, the interbank component tends to grow much faster than total international credit in the periods prior to financial crises.

Graph 2
Contributions to total international claims
 Annual change; in per cent

By counterparty sector



The vertical lines mark: 1979 second oil shock; 1982 Mexican default; 1987 stock market correction; 1994 Mexican peso devaluation; 1997 Asian financial crisis; 1998 Russian default and LTCM; 2000 Nasdaq peak; 2007 global financial crisis; 2008 collapse of Lehman Brothers. The shaded areas mark US recessions (NBER definition).

Sources: NBER; BIS locational banking statistics by *residence*.

C. The foreign-currency funding needs of internationally active banks

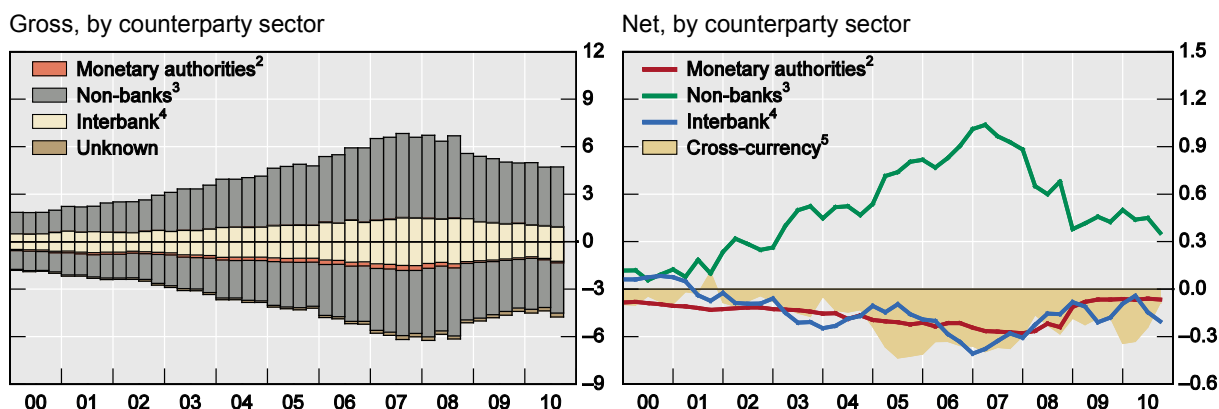
So far the analysis has relied on statistics drawn on the residency principle: just as with the balance-of-payment statistics, economic agents are classified based on their *residence* (location). However, the most important banks increasingly operate in several jurisdictions. These banks need to manage risks and activities across their whole balance sheet, regardless of where they happen to be located. As a result, apparent maturity or currency mismatches on the balance sheet of one office can be offset by positions booked in offices elsewhere. Thus, the more relevant criterion to understand risks and vulnerabilities is to consolidate balance sheets across locations on a nationality basis (ie, based on the location of the headquarters, seen as the nerve centre of the organisation). We next illustrate how this can shed light on the evaporation of funding liquidity for banks during the crisis.

The story is well known by now. Ahead of the crisis, many large global banks, especially European ones, had built up sizeable US dollar asset positions and funded them borrowing short-term in the same currency or swapping into dollars out of their domestic currency. Either way, while hedging their foreign exchange risk, these banks ran substantial liquidity risks. As the crisis broke out, depositors' and swap counterparties' perceptions of credit risk soared, owing to the deterioration in the value of dollar assets and uncertainty about their holders. As a result, these banks found it hard to roll their foreign currency funding. In other words, as the dollar assets became harder to sell in illiquid markets, their effective maturity lengthened. And this occurred precisely as the maturity profile of the dollar liabilities shortened. This exemplifies the vicious circle between market and funding illiquidity under stress. Ultimately, the Federal Reserve arranged swap lines with other central banks to provide funding support.

Graph 3

Long-USD European banks' on-balance sheet USD positions¹

In trillions of US dollars



¹ Estimates are constructed by aggregating the worldwide on-balance sheet cross-border and local positions reported by internationally active banks headquartered in Germany, the Netherlands, Switzerland and the United Kingdom. ² Positions vis-à-vis official monetary authorities. Excludes liabilities to Japanese monetary authorities placed in banks located in Japan. ³ International positions vis-à-vis non-banks plus local positions vis-à-vis US residents (all sectors) booked by banks' offices in the United States. No sectoral breakdown is available for these positions. ⁴ Estimated net interbank lending to other (unaffiliated) banks. ⁵ Implied cross-currency funding (ie FX swaps), which equates US dollar assets and liabilities.

Sources: Bloomberg; JPMorgan; BIS consolidated statistics (immediate borrower basis); BIS locational statistics by nationality.

Given the limited data available, tracking such funding liquidity risks is very hard; even so, while incomplete, the BIS banking statistics provide some aggregate information on the size banks' funding needs in a given currency.⁸ These data allow us to estimate cross-currency funding positions, a proxy for short-term foreign exchange swaps on the assumption that banks hedge their foreign exchange risk. In addition, by making some additional reasonable assumptions, one can use the counterparty break-down (banks, non-banks, central bank) to approximate the maturity of other balance-sheet items. For example, it can be safely assumed that interbank positions are short-term. Together, these two pieces of information provide a rough picture of the degree of maturity transformation in a given currency (long maturity assets minus long maturity liabilities, or "funding gap").

