

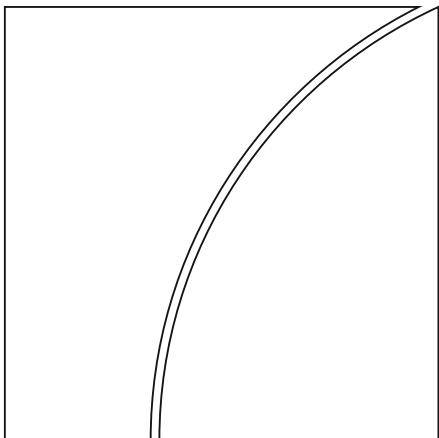


BANK FOR INTERNATIONAL SETTLEMENTS

## **BIS Quarterly Review**

December 2013

International banking  
and financial market  
developments



BIS Quarterly Review  
Monetary and Economic Department

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# BIS Quarterly Review

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## Notations used in this Review

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

Differences in totals are due to rounding.

The term "country" as used in this publication also covers territorial entities that are not states as understood by international law and practice but for which data are separately and independently maintained.

## Low rates spur credit markets as banks lose ground<sup>1</sup>

Over the past few months, monetary accommodation continued to drive financial markets. In major advanced economies, bonds and stocks shrugged off the summer sell-off and posted gains on the view that low policy rates and large-scale asset purchases would persist over the medium term. Thus, markets took in their stride a two-week US government shutdown and uncertainty over a US technical default. By contrast, country-specific strains weighed on several large emerging market economies, preventing a full recovery of local asset valuations and capital flows.

From a longer-term perspective, recent developments confirmed a trend benefiting large corporate borrowers with direct access to credit markets. Since mid-2012, low interest rates on benchmark bonds have driven investors to search for yield by extending credit on progressively looser terms to firms in the riskier part of the spectrum. This investment strategy, which has squeezed credit spreads, has so far been supported by low default rates on corporate bonds.

The credit environment has benefited large non-financial corporates more than banks domiciled in advanced economies. Struggling to regain markets' confidence during the past five years, these banks have consistently faced higher borrowing costs than non-financial corporates with a similar credit rating. While the cost gap narrowed more recently, especially in the United States, it continued to exert upward pressure on bank lending rates. This prompted large non-financial firms to resort directly to debt markets, thus spurring corporate bond issuance. As a result, markets eclipsed banks as a source of new credit to corporates in the euro area.

Euro area banks faced greater market scepticism than their peers in other advanced economies. To some extent, low valuations reflected concerns over the quality of these banks' balance sheets, for which the reported share of non-performing loans has been on the rise since the financial crisis peak. To restore market confidence and prepare for its upcoming supervisory function, the ECB announced a comprehensive assessment of the euro area's banking sector, and committed to disclose its findings and require corrective actions from ailing banks.

<sup>1</sup> This article was prepared by the BIS Monetary and Economic Department. Questions about the article can be addressed to Nikola Tarashev ([nikola.tarashev@bis.org](mailto:nikola.tarashev@bis.org)) and Goetz von Peter ([goetz.von.peter@bis.org](mailto:goetz.von.peter@bis.org)). Questions about data and graphs should be addressed to Agne Subelyte ([agne.subelyte@bis.org](mailto:agne.subelyte@bis.org)) and Alan Villegas ([alan.villegas@bis.org](mailto:alan.villegas@bis.org)).

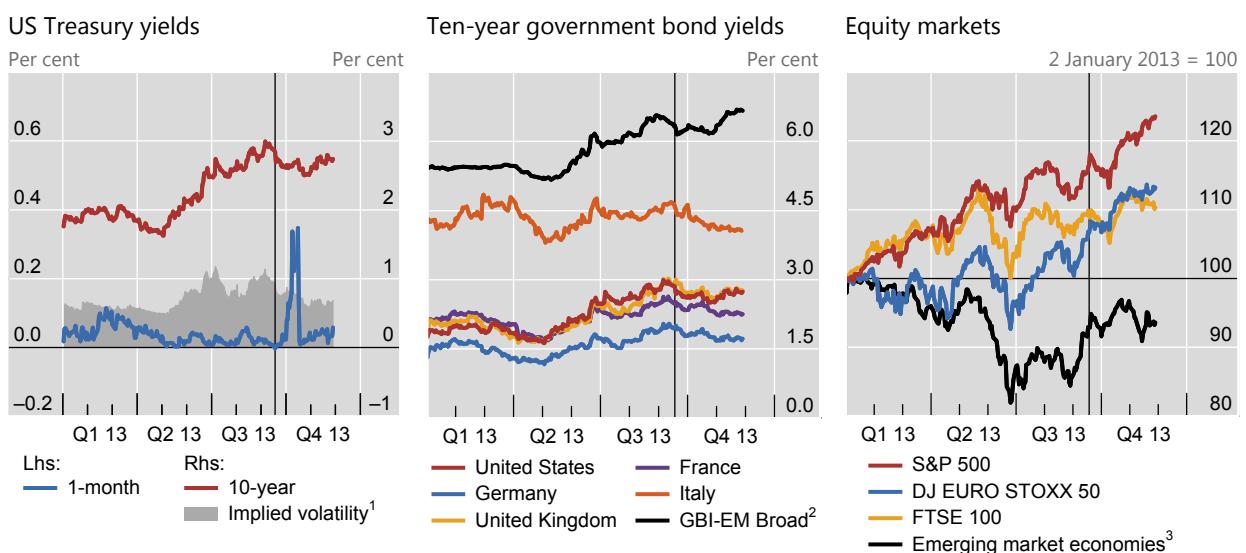
## The low interest rate environment persists

The tightening in global financial conditions from May to July partly reversed after the Federal Reserve surprised markets on 18 September with its decision to postpone “tapering”, the phasing-out of large-scale asset purchases (Graph 1). As the summer sell-off abated, market participants saw several factors weighing against near-term monetary tightening. These included low job growth and labour market participation, inflation below target, and the continuing effect of US fiscal retrenchment. The US government shutdown of 1–16 October contributed to the subdued outlook. During this episode, maturing Treasury bills priced in a rising probability of a US technical default (Graph 1, left-hand panel). Even so, bond volatility rose less than equity volatility. These effects dissipated when Congress approved a funding bill on 16 October and raised the debt ceiling up to February 2014.

The perceived postponement of tapering gave rise to further gains in global bond and equity markets. The 10-year Treasury bond yield fell from its early September peak of 3% to 2.5% in late October, with European bond markets matching more than half of this movement (Graph 1, centre panel). The prospect of continued asset purchases pushed estimates of the term premium on US Treasuries back into negative territory, from 0% to -0.2%.<sup>2</sup> The S&P 500 reached an all-time high on 15 November, after the nominated Fed Chair signalled her commitment to the policy stance in place. Since the beginning of the year, US equities have

Global bond and equity markets

Graph 1



The black vertical line indicates the 18 September 2013 Federal Open Market Committee meeting.

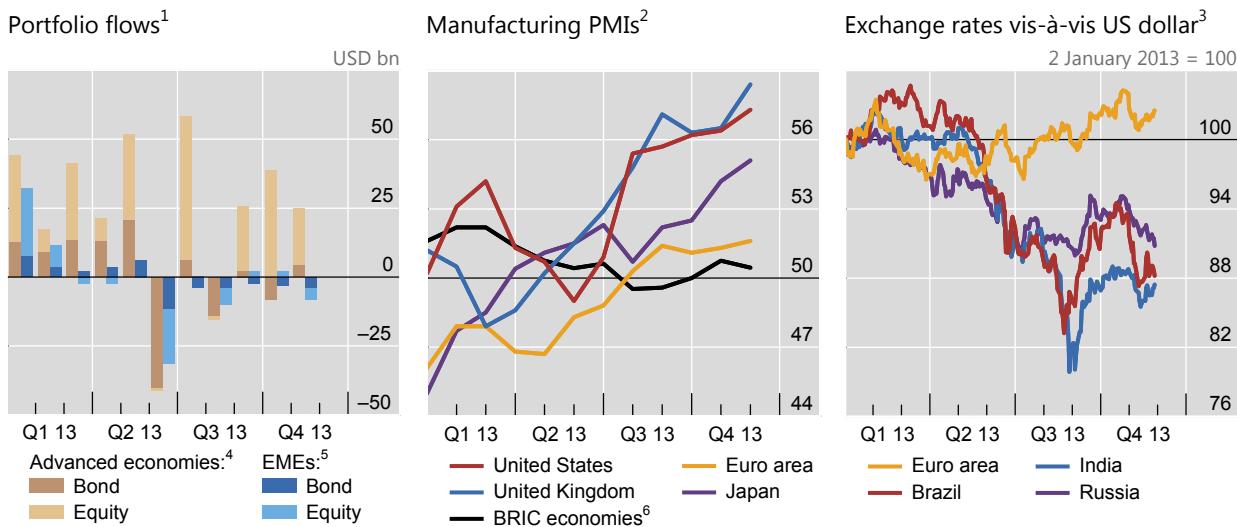
<sup>1</sup> The Merrill Lynch Option Volatility Estimate (MOVE) is an index of Treasury bond yield volatility over a one-month horizon, based on a weighted average of Treasury options of two-, five-, 10- and 30-year contracts. <sup>2</sup> The JPMorgan GBI-EM series provides a comprehensive measure of local currency-denominated, fixed rate government debt issued in emerging markets. <sup>3</sup> Aggregate, calculated by MSCI.

Sources: Bloomberg; Datastream; national data.

<sup>2</sup> The term premium is estimated using the methodology outlined in P Hördahl, O Tristany and D Vestin, “A joint econometric model of macroeconomic and term structure dynamics”, *Journal of Econometrics*, vol 131, 2006.

## Continuing divergence

Graph 2



<sup>1</sup> Net portfolio flows (adjusted for exchange rate changes) to dedicated funds for individual countries and to funds for which country or regional decomposition is available. <sup>2</sup> Purchasing managers' index (PMI) derived from monthly surveys of private sector companies. Values above (below) 50 indicate expansion (contraction). <sup>3</sup> US dollars per unit of local currency. An increase indicates appreciation of the local currency. <sup>4</sup> Sum across Australia, Canada, the euro area, Japan, New Zealand, Switzerland, the United Kingdom and the United States. <sup>5</sup> Sum across China, Chinese Taipei, Hong Kong SAR, India, Indonesia, Korea, Malaysia, the Philippines, Singapore and Thailand; Argentina, Brazil, Chile, Colombia, Mexico, Peru and Venezuela; and the Czech Republic, Hungary, Poland, Russia, South Africa and Turkey. <sup>6</sup> Simple average of Brazil, China, India and Russia.

Sources: Datastream; EPFR; HSBC; Markit.

outperformed bonds on the view that the foreseeable future would bring continued easing until robust growth takes hold. All the major bourses gained 10–25% from early 2013 to 27 November (Graph 1, right-hand panel).

By contrast, emerging markets did not fully recover from the fallout of the summer sell-off. Government bond yields and credit spreads remained elevated, and equity indices recouped only part of their losses (black lines in Graph 1). Likewise, emerging market bond funds saw outflows every month from June to November, as did equity funds save for modest inflows in September and October (Graph 2, left-hand panel). This subdued performance reflected in part market participants' reticence to invest in bonds worldwide, on the view that US policy tightening had only been postponed. It was also in line with the growth outlook of major emerging markets, which did not compare favourably with that of advanced economies (Graph 2, centre panel). Thus, in spite of dollar weakness in September and October, major emerging market currencies undid little of their summer depreciations (Graph 2, right-hand panel).

The ECB on 7 November cut the refinancing rate by 25 basis points to 0.25%, in response to inflation dropping to 0.7%, considerably below its objective. GDP and PMI data releases pointed to continued weakness in the euro area economy amid stubbornly high unemployment. In view of economic conditions, the ECB stated that it expected interest rates to remain at prevailing low levels for an extended period. The Governing Council also decided to continue refinancing operations with full allotment for as long as necessary, at least until mid-2015. With all central banks in the main currency areas in extended easing mode, asset prices continued to reflect the expectation of a low-yield environment for the foreseeable future.

## The search for yield continues unabated

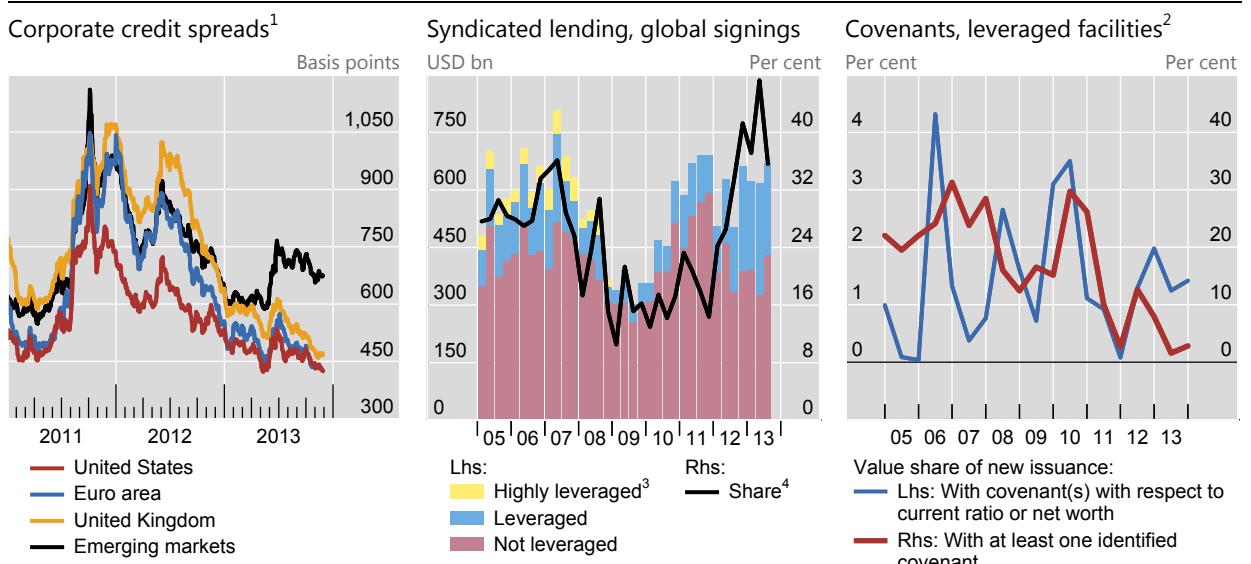
As the accommodative monetary policy stance persisted in all major currency areas, so did investors' search for yield. Low policy rates and large-scale asset purchases translated into low yields on benchmark bonds, to which investment grade assets are tightly linked. This spurred demand for assets in the riskier part of the spectrum, which promised to pay off at a higher rate. By and large, such assets have so far lived up to their promise. Narrowing credit spreads contributed to high mark-to-market returns on high-yield debt, while low default rates since the crisis peak contained credit losses. It remains to be seen, however, whether the combination of tight spreads and low default rates is sustainable.

The search for yield left its mark on price-based indicators, such as credit spreads in major advanced economies. During the bond market sell-off in May and June, these indicators pointed to sweeping rises in the cost of credit and greater differentiation among borrowers in different risk categories. However, this phenomenon proved to be short-lived. For instance, high-yield spreads on the US, euro area and UK local currency markets resumed their downward trend in late June (Graph 3, left-hand panel). By late November, these spreads stood 300–600 basis points below their 2012 peaks and 200–300 basis points above their pre-crisis troughs in 2006–07.

The search for yield was equally evident in quantity-based indicators. In the syndicated loan market, "leveraged" loans – granted to low-rated, highly leveraged borrowers – accounted for roughly 40% of new signings from July to November (Graph 3, centre panel). Remarkably, throughout most of 2013, this share was higher than during the pre-crisis period from 2005 to mid-2007. This was the result of both higher volumes of riskier loans (blue bars) and lower volumes in the safer part of the

Search for yield

Graph 3



<sup>1</sup> High-yield option-adjusted spreads on corporate bond indices of local currency assets. <sup>2</sup> Based on data available up to 6 November 2013. <sup>3</sup> Dealogic Loan Analytics does not distinguish between highly leveraged and leveraged for loans signed after 2008. <sup>4</sup> Of leveraged and highly leveraged loans in total syndicated loan signings.

Sources: Bank of America Merrill Lynch; Dealogic Loan Analytics; BIS calculations.

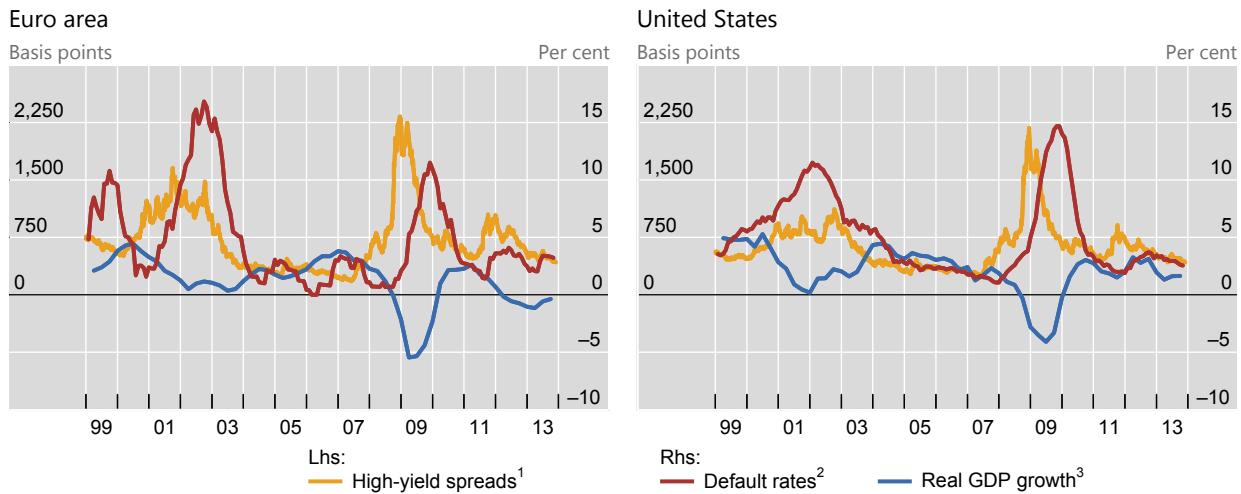
spectrum (red bars). In parallel, investors' drive towards high-yield credit resulted in a gradually falling share of those syndicated loans that feature creditor protection in the form of covenants (Graph 3, right-hand panel).

The trend towards riskier credit was fairly general. It spurred, for example, the market for payment-in-kind notes, which give the borrower an option to repay lenders by issuing additional debt. Investors' renewed interest in these instruments resulted in more than \$9 billion of new issuance over the first three quarters of 2013, one third higher than the overall issuance volume in 2012. This rise occurred despite evidence of the riskiness of payment-in-kind notes: roughly one third of their pre-crisis issuers defaulted between 2008 and mid-2013. The search for yield was also evident in the surge of mortgage real estate investment trusts (mREITs), which fund long-term assets with short-term repos. Following years of rapid expansion, their size peaked shy of \$500 billion in September 2012.<sup>3</sup> While these investment trusts hold less than 5% of agency mortgage-backed securities outstanding, their exposure to interest rate and liquidity risk has attracted regulators' attention. Similarly, industry reports underscored the growing share of debt in funding private equity takeovers. In the United States, this share increased steadily after 2009 to reach two thirds in October 2013, a level similar to that in 2006–07. For their part, European banks took advantage of the borrower's market by stepping up issuance of subordinated debt, thus increasing the cushion that insulates their senior creditors from the fallout of potential future distress.

Aggregate statistics on corporate default rates appear to justify the strategy of granting increasingly cheaper credit to the riskier borrowers. After a brief spike in 2009–10, default rates plummeted and stayed low for three years (Graph 4). At about 3% in 2013, the one-year default rate of speculative grade borrowers in the United States and Europe was only 1 percentage point above its average level

#### Credit and macroeconomic conditions

Graph 4



<sup>1</sup> Option-adjusted spreads on corporate bond indices of local currency assets. <sup>2</sup> Trailing 12-month issuer-weighted speculative grade default rates. In the left-hand panel, Europe-wide default rates. <sup>3</sup> Year-on-year growth rate of quarterly GDP.

Sources: Bank of America Merrill Lynch; Moody's; national data.

<sup>3</sup> The size of mREITs was \$443 billion in March 2013, based on 10-Q reports filed with the Securities and Exchange Commission (see S Pellerin, D Price, S Sabol and J Walter, "Assessing the risks of mortgage REITs", Federal Reserve Bank of Richmond, *Economic Brief*, no 13-11, November 2013).

between 2005 and 2008. On the basis of such statistics, industry analysts have constructed historical credit loss scenarios and have used them to interpret recent spreads. It turns out that these spreads – albeit low – would be generally sufficient to compensate for potential credit losses that are in line with typical historical experience.

However, in addition to reflecting perceptions of credit risk, spreads may also drive default rates. A low interest rate environment naturally fosters cheap and ample credit. Coupled with the reluctance of crisis-scarred creditors to recognise losses, this can facilitate refinancing and keep troubled borrowers afloat. If such a process is indeed at work, its sustainability will no doubt be tested by the eventual normalisation of the monetary policy stance.

The ongoing search for yield has coincided with the breakdown in certain regions of a previously stable relationship between credit market and macroeconomic conditions. Over the 15 years ending in 2011, low or negative real growth had gone hand in hand with high default rates and credit spreads (Graph 4). This pattern prevailed also more recently in the United States. By contrast, default rates in the euro area actually fell from 2012 onwards, even as the region entered a two-year downturn and the share of banks' non-performing loans trended upwards (see below). Similarly, credit spreads in emerging markets dropped between late 2011 and mid-2013, just when local economic growth showed clear signs of weakness. This suggests that investors' high risk appetite may have been boosting credit valuations in capital markets, keeping a lid on default rates.

## Banks lose ground to non-financial corporates

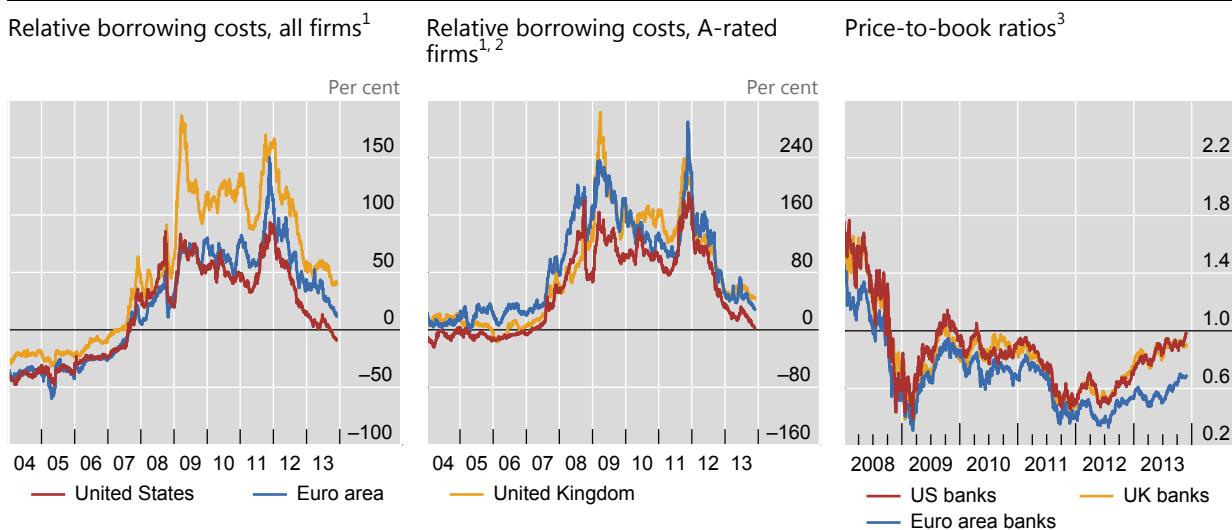
Upbeat investor sentiment contrasted with lingering unease about banks. Over the past seven years, banks had to face higher funding costs than large non-financial corporates, which made increasing use of their direct access to credit markets. One reason why banks lost their previous funding advantage stems from the rapid deterioration of their intrinsic health during the financial crisis. In addition, more recently, perceived and announced reductions in official sector support increased banks' riskiness in the eyes of investors, even as these institutions strengthened their capital and liquidity positions. Uncertainty about banks' financial condition – including their exposure to sovereign risk – also played an important role. (See the box below for the regulatory treatment of sovereign exposures in the Basel capital framework.)