These data indicate that, in the run-up to the financial crisis, non-US banks built up substantial liquidity risk in US dollars – a major undetected vulnerability. For example, Graph 3 shows the US dollar assets and liabilities of those European banking systems that had more dollar assets than dollar liabilities on their balance sheets, ie of the banking systems that, on the assumption of squared foreign exchange exposures, were net borrowers of dollars in the FX swap market (shaded area in the right-hand panel). In addition, these banks borrowed dollars from the cash interbank market (the blue line) and central banks (the red line). They then used the proceeds to finance their holdings of assets issued by non-banks (the green line). Graph 3 points to a significant degree of maturity transformation. The lower-bound estimate of the US dollar funding gap peaked at almost \$1 trillion in mid-2007. While it has declined substantially since then, to roughly \$350 billion by end-Q3 2010, the funding gap remains sizeable.

⁸ For a further discussion, see P McGuire and G von Peter "The US dollar shortage in global banking and the international policy response", *BIS Working Papers* no 291, October 2009; P McGuire and I Fender "Bank structure, funding risk and the transmission of shocks across countries: concepts and measurement", *BIS Quarterly Review*, September 2010; Committee on the Global Financial System, "The functioning and resilience of cross-border funding", *Report* no 37, March 2010.

D. Highlights from the indicators

Since May, investor risk appetite has been tested by the escalation of geopolitical tensions related to Ukraine and the Middle-East, and signs of a deteriorating growth outlook in the euro area. Yet, the ensuing market correction remained short-lived, with global liquidity indicators continuing to point to an unusually accommodative policy environment and funding costs near record lows. In particular (with BIS data available only up to the first quarter of 2014), growth in US dollar-denominated bank and bond market credit to non-banks has remained robust, although the pace has apparently slowed somewhat over the past year (Graph I.3). Global growth in international bank credit, in contrast, continued to be virtually zero (Graph I.1),

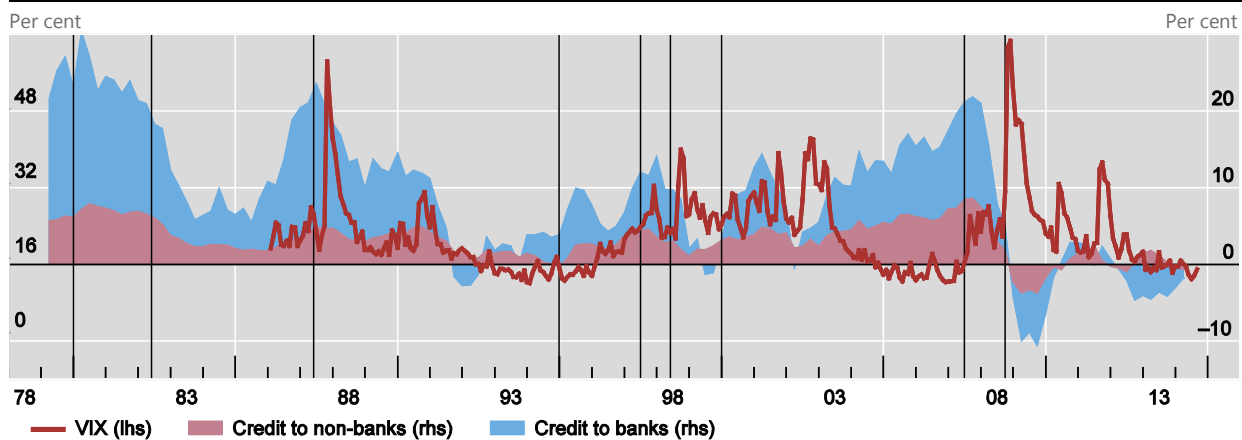
- Euro-denominated bank lending to non-residents has continued to fall, while the growth in US dollar- and, especially, Japanese yen-denominated bank lending has moderated (Graph I.3). At the same time, US dollar- and euro-denominated bond market credit to non-resident corporates and households continues to grow at double-digit rates, outpacing domestic credit.
- In contrast, cross-border bank credit growth has been zero or negative in most regions, apart from Asia-Pacific, where the stock is still low in absolute terms (Graph I.2). In addition, several emerging market economies (EMEs), such as China, are exhibiting particularly robust growth in locally extended foreign-currency credit, albeit from a small base (Graph I.3b).
- Short-term interest rates remain at or near record lows in advanced economies (Graph II.1). Long-term bond yields have fallen again over the past quarter, with pronounced declines in term premia, particularly in the euro area.
- Net international debt issuance by non-financial borrowers has been strong in both advanced economies and EMEs, contrasting with negative or slowing net issuance by financial corporates (Graph III.1).
- Baseline measures of risk and uncertainty continue to be compressed (Graph IV.1). CFTC data also suggest a resumption of carry trades in traditionally higher yielding currencies.