### Relative funding costs and debt issuance

The financial crisis of 2007–09 marked the end of an era in which banks had had a funding advantage. In the run-up to the crisis, spreads on bank bond indices in advanced economies were typically 20–30% lower than those on non-financial corporate indices (Graph 5, left-hand panel). The gap reversed sign in 2007, and bank spreads peaked 95% above non-financial corporate spreads in the United States at end-2011; the corresponding numbers were 150% for both the euro area and the United Kingdom. Thereafter, the percentage difference in borrowing costs generally narrowed. By November 2013, it had disappeared in aggregate for US institutions but had remained at 10% and 40% for euro area and UK institutions, respectively.

## Market perceptions of banks' riskiness

Graph 5



<sup>1</sup> Option-adjusted spread on a bank sub-index minus that on a non-financial corporate sub-index, divided by the spread on the non-financial corporate sub-index. Sub-indices include local currency assets. <sup>2</sup> UK series is based on financial and industrial sub-indices. <sup>3</sup> Simple averages across major banks. For the euro area: Banco Santander, BNP Paribas, Crédit Agricole, Deutsche Bank, ING Group, Société Générale and UniCredit. For the United Kingdom: Barclays, HSBC, Lloyds and RBS. For the United States: Bank of America Merrill Lynch, Citigroup, Goldman Sachs, JPMorgan Chase and Morgan Stanley.

Sources: Bank of America Merrill Lynch; Bloomberg; Datastream; BIS calculations.

The erosion of banks' funding advantage limits their effectiveness as intermediaries. There are indications that euro area banks, for instance, passed on some of their relatively high borrowing costs. The average interest rate on euro area bank loans stalled at levels above 3% over the past three years, in spite of falling policy rates. As the cost of funding in bond markets trended downwards, large corporates increasingly faced incentives to bypass banks and tap markets directly (Graph 6, left-hand panel). It is thus hardly surprising that net issuance in European debt markets rose sharply in 2012 (Graph 6, right-hand panel).<sup>4</sup> Strong issuance by US and emerging market corporates underlines that this trend was global in nature. A similar surge in global corporate bond issuance took place when markets rebounded from the financial crisis after March 2009.

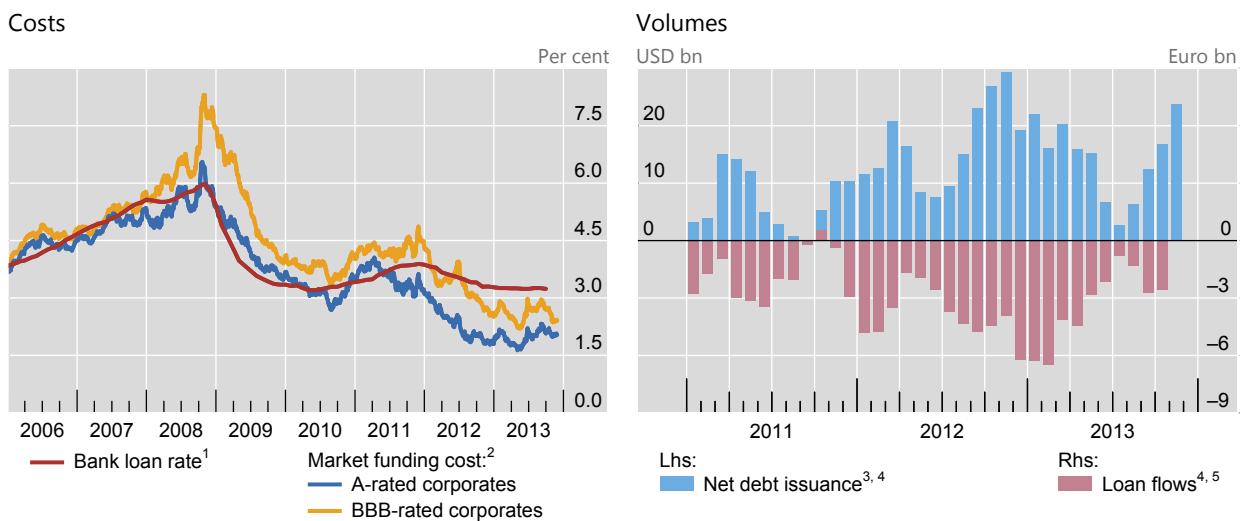
The composition of corporate financing shifted towards market funding as a result. A comparison between issuance volumes of corporate debt and those of syndicated loans suggests that bond markets in Europe have recently outpaced banks in the provision of funding: more than 50% of cumulative funding raised by euro area corporates since early 2011 was met in securities markets rather than through syndicated loans. Moreover, banks in the euro area provided no new direct lending in the aggregate, and the stock of corporate loans fell a cumulative 15% during this period. Markets thus eclipsed banks as a source of new credit to euro area corporates. In the United States, syndicated lending kept pace with corporate debt issuance, leaving the share of market funding unchanged near 33%.<sup>5</sup>

<sup>4</sup> Net issuance equals gross issuance of new debt securities minus repayment of maturing debt. As such, the measure roughly corresponds to the change in bank loans outstanding that enters the calculation of loan growth.

<sup>5</sup> In 2007, those shares were below 25% on both sides of the Atlantic.

## Funding of euro area non-financial corporations

Graph 6



<sup>1</sup> Annualised effective interest rate charged by euro area monetary financial institutions (MFIs) on existing loans to non-financial corporations (excluding households), of one to five years' original maturity. <sup>2</sup> Yields on euro-denominated bonds issued by European non-financial corporates. <sup>3</sup> Net issuance (gross issuance minus repayments) of domestic and international debt securities issued by euro area non-financial corporates, on an ultimate owner basis. Based on data available up to 27 November. <sup>4</sup> Trailing three-month moving average. <sup>5</sup> Monthly flows. Euro area MFI lending to non-financial corporations of one to five years' original maturity (working day and seasonally adjusted).

Sources: ECB; Datastream; Dealogic; JPMorgan Chase.

## Perceptions of weak and uncertain health weigh on banks

Uncertainty about banks' riskiness appears to have been an important reason for their relatively high funding costs over the past years. This can be seen by looking at firms – banks and non-banks – that have similar credit ratings and, thus, are expected to impose similar losses on their creditors. If expected credit losses alone drive market pricing, such institutions should face similar borrowing costs. This was indeed the case in the United States, the euro area and the United Kingdom prior to the financial crisis (Graph 5, centre panel). Thereafter, uncertainty about credit losses rose to become an important additional driver. From 2007 to 2011, its impact on risk premia pushed bank bond yields above those of similarly rated non-financial corporates. This phenomenon subsequently reversed in the United States but remained pronounced in the euro area and the United Kingdom.

Persistent uncertainty about banks manifested itself in the stock market as well. In a sample of large internationally active banks, price-to-book ratios have been less than unity for almost four consecutive years (Graph 5, right-hand panel). These ratios have been particularly low for euro area banks, dipping below 0.4 at end-2011 and at mid-2012, and standing at 0.7 in November 2013. By contrast, stock markets perceived a much brighter outlook for the non-financial sector, where price-to-book ratios remained above unity through the financial crisis and hovered around 2 in November 2013.

Credit ratings also express reservations about banks' financial strength. Fitch and Moody's convey this message through stand-alone ratings, which reflect banks' likelihood of default, assuming that no external support is forthcoming. Judging from these ratings, the two agencies agree that the intrinsic financial strength of

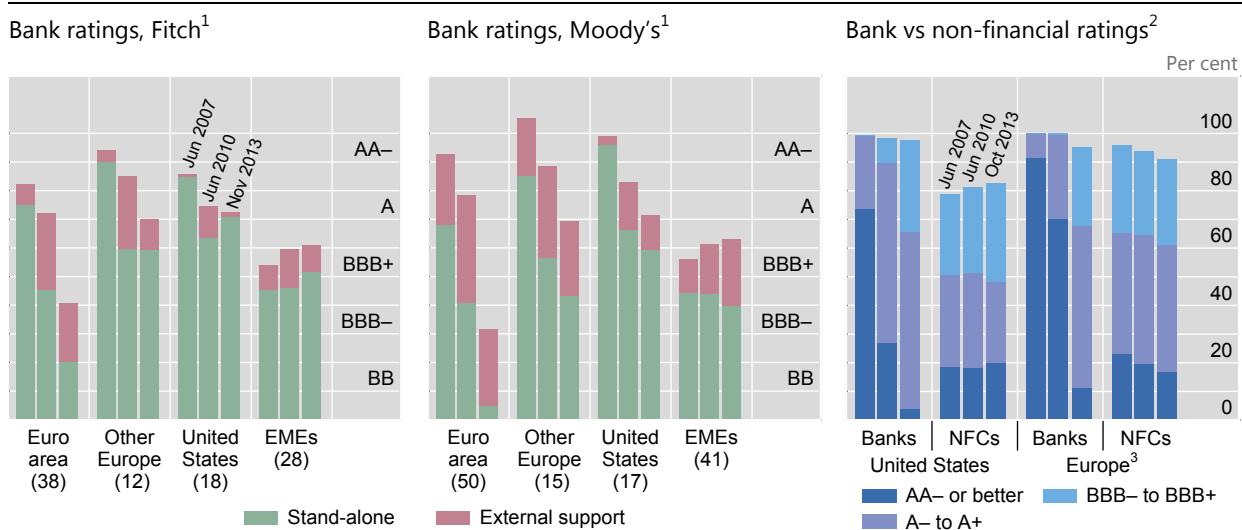
banks in major advanced economies was considerably weaker in November 2013 than at mid-2007, prior to the financial crisis (Graph 7, left-hand and centre panels). They also agree that at mid-2010 the stand-alone health of the same banks had already deteriorated by two to three rating notches. While Moody's sees such deterioration as continuing in advanced economies, Fitch does not. Indeed, it reports recent worsening or stabilisation of the stand-alone ratings of European banks but a recent improvement in those of US banks.

According to rating agencies, credit risk increased also for senior bondholders and other investors in bank debt who benefit from explicit or implicit government guarantees. The increase in the value of these guarantees during the global financial crisis (expanding red bars in Graph 7) limited the concurrent decline in banks' overall ratings, ie the ratings that account for both intrinsic financial strength and external support.<sup>6</sup> After 2010, however, a reduction in perceived government support (shrinking red bars) contributed to a deterioration of the overall ratings of banks from major advanced economies. On average, this deterioration amounted to more than three notches in the case of euro area banks, almost two notches for other European banks and a fifth of a notch to one notch for US banks.

A reduction in government support can arise for two reasons, with opposite implications for financial stability. The first is rooted in a weak financial condition of the sovereign, which impairs its *capacity* to rescue banks in its jurisdiction. This factor has played a role in a number of countries in the euro area's geographical periphery, which have experienced multi-notch downgrades of their sovereigns' ratings since mid-2010. In this case, the deterioration in governments' creditworthiness removes an important backstop that could stabilise the financial

## Credit outlook

Graph 7



<sup>1</sup> Average credit ratings. Numbers of banks in parentheses. <sup>2</sup> From Moody's. Aggregate assets of the firms in a given rating category, as a share in the combined assets of all rated firms in the corresponding region and sector. NFCs = non-financial corporates. <sup>3</sup> Includes banks domiciled in France, Germany, Italy, the Netherlands, Spain, Switzerland and the United Kingdom.

Sources: Fitch Ratings; Moody's; BIS calculations.

<sup>6</sup> For a discussion of banks' stand-alone and overall (or all-in) ratings, see F Packer and N Tarashev, "Rating methodologies for banks", *BIS Quarterly Review*, June 2011.

## Treatment of sovereign risk in the Basel capital framework

It is sometimes asserted that the Basel capital framework prescribes a zero risk weight for bank exposures to sovereigns. This is incorrect. Basel II and Basel III call for minimum capital requirements *commensurate with the underlying credit risk*, in line with the objective of ensuring risk sensitivity. This is the basic philosophy of the framework.

In most jurisdictions, the treatment of sovereign exposures<sup>①</sup> in the banking book follows the Basel II framework, which Basel III has not changed.<sup>②</sup> Jurisdictions may adopt one of two (or both) methodologies: the Standardised Approach, which relies on external credit ratings; and the Internal Ratings-Based (IRB) approach, which relies on banks' own risk assessments.

The most relevant standard for internationally active banks is the *IRB approach*. This approach has been designed bearing in mind the world's largest banks, including global systemically important banks (G-SIBs). The IRB approach requires banks to assess the credit risk of individual sovereigns using a granular rating scale, accounting for all relevant differences in risk with a bespoke risk weight per sovereign. Risk weights are primarily determined by banks' own estimates of probability of default (PD) and loss-given-default (LGD) for a given exposure. The approach does not prescribe minimum levels of PD or LGD for sovereign exposures, but it includes detailed qualitative minimum requirements. In particular, the framework requires a "meaningful differentiation" of risk.