E. Select indicators:

I. Credit aggregates

Year-on-year rate of growth in international bank claims¹

Graph I.1



The vertical lines indicate: 1979, second oil shock; 1982, Mexican default; 1987, stock market correction; 1994, Mexican peso devaluation; 1997, Asian financial crisis; 1998, Russian default and LTCM; 2000, Nasdaq peak; 2007, beginning of global financial crisis; 2008, collapse of Lehman Brothers.

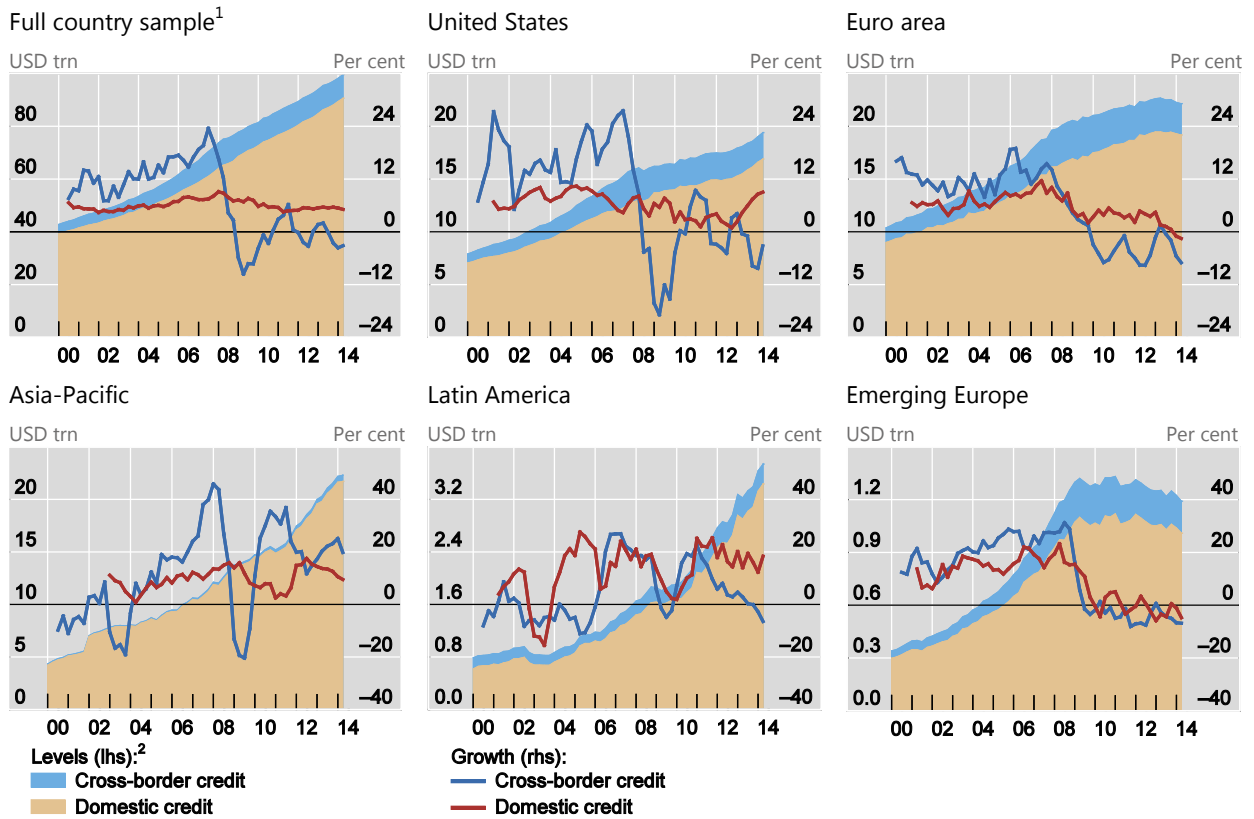
¹ Includes all BIS reporting banks' cross-border credit and local credit in foreign currency.

Sources: Bloomberg; BIS locational banking statistics by residence.

Global bank credit aggregates, by borrower region

At constant end-Q1 2014 exchange rates

Graph I.2



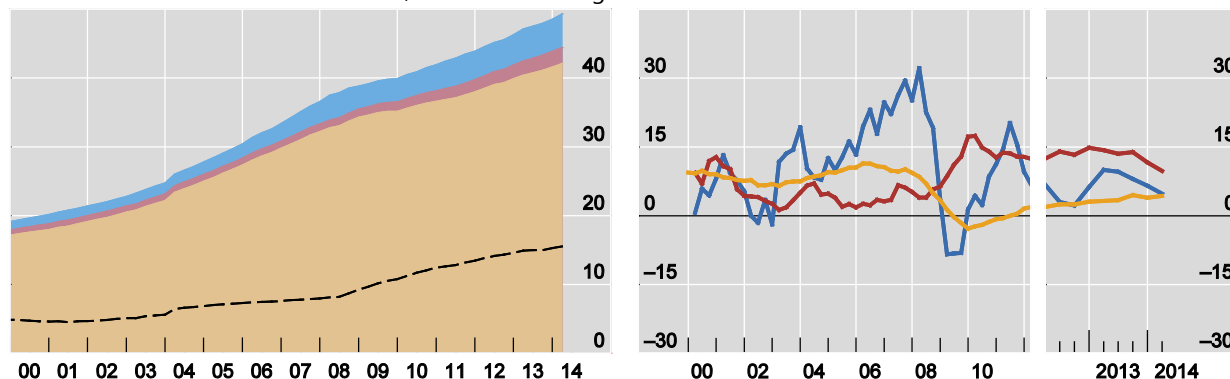
¹ Aggregate for a sample of 56 reporting countries. ² Total bank credit to non-bank borrowers (including governments), adjusted using various components of the BIS banking statistics to produce a breakdown by currency for both cross-border credit and domestic credit.