For illustrative purposes, Table A below sets out PDs and their associated risk weights for banks using the Foundation IRB approach. This variant of the IRB, in contrast to its advanced counterpart, allows banks to rely on their risk assessments for PDs but requires them to use a standard LGD of 45% set by supervisors. The PDs are subject to supervisory validation. Data collected by the Basel Committee covering 201 large banks show a weighted mean PD for sovereign exposures subject to the IRB approach of 0.1%.<sup>③</sup>

The Basel framework is based on the premise that banks use the IRB approach across the entire banking group and across all asset classes. It recognises, however, that it may not be practicable for banks to implement the IRB approach across all asset classes and business units at the same time. Therefore, it allows national supervisors to permit their banks to phase in the approach across the banking group. And, subject to strict conditions, it also allows them to keep some exposures in the Standardised Approach indefinitely. For this to be the case, however, these exposures have to be in non-significant business units or in asset classes that are immaterial in terms of size and perceived risk. As a result, banks adopting the IRB approach are expected, over time, to move all material exposures to the IRB framework.

The *Standardised Approach*, as a rule, also prescribes positive risk weights. As shown below, based on external credit ratings, it assigns a positive risk weight to all but the highest-quality credits (AAA to AA). That said, national

Illustrative IRB risk weights for sovereigns

Table A

Asset class: LGD: 45% Maturity: 2.5 years	Sovereign exposure
Probability of default (%)	Risk weight (%)
0.01	7.53
0.05	19.65
0.10	29.65
0.25	49.47
0.50	69.61
1.00	92.32
5.00	149.86
10.00	193.09

Source: BIS.

## Credit ratings and sovereign risk weights under the Standardised Approach

In per cent

Table B

Credit ratings	AAA to AA–	A+ to A–	BBB+ to BBB–	BB+ to B–	Below B–	Unrated
Risk weight	0	20	50	100	150	100

Source: BIS.

supervisors are allowed to exercise discretion and set a lower risk weight provided that the exposures are denominated and funded in the currency of the corresponding state.<sup>④</sup>

There are significant differences in the application of the Basel rules across jurisdictions.<sup>⑤</sup> For instance, in the United States, internationally active banks are required to implement the IRB approach; a parallel run is under way and the process is not yet finalised. As a result, for the time being, they continue to use the local version of the Standardised Approach. In the European Union (EU), authorities have allowed supervisors to permit banks that follow the IRB approach to stay *permanently* on the Standardised Approach for their sovereign exposures. In applying the Standardised Approach, in turn, EU authorities have set a zero risk weight not just to sovereign exposures denominated and funded in the currency of the corresponding Member State, but also to such exposures denominated and funded in the currencies of *any other* Member State.<sup>⑥</sup>

As a consequence of these differences, applied sovereign risk weights vary considerably for large international banks, including global systemically important ones. In fact, the variation in sovereign risk weights is an important source of the variability in risk-weighted assets across banks. It is the national authorities' responsibility to implement the IRB approach in a manner consistent with the Basel framework so as to achieve appropriate risk weights for sovereigns.

<sup>①</sup> Sovereign exposures comprise those to the central government and corresponding central bank. <sup>②</sup> Basel I's treatment of sovereign risk was based on the distinction between OECD and non-OECD members. Under Basel I, banks assigned a 0% risk weight to exposures to OECD member countries; exposures to non-OECD countries were assigned a 100% risk weight. The Basel I framework remains the minimum standard in some jurisdictions. <sup>③</sup> See Basel Committee on Banking Supervision, *Regulatory consistency assessment programme (RCAP) – Analysis of risk-weighted assets for credit risk in the banking book*, July 2013. <sup>④</sup> Where this discretion is exercised, and in order to ensure a level playing field, bank supervisory authorities in other jurisdictions may also permit their own banks to apply the same risk weights to the given sovereign under the same conditions, ie as long as those exposures are denominated and funded in the corresponding currency. <sup>⑤</sup> Basel Committee on Banking Supervision, *Progress report on implementation of the Basel regulatory framework*, October 2013. <sup>⑥</sup> This provision will be phased out gradually between 2017 and 2020. The new framework, governed by the Capital Requirements Directive IV (CRD IV) and coming into force from January 2014, supersedes the treatment enshrined in CRD III. It requires that, following the phasing-out, the corresponding exposures rely on credit rating agencies' assessments.

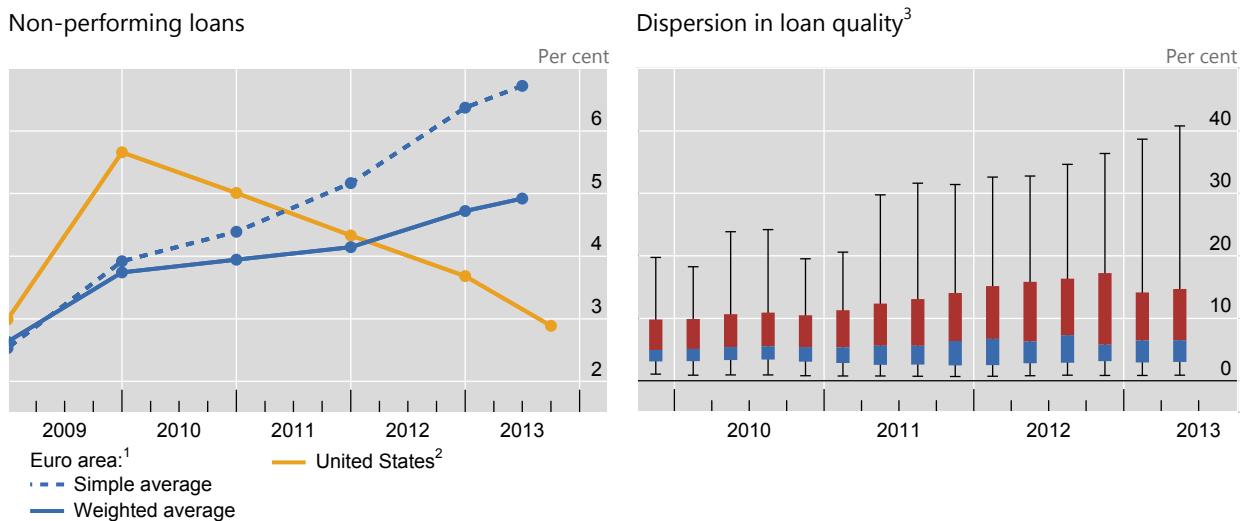
system under stress. The second reason is a reduction in the sovereign's *willingness* to support banks, as reflected in recent regulatory steps, in both Europe and the United States, to address the too-big-to-fail problem. This promotes financial stability by strengthening incentives for prudent behaviour.

The perceived riskiness of banks has also increased relative to that of non-financial corporates. While the overall ratings of many US, UK and euro area banks deteriorated steadily over the past five years, those of non-financial corporates remained largely stable. As a result, the pool of highly rated banks shrank relative to that of highly rated corporates (shrinking dark blue bars in Graph 7, right-hand panel). And as banks' relative credit outlook worsened, their relative borrowing costs remained high (Graph 5, centre panel). This is likely to have contributed to a weakening of banks' intermediation capacity and, unless reversed, does not augur well for their future.

Market perceptions of banks' riskiness were driven by various factors ranging from lawsuits to lingering doubts about asset quality, especially at European banks.

## Indicators of loan quality at euro area banks

Graph 8



<sup>1</sup> Gross total doubtful and non-performing loans, as a percentage of debt instruments, loans and advances, of euro area domestic banking groups and foreign branches and subsidiaries. <sup>2</sup> Non-performing loans (past due 90+ days plus non-accrual), as a percentage of total loans for all US banks. <sup>3</sup> Impaired loans and past due (>90 days) loans to total loans of 56 major EU banks. The box plot is centred on the non-performing loan ratio of the median (typical) bank, the box around the median represents the range between the 25th (blue) and 75th (red) percentiles, and the whiskers mark 5th and 95th percentiles, respectively.

Sources: ECB; European Banking Authority; US Federal Financial Institutions Examination Council.

Reported numbers indicate that the share of non-performing loans trended up after 2008 in the euro area, but subsided after 2009 in the United States (Graph 8, left-hand panel).<sup>7</sup> At the same time, reported aggregates conceal large differences across banks and countries (Graph 8, right-hand panel). The gradual build-up of such strains went hand in hand with the contraction in euro area bank lending. Since mid-2012 alone, European banks shed more than €2 trillion in assets, judging by industry estimates.

Policymakers have acknowledged that the uncertainty surrounding banks stands in the way of a broad-based recovery. To strengthen the banking system, on 23 October the ECB announced the terms of a comprehensive 12-month assessment of 130 major credit institutions. The muted equity market response suggests that these terms were broadly anticipated. The assessment consists of a harmonised asset quality review followed by a forward-looking stress test. Its stated goal is to enhance transparency on the condition of banks, repair balance sheets, and restore confidence in the soundness of the euro area banking sector. Accordingly, banks will be required to adopt corrective measures if their Common Equity Tier 1 ratio is deemed insufficient with respect to an 8% benchmark, either because of asset revaluations or in a stress scenario.

<sup>7</sup> While trends over time are telling, the levels may not be comparable across regions due to differences in definitions, disclosure and regulatory treatment.

## Highlights of the BIS international statistics<sup>1</sup>

*BIS reporting banks reduced their cross-border claims in the second quarter of 2013, in particular claims on non-bank borrowers, which registered the largest decline since end-2011. Gross credit exposures in the OTC derivatives market increased despite a sizeable fall in market values. This chapter contains three boxes. The first analyses the impact on cross-border credit to emerging market economies of announcements in May that the Federal Reserve envisaged phasing out large-scale asset purchases. The second analyses the issuance of international bonds denominated in emerging market currencies. The third updates previous estimates of the relationship between FX turnover and countries' current account transactions and income levels using data from the most recent BIS Triennial Survey.*

During the second quarter of 2013, the cross-border claims of BIS reporting banks declined, after remaining stable in the previous quarter. A sizeable reduction in cross-border claims on borrowers in advanced economies and, to a lesser extent, offshore centres was only partly offset by a slight increase in cross-border credit to emerging market borrowers. That said, the small overall increase in lending to emerging markets hides significant variations across countries. Announcements by the Federal Reserve on the prospective "tapering" of large-scale asset purchases coincided with sharp drops in cross-border credit to some of the largest emerging market economies, such as Brazil, India, Russia and South-Africa. In contrast to developments in previous quarters, BIS reporters cut their cross-border lending to all sectors. Previously, lower claims on banks had gone hand in hand with higher lending to non-banks.

### The international banking market in the second quarter of 2013

The cross-border claims of BIS reporting banks fell by \$515 billion (1.8%) between end-March and end-June 2013 (Graph 1, top left-hand panel).<sup>2</sup> As a result, total

<sup>1</sup> This article was prepared by Adrian van Rixtel (adrian.vanrixtel@bis.org) for the banking section and Jacob Gyntelberg (jacob.gyntelberg@bis.org) for the derivatives section. Statistical support was provided by Pablo García (banking) and Denis Pêtre (derivatives).