Sources: IMF, *International Financial Statistics*; BIS international banking statistics; BIS calculations.

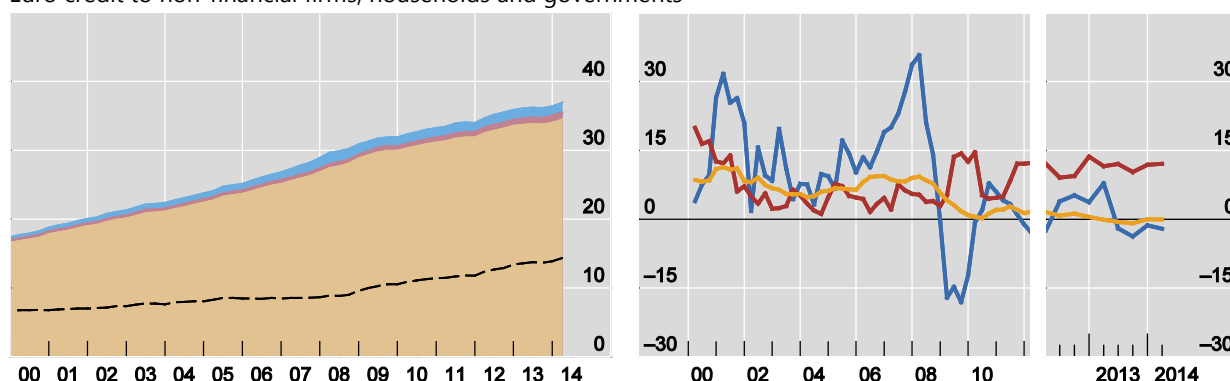
Stocks, in trillions of US dollars

Year-on-year growth, in per cent

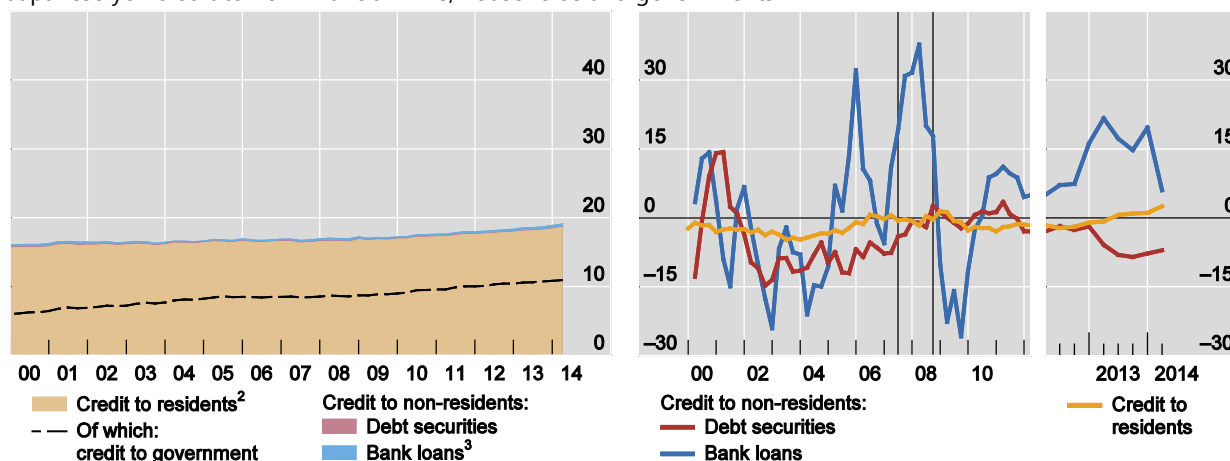
US dollar credit to non-financial firms, households and governments



Euro credit to non-financial firms, households and governments¹



Japanese yen credit to non-financial firms, households and governments¹



¹ At constant end-Q1 2014 exchange rates. ² Credit to non-financial sector in the United States/euro area/Japan from national flow of funds, excluding identified credit to these borrowers in non-domestic currencies (ie cross-border and locally extended loans and outstanding international bonds in non-domestic currencies). ³ Cross-border and locally extended loans to non-banks outside the United States/euro area/Japan. For China and Hong Kong SAR, locally extended loans are derived from national data on total local lending in foreign currencies on the assumption that 80% are denominated in US dollars. For other non-BIS reporting countries, local US dollar/euro/Japanese yen loans to non-banks are proxied by all BIS reporting banks' gross cross-border US dollar/euro/Japanese yen loans to banks in the country, on the assumption that these funds are then extended to non-banks.