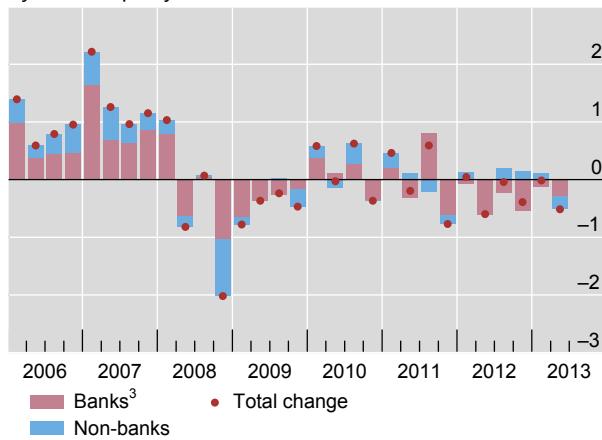
<sup>2</sup> The analysis in this section is based on the BIS locational banking statistics by residence, unless stated otherwise. In these statistics, creditors and debtors are classified according to their residence

## Changes in cross-border claims<sup>1</sup>

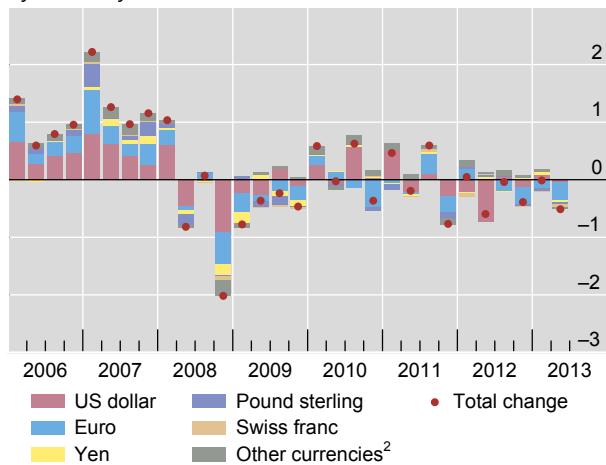
Exchange rate- and break-adjusted changes, in trillions of US dollars

Graph 1

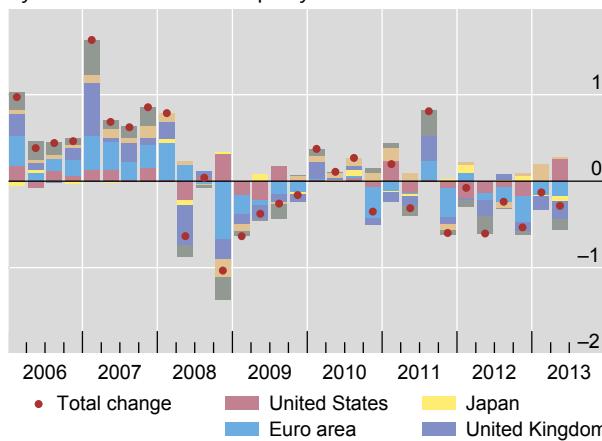
By counterparty sector



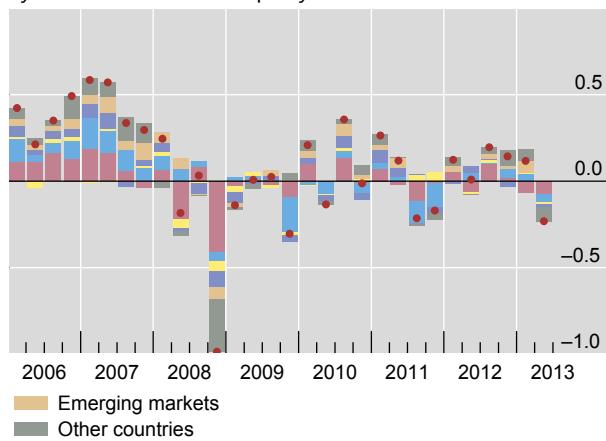
By currency



By residence of counterparty, banks<sup>3</sup>



By residence of counterparty, non-banks



<sup>1</sup> BIS reporting banks' cross-border claims include inter-office claims.

<sup>2</sup> Includes unallocated currencies.

<sup>3</sup> Includes claims unallocated by counterparty sector.

Source: BIS locational banking statistics by residence.

outstanding cross-border credit stood at \$28.3 trillion at end-June 2013, 1.2% lower than in the same quarter one year earlier. Cross-border claims fell in all major currency denominations, with large declines in claims in euros (\$315 billion or 3.2%), Swiss francs (\$48 billion or 11%) and Japanese yen (\$43 billion or 3.5%) (Graph 1, top right-hand panel).

The second quarter of 2013 saw the first substantial decline in banks' cross-border claims on non-bank borrowers since end-2011. Claims on these borrowers – comprising non-bank financial institutions, governments and corporations – fell by \$231 billion or 2.0% (Graph 1, top left-hand panel), to \$11.4 trillion. The reduction mostly affected non-banks resident in advanced economies, although claims on

(as in the balance of payments statistics), not according to their nationality. All reported flows in cross-border claims have been adjusted for exchange rate fluctuations and breaks in series.

non-banks in other countries (primarily offshore centres) declined as well (Graph 1, bottom right-hand panel).

Cross-border interbank claims, including claims on related offices, also contracted during the quarter, falling by \$285 billion (1.7%), to \$16.8 trillion (Graph 1, bottom left-hand panel). This extended a trend evident since the fourth quarter of 2011.

Cross-border credit developments differed across regions. Claims on advanced economies fell by \$470 billion (2.2%), accounting for 91% of the total global decline in cross-border lending. Claims on offshore centres declined by \$70 billion (1.9%). In contrast, cross-border claims on emerging market economies increased modestly by \$23 billion (0.7%).

### Credit to advanced economies

Claims on non-bank borrowers in advanced economies decreased by \$181 billion (2.2%) in the second quarter of 2013. This was the first major reduction in positions on non-banks since end-2011, and it almost reversed the cumulative increase in 2012. The decline was widespread, affecting especially non-bank borrowers in the United States, the euro area, the United Kingdom, Japan and Switzerland.

The consolidated banking statistics<sup>3</sup> provide more detail on the types of non-bank borrowers affected. A drop in claims on the public sector, especially those of the United States and Japan, was a key driver of this contraction. The share of public sector claims in total consolidated international claims<sup>4</sup> on US borrowers fell to 22% at end-June 2013, from a high of 25% at end-2012. The corresponding share for Japan declined to 6.7% at end-June 2013, from 9.3% at end-2012. By contrast, the share of the public sector in claims on the euro area was stable at around 19%.

Claims on banks in advanced economies continued to fall, albeit at a somewhat slower pace, declining by \$289 billion (2.2%) in the second quarter of 2013. The continued retreat in international interbank activity was concentrated on banks in the United Kingdom (−\$198 billion or 5.9%) and the euro area (−\$170 billion or 3.4%) (Graph 1, bottom left-hand panel). Claims on banks in Japan and Switzerland declined as well. Banks in the United States proved an exception to the generalised contraction, with new claims on the sector amounting to \$250 billion (+11%). About half of the reduction in interbank positions of banks headquartered in advanced economies was due to a drop in claims on related offices.<sup>5</sup>

<sup>3</sup> The consolidated banking statistics are structured by the nationality of reporting banks and are reported on a worldwide consolidated basis, ie excluding positions between affiliates of the same banking group. Banks consolidate their inter-office positions and report only their claims on unrelated borrowers.

<sup>4</sup> International claims comprise cross-border claims in all currencies and local claims in foreign currencies, where local claims refer to credit extended by banks' affiliates located in the same country as the borrower.

<sup>5</sup> This is derived from the BIS locational banking statistics by nationality. These provide information on the banking activity of all internationally active banks residing in the reporting country grouped by the nationality of the controlling parent institution. These statistics break down positions versus banks into positions versus related foreign offices (inter-office positions), other (or unrelated) banks and official monetary institutions. For more details, see *Guidelines to the international banking statistics*.

## Emerging markets and talk of tapering

Pablo García Luna and Adrian van Rixtel

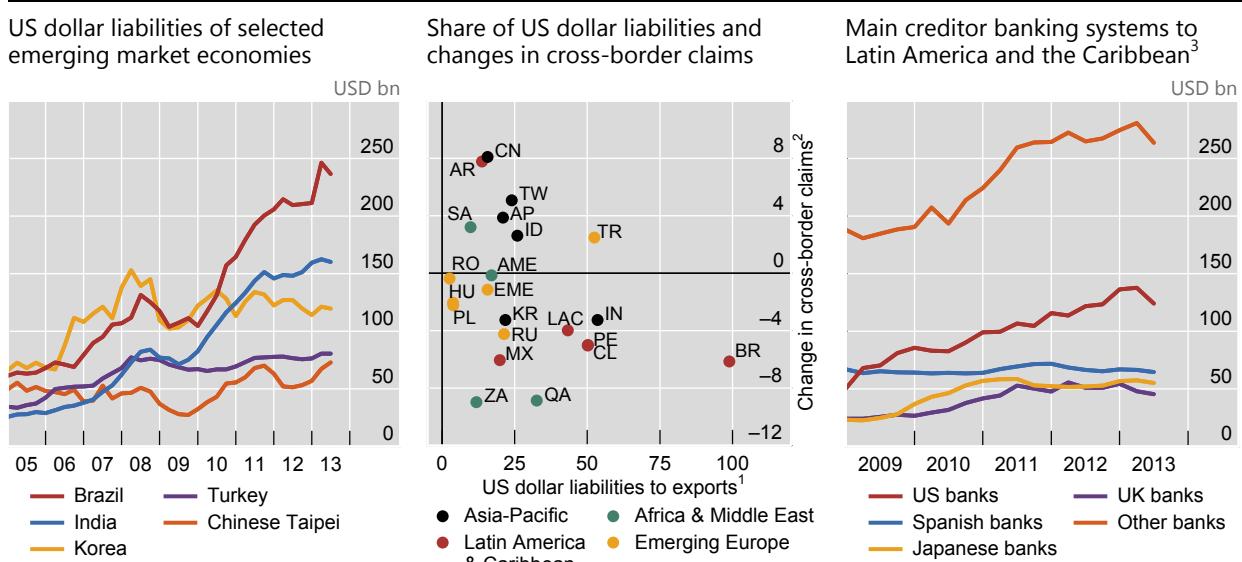
The accommodative monetary policy stance in advanced economies in the wake of the global financial crisis boosted capital flows to fast-growing emerging market economies and put upward pressure on their currencies. This contributed to a build-up of financial imbalances, reflected in surging credit and asset prices. International bank lending to these economies picked up markedly. The volume of foreign banks' US dollar-denominated credit to emerging market economies grew rapidly, especially during 2010–11. But this masked considerable variation across countries (Graph A, left-hand panel). US dollar-denominated liabilities of Brazil and India more than doubled from early 2009 to end-June 2013, to \$237 billion and \$160 billion, respectively. For Turkey and South-Korea, the growth of US dollar-denominated borrowing during the same period was more moderate.

A tightening of US monetary policy and higher US interest rates will raise the refinancing costs of US dollar-denominated debt. Moreover, possible related upward pressures on the US dollar will increase the value of this debt in local currencies. Emerging market economies with relatively low US dollar liabilities in terms of their exports, which generate foreign currency, may be affected less. These effects may also be relevant for liabilities denominated in other foreign currencies, as increases in US interest rates may be associated with higher rates in other advanced economies. At the same time, the channels are the most direct for liabilities denominated in US dollars. This box considers how cross-border credit to economies with relatively large US dollar liability exposures was affected by announcements of a "tapering" of large-scale asset purchases in May 2013.

The BIS locational banking statistics, which include inter-office activity, show that cross-border credit to a large number of emerging market economies with sizeable US dollar-denominated liabilities fell in the second quarter of

### Cross-border banking activity in emerging market economies

Graph A



AE = United Arab Emirates; AME = emerging Africa & Middle East; AP = emerging Asia-Pacific; AR = Argentina; BR = Brazil; CL = Chile; CN = China; EME = emerging Europe; HU = Hungary; ID = Indonesia; IN = India; KR = Korea; LAC = emerging Latin America & Caribbean; LR = Liberia; MX = Mexico; PE = Peru; PL = Poland; QA = Qatar; RO = Romania; RU = Russia; SA = Saudi Arabia; TR = Turkey; TW = Chinese Taipei; ZA = South Africa.

<sup>1</sup> BIS reporting banks' cross-border claims in US dollars as a percentage of annual exports. <sup>2</sup> BIS reporting banks' Q2 2013 quarter-on-quarter growth in cross-border claims. <sup>3</sup> International claims.

Sources: IMF, *Direction of Trade Statistics*; BIS locational banking statistics by residence and by nationality; BIS consolidated banking statistics (immediate borrower basis).

2013 (Graph A, centre panel). Those most affected were located predominantly in Latin America. The drop was largest for Brazil (with a ratio of US dollar liabilities to exports of 99%), but was also quite sharp for Chile (50%), Mexico (20%) and Peru (50%). In other regions, claims on India and Russia contracted as well. In contrast, cross-border credit to Turkey (52%) and several emerging Asian countries increased, most notably to Chinese Taipei and Indonesia.

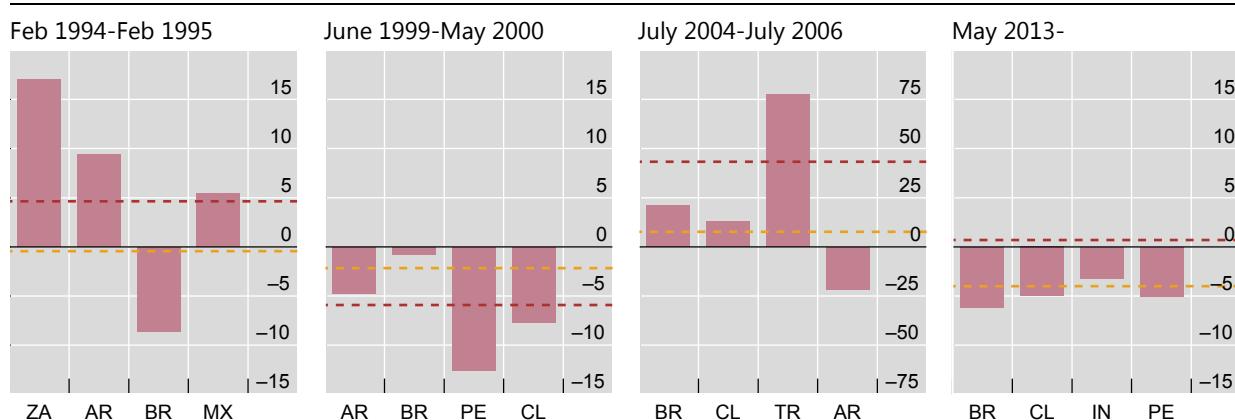
But the observation that countries with relatively large US dollar-denominated liabilities, especially those in Latin America, were strongly affected by talk about tapering is not new: something similar happened during previous Fed tightening cycles. Graph B shows the change in cross-border credit to the four emerging market economies with the largest ratio of US dollar-denominated liabilities to exports at the start of the four most recent cycles of US monetary policy tightening. These countries, which are drawn from a group of 16 main emerging market economies, are chiefly from Latin America. The growth of cross-border credit to the selected Latin American countries was considerably lower than that of claims on all emerging market economies during the 2004–06 cycle. In the second quarter of 2013 the difference was even more pronounced. Furthermore, during three of the four episodes, cross-border claims on Latin America and the Caribbean (Graph B, dashed yellow line) displayed a considerably lower growth than those on all emerging market economies (Graph B, dashed red line). The only exception was 1999–2000, when cross-border credit to emerging Asia continued to be severely affected by the Asian crisis.

The fact that sharp falls in credit to Latin American countries with relatively large US dollar exposures coincided with the talk of tapering may be related to the growing regional importance of US banks (Graph A, right-hand panel). These banks doubled their international claims on Latin America and the Caribbean from early 2009 to almost \$140 billion in early 2013. The share of US banks in total international credit to Latin America is much higher than their share in claims on other emerging market regions. International claims of US banks on Latin America and the Caribbean fell by 10% in the second quarter of 2013, much more than those reported by other main creditor banking systems.

## Fed tightening cycles

Change in cross-border claims during actual tightening and talk of tapering, in per cent

Graph B



AR = Argentina; BR = Brazil; CL = Chile; IN = India; MX = Mexico; PE = Peru; TR = Turkey; ZA = South Africa.

The dashed red and yellow lines represent the change in cross-border claims vis-à-vis all emerging market economies and vis-à-vis Latin America and the Caribbean, respectively.

The panels display the four countries with the largest ratio of US dollar cross-border liabilities to exports at the start of each tightening cycle. The sample of countries comprises Argentina, Brazil, Chile, China, Hungary, India, Indonesia, Korea, Malaysia, Mexico, Peru, Poland, Romania, Russia, South Africa and Turkey.

Source: BIS locational banking statistics by residence.

With interbank funding declining, banks increasingly relied on funding from non-bank entities. Cross-border funding obtained by reporting banks from non-

banks in advanced economies increased by \$224 billion (4.3%) in the second quarter of 2013, to almost one third of banks' cross-border liabilities. Non-banks in the United States and the United Kingdom contributed \$107 billion (+6.1%) and \$71 billion (+6.5%) to reporting banks' cross-border funding, respectively.

## Credit to emerging market economies

Reporting banks' cross-border claims on borrowers in emerging market economies inched up by \$23 billion (0.7%) in the second quarter of 2013.<sup>6</sup> This followed the record growth of \$266 billion in the previous quarter. Claims on banks increased by \$25 billion (1.4%); those on non-banks fell by \$1.8 billion (0.1%).

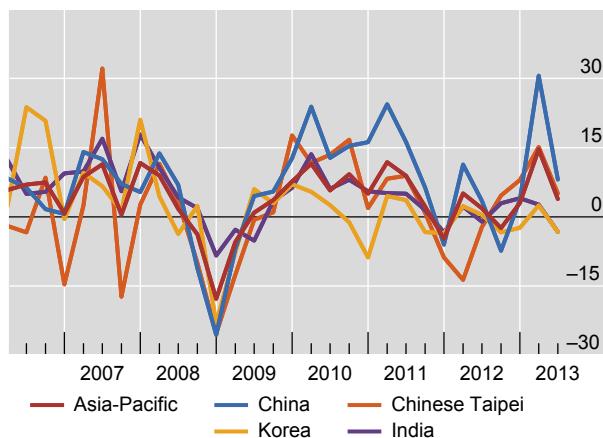
The significant slowdown in cross-border credit to emerging market economies in the second quarter of 2013 went hand in hand with heightened financial market

### Growth of cross-border claims on residents of emerging markets, by region<sup>1</sup>

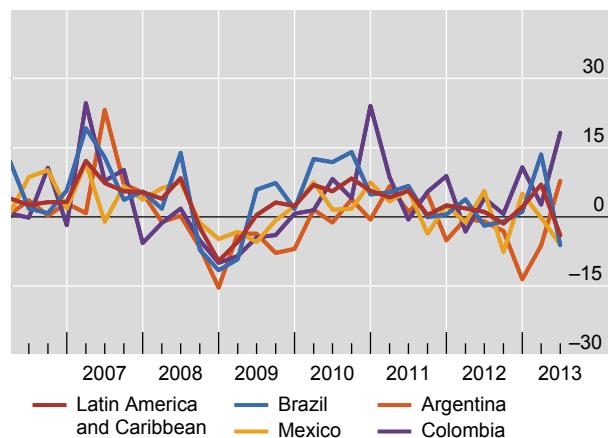
In per cent

Graph 2

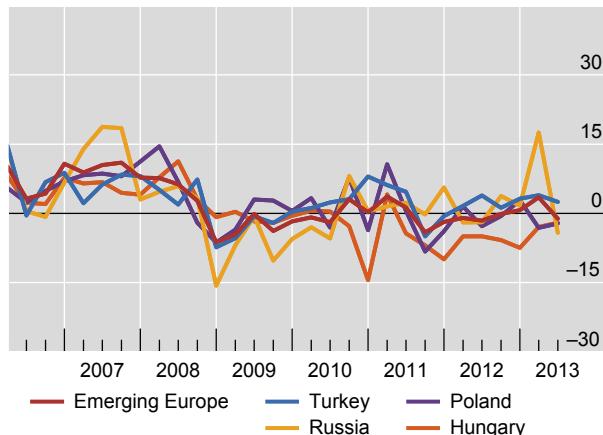
#### Asia-Pacific



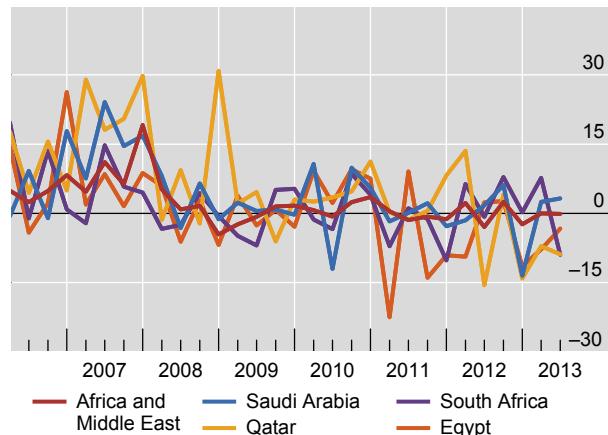
#### Latin America and Caribbean



#### Emerging Europe



#### Africa and Middle East



<sup>1</sup> Quarter-on-quarter changes in BIS reporting banks' cross-border claims (including inter-office claims) in all currencies.

Source: BIS locational banking statistics by residence.

<sup>6</sup> The BIS locational banking statistics by residence are described in footnote 2.

volatility. This followed announcements in May that the Federal Reserve envisaged phasing out large-scale asset purchases. The prospect of this so-called “tapering” affected asset prices in some of the largest emerging market economies, such as Brazil, India, Russia and South-Africa. International banking activity largely followed the same pattern. A further analysis is presented in Box 1.

Cross-border credit to borrowers in Latin America and the Caribbean contracted the most. It fell by \$27 billion or 4.0% (Graph 2, top right-hand panel), the largest quarterly decline on record. This decline was heavily concentrated on Brazil (\$20 billion or 6.2%), although credit to several other Latin American countries contracted significantly (Mexico: \$7.5 billion or 6.0%, Chile: \$2.8 billion or 5.0%).

In contrast, claims on emerging economies in Asia, Europe, and Africa and the Middle East were relatively stable (Graph 2, top left-hand and bottom panels), but this hides significant variation across countries.

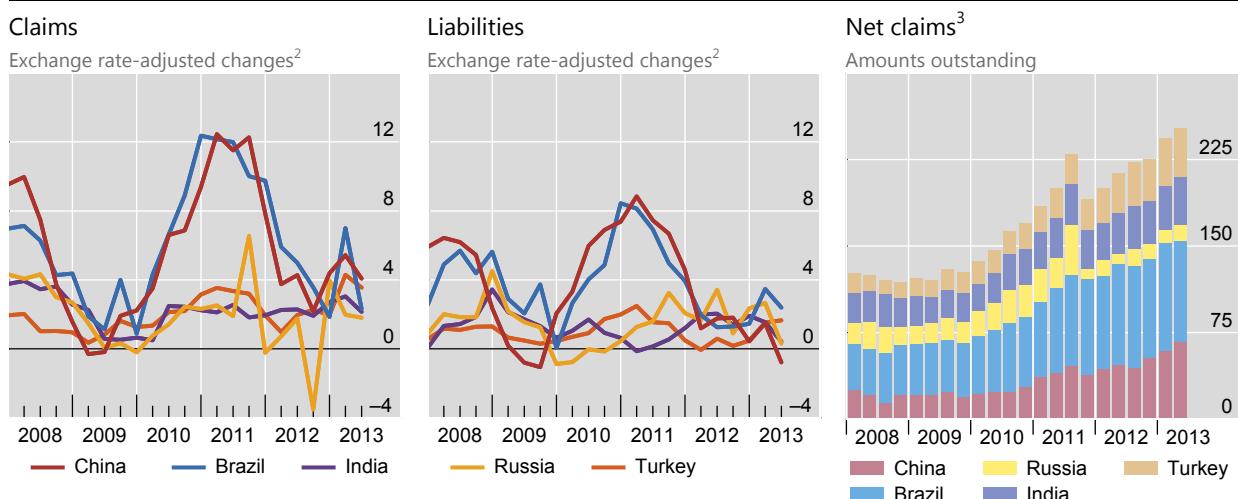
In emerging Asia, claims on India and Korea dropped by \$7.2 billion (3.3%) and \$6.3 billion (3.3%), respectively. In emerging Europe, cross-border claims on Russia fell by \$8.0 billion (4.2%). Those on Poland and the Ukraine contracted by \$2.6 billion (2.2%) and \$1.8 billion (11%), respectively. In Africa and the Middle East, claims on Qatar and South-Africa fell by significant amounts (\$4.6 billion (8.9%) and \$3.5 billion (9.0%), respectively).

On the other hand, cross-border bank credit to China, the largest among the emerging markets, continued to grow, albeit at a slower pace than in the first quarter. In the second, banks lent an additional \$54 billion (8.1%), mainly to banks and related offices (up \$35 billion or 7.8%). China alone now accounts for 21% of the stock of cross-border claims on emerging market borrowers, up from 8% at

### Local claims and liabilities of BIS reporting banks in selected emerging market economies<sup>1</sup>

In billions of US dollars

Graph 3



<sup>1</sup> In local currency terms. <sup>2</sup> Four-quarter moving averages. <sup>3</sup> Local claims minus local liabilities.

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

end-2007. Indeed, BIS reporting banks' cross-border claims on China are larger than those on all but eight countries worldwide.<sup>7</sup>

Another country that recorded inflows in the second quarter was Turkey, where an increase in claims on banks and related offices more than offset a decline in claims on non-bank borrowers, resulting in a \$4.6 billion (2.5%) overall rise. Cross-border claims on Saudi Arabia, Gabon, Morocco, Kuwait and Angola also increased, by a combined \$8.4 billion.