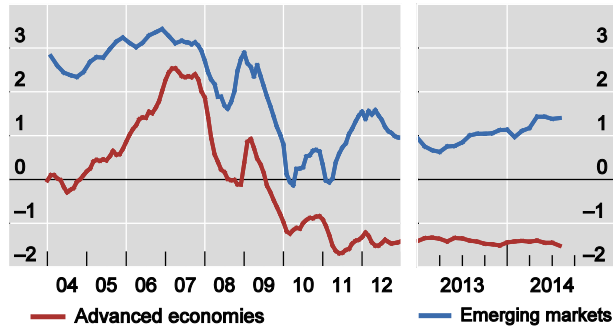
Sources: IMF, *International Financial Statistics*; Datastream; BIS international debt statistics and locational banking statistics by residence.

II. Monetary liquidity

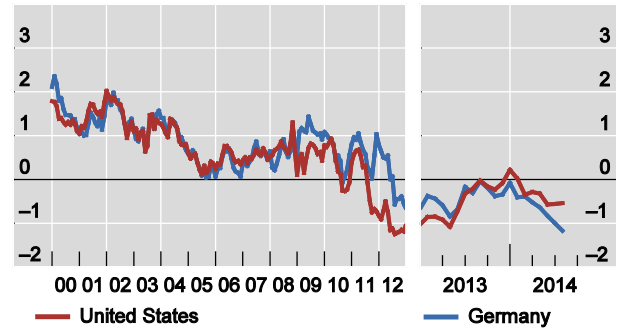
Indicators of monetary liquidity

Graph II.1

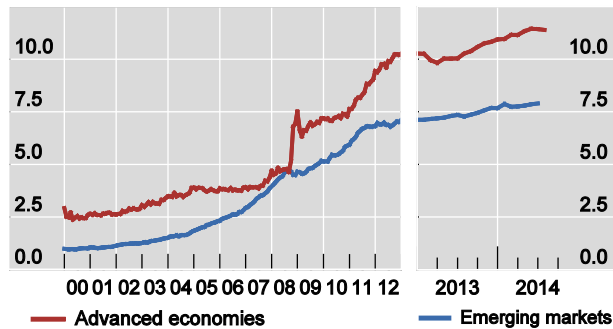
Global real short-term interest rates¹



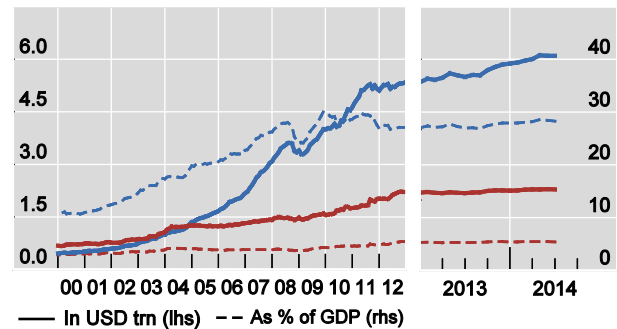
Ten-year nominal term premium²



Central bank assets, in USD trillions



Official FX reserves



¹ Based on 12-months-ahead average inflation expectations. ² Ten-year nominal term premium (sum of the real risk premium and the inflation risk premium) as derived from econometric term structure models.

Sources: IMF, *International Financial Statistics*; OECD, *Main Economic Indicators*; Bloomberg; Consensus Economics; Datastream; BIS calculations.

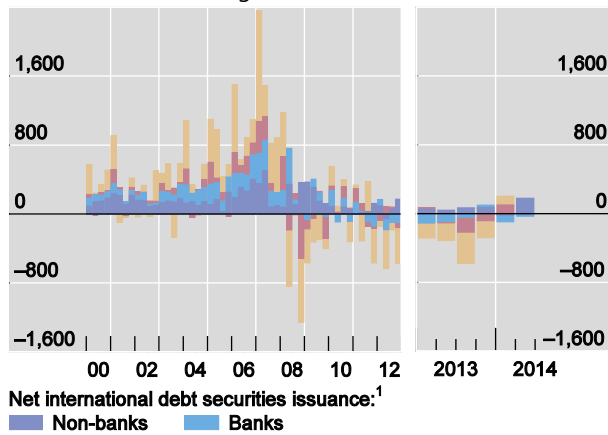
III. Funding liquidity

External financing flows

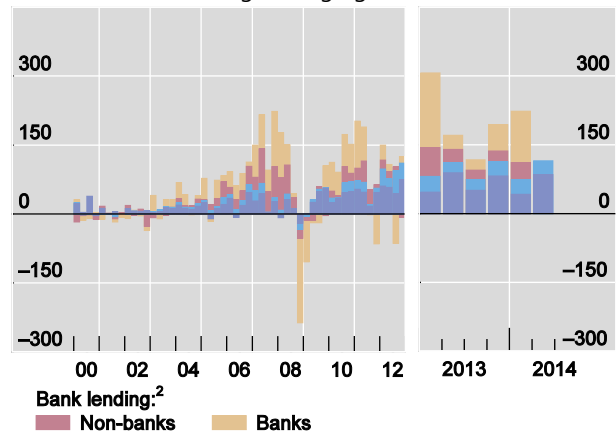
In billions of US dollars

Graph III.1

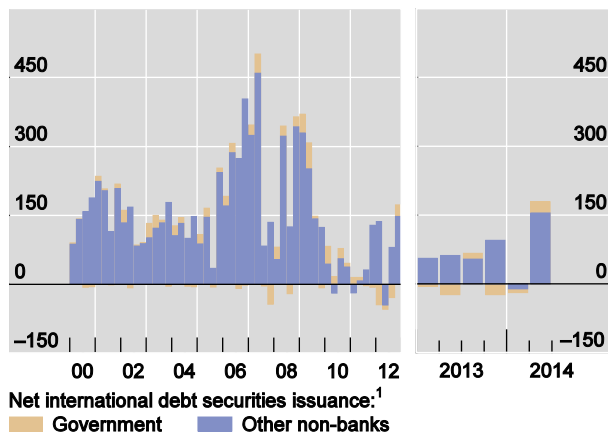
Debt and bank lending: advanced economies



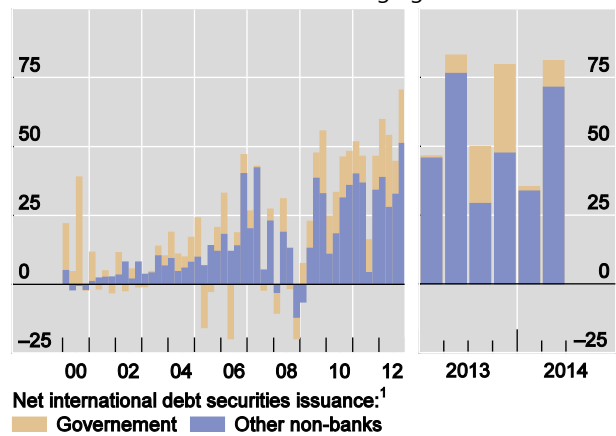
Debt and bank lending: emerging markets



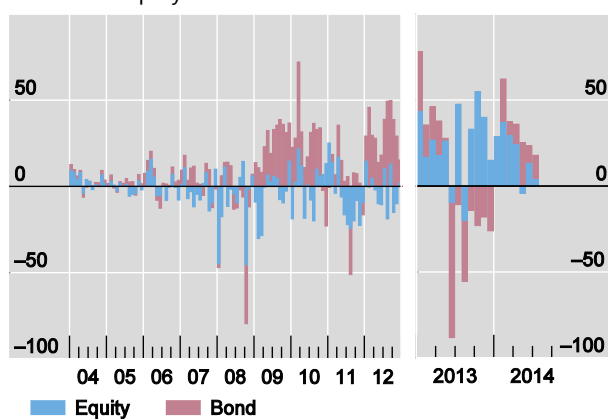
Net non-bank debt issuance: advanced economies¹



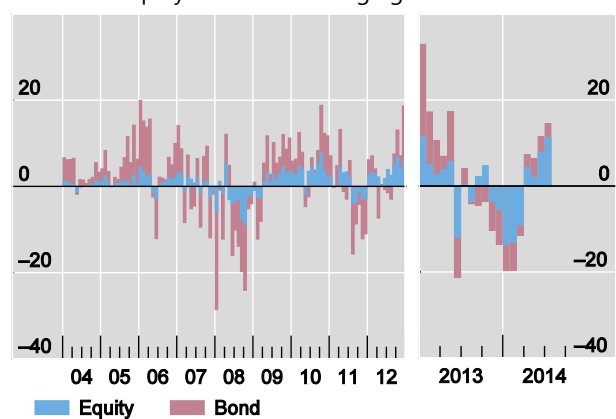
Net non-bank debt issuance: emerging markets¹



Bond and equity flows into advanced economies³



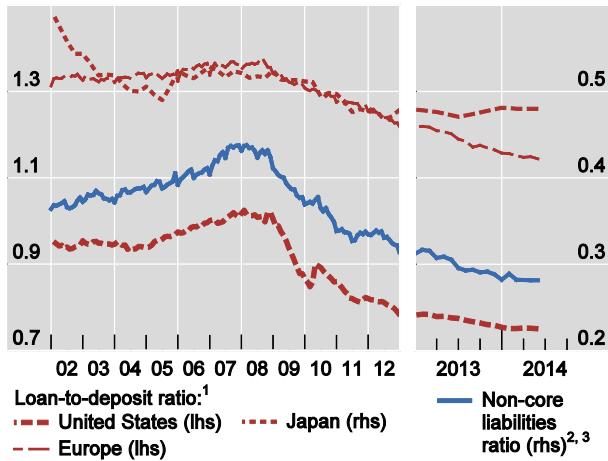
Bond and equity flows into emerging markets³