In many economies, the decline in cross-border credit was offset by high claims of foreign banks' local offices. Although the dollar value of locally booked claims in many economies fell in the second quarter, they actually increased in local currency terms as the local currency depreciated against the US dollar. Overall, when corrected for these exchange rate effects, the four-quarter moving average of credit provided by BIS reporting banks' local offices continued to expand for major emerging market economies (Graph 3, left-hand panel). This expansion largely surpassed that of the local liabilities reported by these banks (Graph 3, centre panel).

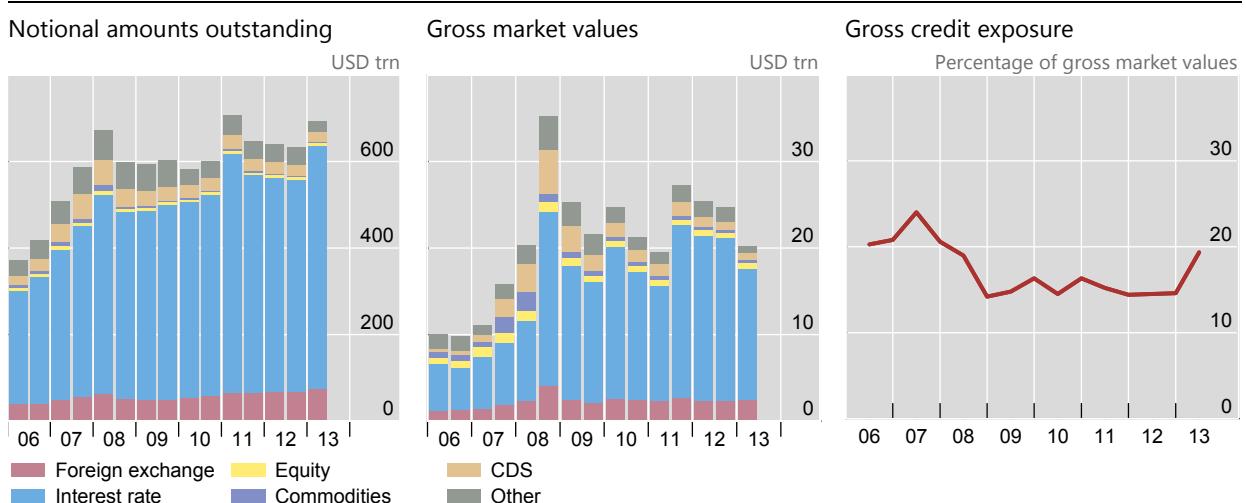
## The OTC derivatives market in the first half of 2013

The latest BIS statistics on global OTC derivatives markets show that notional amounts outstanding totalled \$693 trillion at end-June 2013, 10% more than at end-December 2012 (Graph 4, left-hand panel). Of this total, \$668 trillion was reported by dealers in the 13 countries that participate in the BIS's semiannual

### Global OTC derivatives

By data type and market risk category

Graph 4



Source: BIS OTC derivatives statistics.

<sup>7</sup> Based on the locational banking statistics by residence, the eight largest borrowing countries are: the United States, the United Kingdom, France, Germany, the Cayman Islands, the Netherlands, Luxembourg and Japan.

survey, and \$25 trillion by dealers in the 34 countries that participate only in the Triennial Survey.<sup>8</sup>

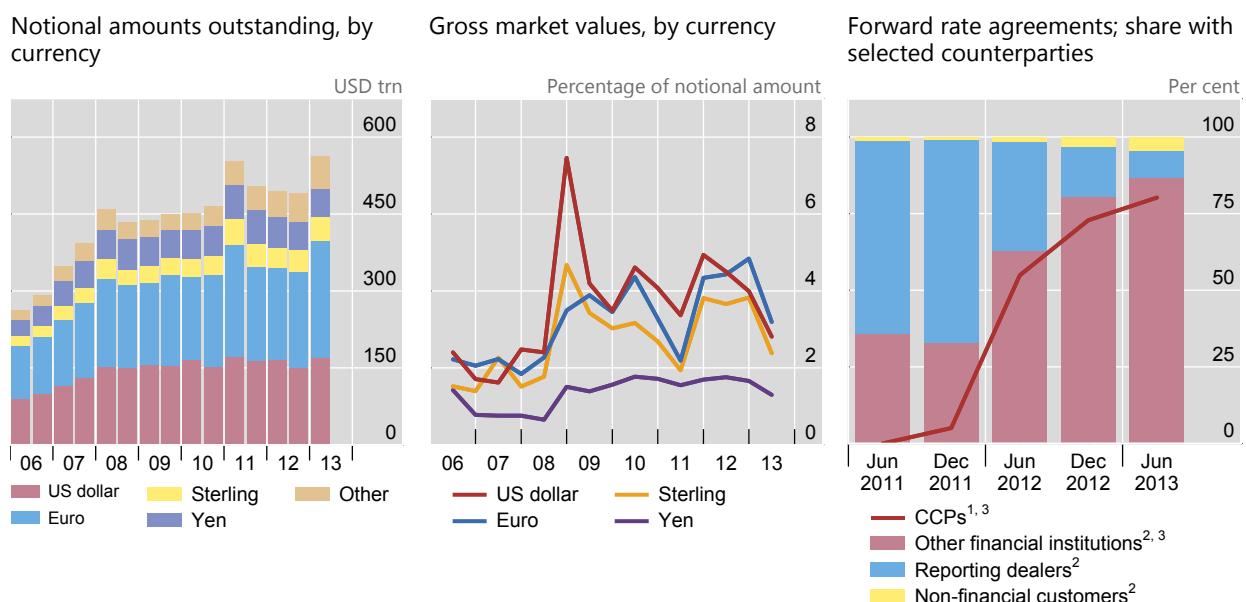
Despite the increase in outstanding amounts, the gross market value of all contracts, which measures the cost of replacing existing contracts at end-June market prices, dropped by 19% to \$20 trillion (Graph 4, centre panel). Gross credit exposures, which capture reporting dealers' exposure after taking account of legally enforceable netting agreements and thus provide a measure of counterparty risk in the OTC derivatives market, jumped 8% to \$3.9 trillion, or 20% of gross market values. This is almost on a par with the end-2007 level (Graph 4, right-hand panel).

Growth in notional amounts outstanding was dominated by developments in interest rate and FX derivatives. The amounts outstanding of interest rate derivatives grew 15% to a new high of \$561 trillion at mid-2013 (Graph 5, left-hand panel). Notional amounts outstanding of FX derivatives rose by almost 9% in the first half of 2013 to \$73 trillion at end-June 2013. The increase in outstanding interest rate derivatives was driven by swaps (15%) and forward rate agreements (FRAs) (21%). The growth in FX derivatives was due mainly to a notable increase in options.

Despite the growth in notional amounts, the market value of interest rate derivatives dropped by almost 20%, driven by notable declines in the replacement values of swaps denominated in US dollars, euros and sterling (Graph 5, centre panel). Swap rates in these currencies increased sharply during the first half of 2013, bringing them closer to the level that prevailed at the inception of many longer-dated swaps.

## Interest rate derivatives

Graph 5



<sup>1</sup> Share of notional amounts reported to the Global Trade Repository that are with central counterparties (CCPs). <sup>2</sup> Share of notional amounts reported to the BIS. <sup>3</sup> Not adjusted for the doubling of contract volumes when bilateral positions are moved to CCPs.

Sources: BIS OTC derivatives statistics; DTCC; TriOptima.

<sup>8</sup> In the semiannual survey the latter is shown as the unallocated part of the total outstanding. The unallocated portion dropped from 7% in December 2012, where it was based on the 2010 Triennial Survey, to 4% in June 2013, where it was updated to reflect the 2013 Triennial Survey. See [www.bis.org/publ/otc\\_hy1311.htm](http://www.bis.org/publ/otc_hy1311.htm).

## Who is issuing international bonds denominated in emerging market currencies?

*Branimir Gruić and Philip Wooldridge*

In recent quarters investor demand for higher-yielding assets has supported robust issuance of international debt securities denominated in emerging market (EM) currencies.<sup>①</sup> In January–September 2013, gross issuance of such securities totalled \$107 billion, down slightly from \$115 billion during the same period in 2012. On a net basis, ie after adjusting for repayments, issuance in January–September 2013 was concentrated in the Brazilian real, Chinese renminbi and Mexican peso. While increased volatility in global financial markets in mid-2013 contributed to a slowdown in the issuance of EM currency-denominated international debt securities in the third quarter, new placements remained well above the lows seen in 2008–10 (Graph C, left-hand panel).

Recent international issuance in EM currencies was boosted by EM companies, especially their affiliates based abroad. The BIS international debt securities statistics capture issuance outside the market where the borrower resides – offshore issuance – regardless of the currency.<sup>②</sup> Borrowers resident in an emerging market who issue offshore in their domestic currency have accounted for only a small share of EM currency-denominated issuance in international markets: 18% in 2013, equal to the average for the 2003–12 period (Graph C, left-hand panel). But if the nationality of issuers is considered, then there has been a marked change in the importance of EM borrowers. Companies headquartered in an emerging market but residing outside that market – shown in the left-hand panel of Graph C as EM nationals issuing in an EM currency as a foreign currency – accounted for 35% of gross international issuance of EM currencies in 2013. This compares to 25% in 2011–12 and only 11% prior to 2011.

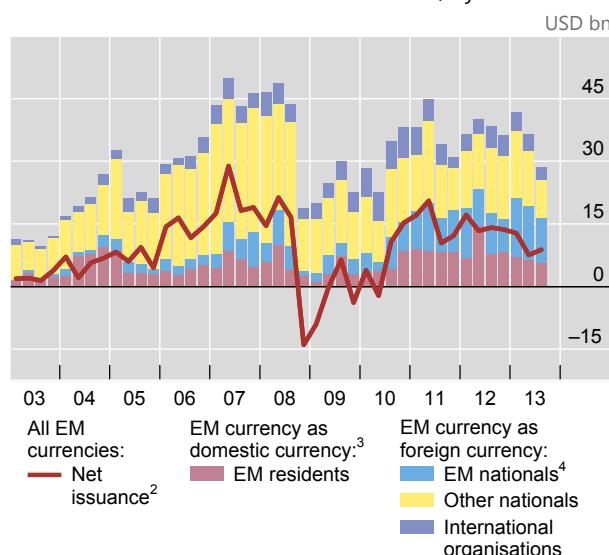
In recent years, Asian firms were the most active EM issuers of international debt securities denominated in EM currencies, followed by Latin American firms. Whereas Brazilian and Mexican firms issuing real- or peso-denominated bonds internationally tend to issue through their head offices, Chinese, Korean and Russian firms often issue through affiliates abroad, including ones based in offshore financial centres.<sup>③</sup> To the extent that the parent

### International debt securities denominated in emerging market currencies<sup>1</sup>

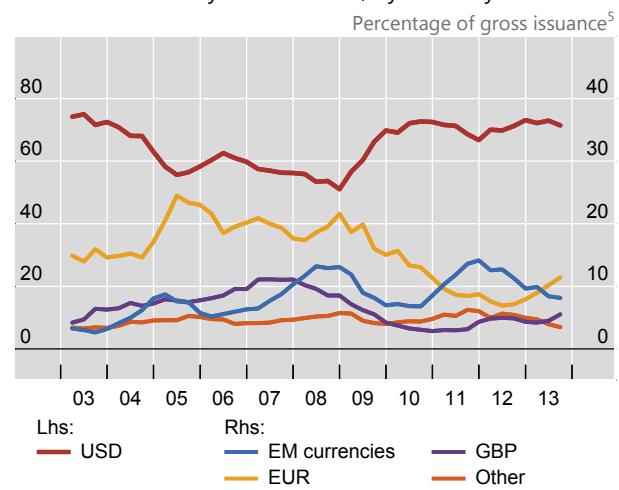
Quarterly gross issuance

Graph C

#### Securities denominated in EM currencies, by borrower



#### Securities issued by EM nationals, by currency



<sup>1</sup> EM currencies are defined in footnote ①. <sup>2</sup> Gross issuance minus repayments. <sup>3</sup> "Domestic currency" refers to international issues denominated in the currency of the country where the borrower resides. <sup>4</sup> "EM nationals" refers to foreign affiliates of borrowers headquartered in an emerging market economy. <sup>5</sup> Four-quarter moving average.