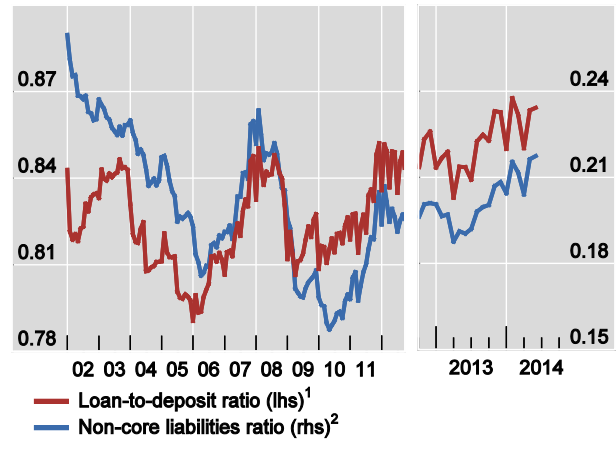
¹ Net international debt issuance for all issuers, in all maturities, by nationality of issuer. In December 2012, the BIS revised the compilation of its debt securities statistics to enhance their comparability across different markets. International issues were redefined as debt securities issued outside the market where the borrower resides. ² External loans of BIS reporting banks vis-à-vis individual countries; estimated exchange rate-adjusted changes. ³ Monthly flows into equity and bond funds; for the most recent observation, sum of available weekly figures.

Sources: Dealogic; EPFR; Euroclear; Thomson Reuters; Xtrakter Ltd; BIS locational banking statistics by residence; BIS calculations.

Advanced economies



Emerging markets



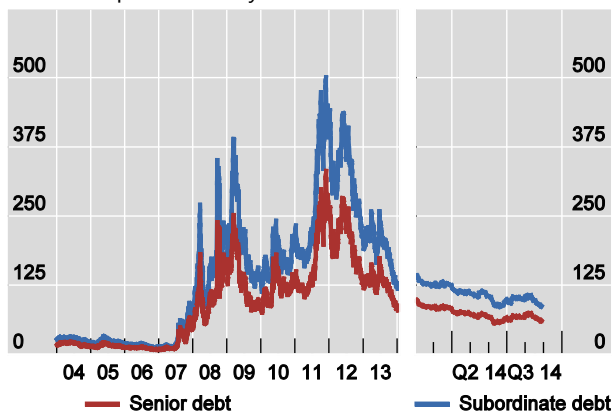
¹ Weighted average by deposits. ² Bank liabilities (excluding equity) minus customer deposits divided by total liabilities. ³ The United States, Japan and Europe (the euro area, the United Kingdom and Switzerland). This ratio measures the degree to which banks finance their assets using non-deposit funding sources.

Sources: IMF, *International Financial Statistics*; national data; BIS calculations.

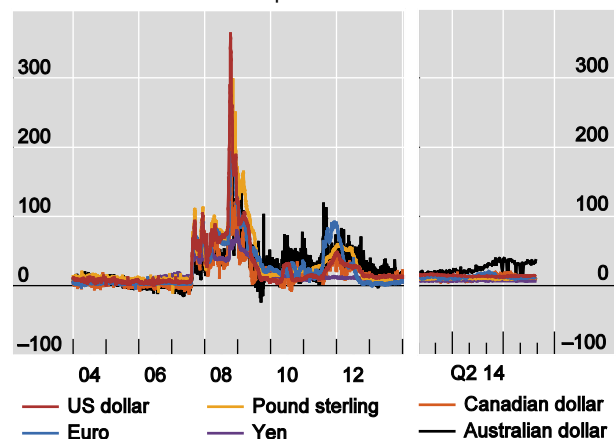
Short-term and cross-currency funding conditions

In basis points

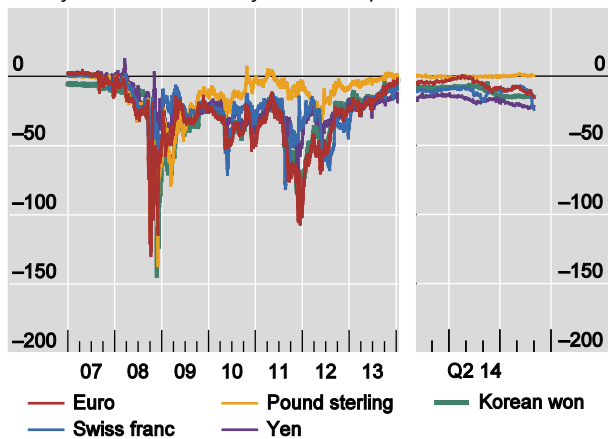
Bank CDS premia, five-year



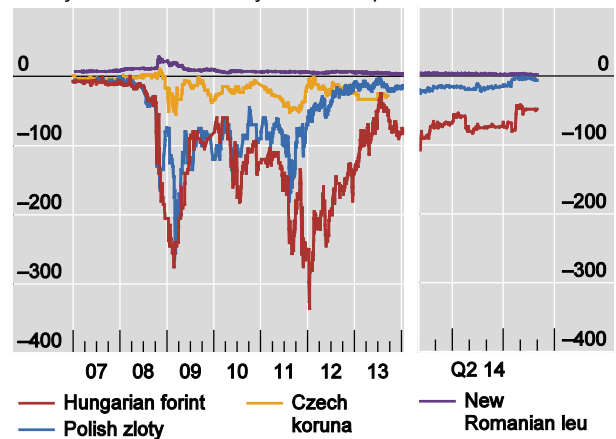
Three-month Libor-OIS spread



One-year cross currency basis swaps vs USD



One-year cross currency basis swaps vs EUR



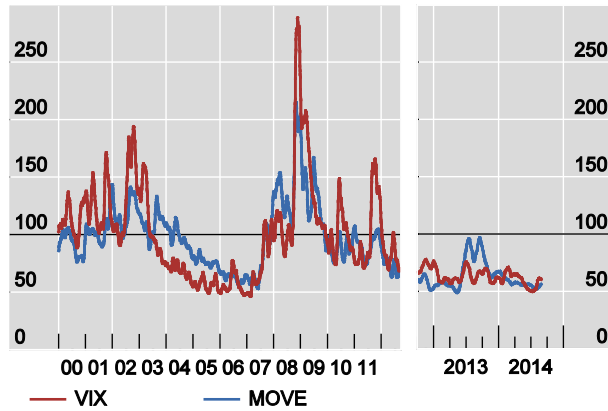
Sources: Bloomberg; Markit; BIS calculations.

IV. Risk appetite

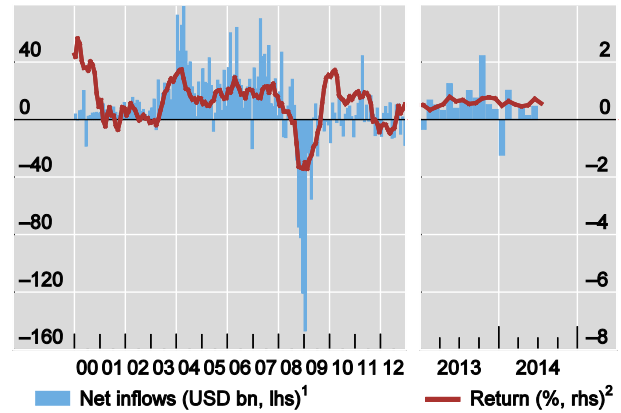
Risk appetite and market positioning

Graph IV.1

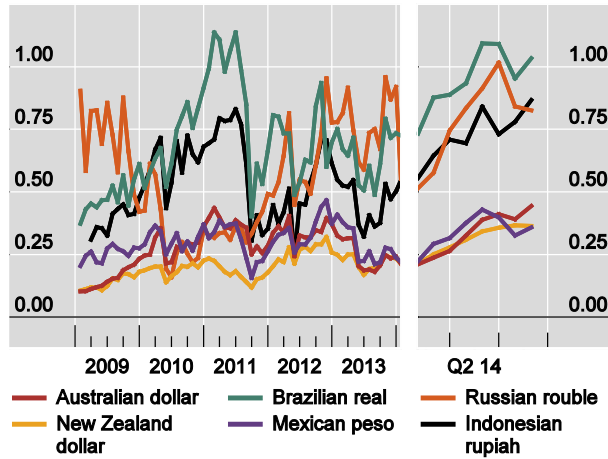
VIX and MOVE indices, 1 Jan 1991 = 100



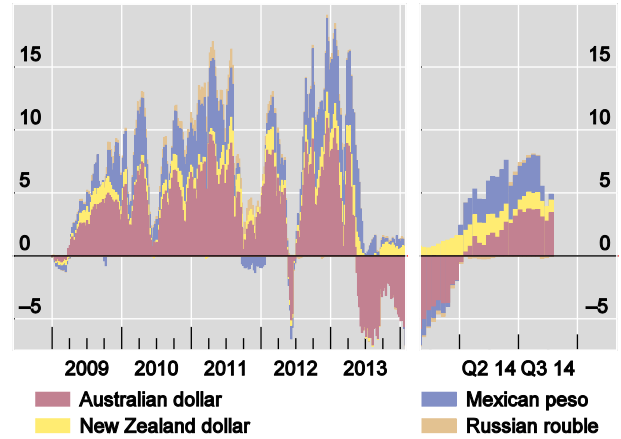
Net inflows into hedge funds



Carry-to-risk ratios by target currency³



CFTC non-commercial net positions, in USD bn



¹ Information based on active funds reporting to HFR database. Most recent data are subject to incomplete reporting. ² HFRI Monthly Performance Indices calculated by Hedge Fund Research; 12-month moving average. ³ Carry-to-risk ratios reflect the attractiveness of carry trades by measuring the ex ante, risk-adjusted profitability of a carry trade position such that the one-month interest rate differential is divided by the implied volatility of one-month at-the-money exchange rate options. Aggregates for possible target currencies are obtained by averaging the relevant currency pairs.

Sources: Bloomberg; HFR; BIS calculations.