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

company stands ready to offer financial support to its affiliates abroad, analysing borrowing through the lens of nationality rather than residence can provide additional insights about a country's vulnerability to volatility in global financial markets.

The increased presence of EM borrowers suggests that the international market for emerging market debt is opening to a wider diversity of borrowers. Historically, international issuance of bonds denominated in EM currencies was dominated by borrowers of high credit quality; international investors tended to prefer to separate the currency risk associated with EM-denominated issues from the credit risk associated with EM borrowers. While borrowers headquartered in advanced economies – “Other nationals” in the left-hand panel of Graph C – remain the most active issuers of international securities denominated in EM currencies, in recent years their share has fallen well below the 55% level of the 2000s, to 38% in 2012 and 36% in 2013. International organisations typically accounted for a further 12%.

The perceived improvement in the credit standing of many EM economies in recent years helps to support investor demand for EM currency-denominated bonds issued by EM companies. Such issuance in turn helps EM companies to reduce currency mismatches in their assets and liabilities.

That said, the US dollar continues to account for the bulk of their international issuance by a large margin. The US dollar's share of new placements by EM nationals has averaged 71% since 2010, well above the 61% share seen in 2003–09 (Graph C, right-hand panel). By comparison, EM currencies have accounted for between 6% and 17% of international issuance by EM-headquartered borrowers since 2010. The euro accounted for about 19% of gross issuance by EM nationals prior to 2009, but its share has since fallen to less than 10%. The euro's share of issuance by borrowers headquartered in central and eastern Europe is higher than that of issuance by borrowers from other regions. Yet even in Europe the US dollar is the currency of choice; since 2009 the US dollar's share of their international issuance has averaged 65%.

① For the purpose of this box, EM currencies are defined as any currency other than the following 11: Australian dollar, Canadian dollar, Danish krone, euro (including legacy currencies), Japanese yen, Norwegian krone, New Zealand dollar, Swedish krona, Swiss franc, pound sterling and US dollar. As of end-September 2013, this definition produced a total of 76 currencies denominating one or more issues in the BIS international debt securities statistics. ② The BIS classifies a debt security as international if any one of the following characteristics is different from the country of residence of the issuer: country where the security is registered, law governing the issue, or market where the issue is listed. See “Enhancements to the BIS debt securities statistics”, *BIS Quarterly Review*, December 2012, pp 63–76. ③ For an explanation of why some borrowers issue through offshore affiliates, see “Emerging market debt securities issuance in offshore centres”, *BIS Quarterly Review*, September 2013, pp 22–3.

A decline in the volume of inter-dealer positions was more than offset by larger positions with other financial counterparties. This was especially the case in the FRA market, where only 10% of all outstanding trades are between reporting dealers (Graph 5, right-hand panel). In part, this reflects the increasing share of contracts that are cleared centrally. When contracts are cleared through central counterparties (CCPs), contract volumes reported to the BIS increase because one contract becomes two (Graph 5, right-hand panel).<sup>9</sup> Due to the impact of central clearing, as well as a substantial expansion of the reporting coverage in one country, FRA

<sup>9</sup> A central counterparty is an entity that interposes itself between counterparties to contracts traded in one or more financial markets, becoming the buyer to every seller and the seller to every buyer. When a derivatives contract between two reporting dealers is cleared by a CCP, this contract is replaced, in an operation called novation, by two new contracts: one between counterparty A and the CCP, and a second between the CCP and counterparty B. As the BIS data record all outstanding positions, they would capture both the contracts in this example. This measure of the market size, ie a measure that captures all outstanding contracts, may be appropriate for gauging counterparty risk, given that any outstanding contract could potentially be defaulted on. However, this approach overstates the size of the derivatives market if used to proxy other aspects, such as the transfer of underlying risks, for which a single counting of the centrally cleared contracts would be more appropriate.

market values outstanding jumped from \$47 billion at end-2012 to \$168 billion at mid-2013.

## Credit default swaps (CDS)

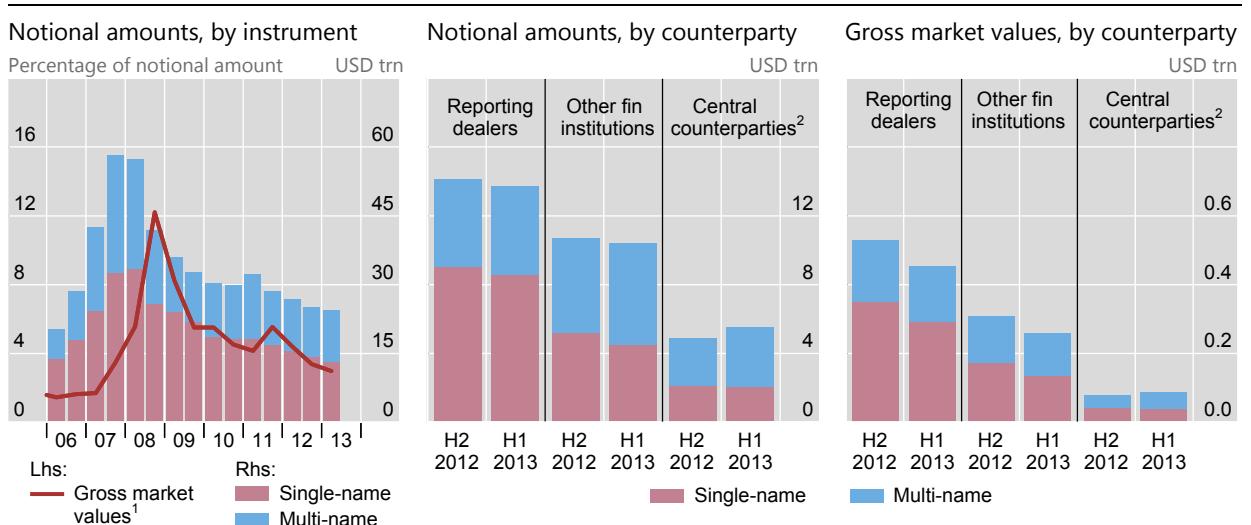
Outstanding contract volumes in the CDS market continued their gradual decline, contracting to \$24 trillion at the end of June 2013 (Graph 6, left-hand panel). The fall in volumes in the first half of the year reflected a combination of compression of outstanding contracts and fewer new ones.

The drop in notional amounts outstanding was driven by lower positions in single-name contracts (-8%). In contrast, contracts referencing multiple names picked up for the first time since end-June 2011, increasing by 4% to \$11 billion. Of these, index products grew slightly faster, at 5%. Outstanding credit protection on sovereigns grew by 10% compared to end-2012. In contrast, protection outstanding on securitised products relating to mortgage- and other asset-backed securities fell by 21%.

Gross market values for CDS continued to fall, by 14%, to \$725 billion, the lowest since June 2007 (Graph 6, left-hand panel). This development was led by single-name contracts (-18%). Market values of multi-name contracts also declined, but by only 8%. Trades between reporting dealers continued to account for slightly more than half of outstanding contracts and other financial institutions for most of the rest with 43% (Graph 6, centre panel). The share of CDS cleared centrally with CCPs remained low at only 8% for single-name contracts and 18% for multi-name contracts.<sup>10</sup>

Credit default swaps

Graph 6



<sup>1</sup> As a percentage of the notional amount outstanding. <sup>2</sup> Included as part of "Other financial institutions".

Source: BIS OTC derivatives statistics.

<sup>10</sup> Original trades adjusted for double counting, since a single contract initially agreed between two CCP members is replaced by two separate contracts, between the CCP and each of the counterparties.

## Currency trading gets more financial

*Robert N McCauley and Michela Scatigna*

The Triennial Central Bank Survey in both 2007 and 2010 suggested that foreign exchange turnover in relation to a country's underlying trade grows with national income.<sup>①</sup> In particular, as income per capita rises, currency turnover as a ratio of current account transactions of the home country rises from one to 10 times to a hundred or more (Graph D, left-hand and centre panels). In effect, with higher income, currencies become less connected to the real economy and more related to the financial economy. Estimated separately on the 2007 and 2010 data, the curvilinear regression lines ("Kuznets curves") were remarkably similar. As economies develop and GDP per capita rises, this ratio rises and the balance shifts from trade-related to financial transactions in a very predictable fashion.

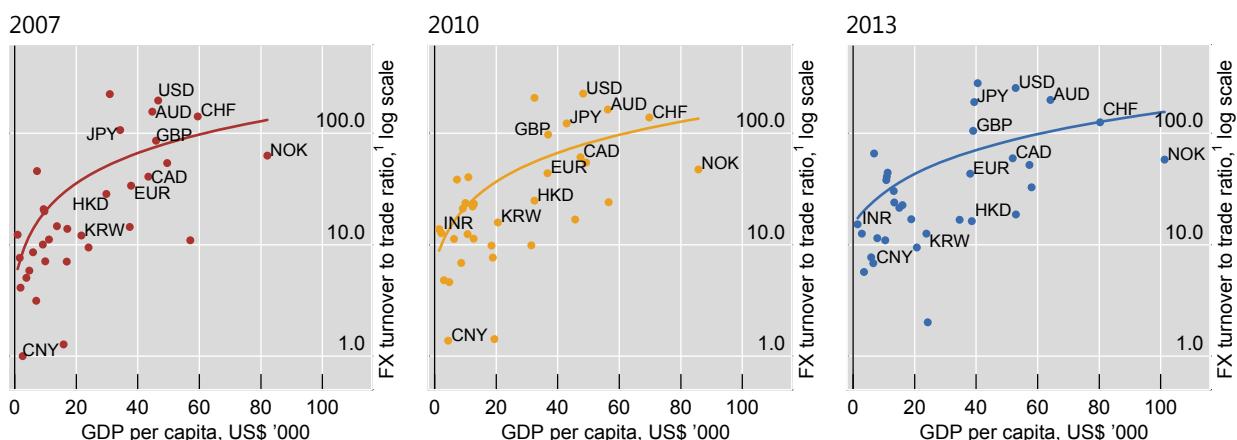
The 2013 data again show the same relationship between national income and the balance between trade-related and financial transactions (Graph D, right-hand panel). Statistical tests do not support the hypothesis that the relationship has changed over time.

In terms of goodness of fit, the relationship is quite tight. In 2013, burgeoning renminbi trading strengthened an already strong relationship, while the blip in yen turnover temporarily weakened it (see "The anatomy of the global FX market through the lens of the 2013 Triennial Survey" in this issue). Taking the three years' observations together, the simple curvilinear model accounts for two fifths of the variance.

<sup>①</sup> Robert N McCauley and Michela Scatigna, "Foreign exchange trading in emerging currencies: more financial, more offshore", *BIS Quarterly Review*, March 2011, pp 67–75.

Ratio of foreign exchange turnover to trade and GDP per capita

Graph D



<sup>1</sup> Foreign exchange turnover includes not only over-the-counter but also exchange-traded turnover, which is most significant for the Brazilian real, the Indian rupee and the Korean won. The estimated relationship, common to the whole sample (2007–13), is:  $y = 0.492 (5.621) + 0.029 (5.275) \times -1.96E-07 (-2.754) \times x$ ; Adj R<sup>2</sup> = 0.41, total number of observations = 99. With  $y = \log (\text{FX turnover}/\text{trade})$  and  $x = \text{GDP per capita}$ ; t-statistics in parentheses.

Sources: IMF; FOW TRADEdata; Futures Industry Association; Triennial Central Bank Survey of Foreign Exchange and Derivatives Market Activity; authors' estimates.

## The anatomy of the global FX market through the lens of the 2013 Triennial Survey<sup>1</sup>

*Trading in the FX market reached an all-time high of \$5.3 trillion per day in April 2013, a 35% increase relative to 2010. Non-dealer financial institutions, including smaller banks, institutional investors and hedge funds, have grown into the largest and most active counterparty segment. The once clear-cut divide between inter-dealer and customer trading is gone. Technological change has increased the connectivity of participants, bringing down search costs. A new form of "hot potato" trading has emerged where dealers no longer play an exclusive role.*

*JEL classification:* F31, G12, G15, C42, C82.

This article explores the anatomy of the global foreign exchange (FX) market, drawing on the 2013 Triennial Central Bank Survey of Foreign Exchange and Derivatives Market Activity (in short, "the Triennial"). The Triennial covers 53 countries and represents the most comprehensive effort to collect detailed and globally consistent information on FX trading activity and market structure.<sup>2</sup>

Global FX turnover climbed to \$5.3 trillion per day in 2013 from \$4.0 trillion in 2010 (Graph 1, left-hand panel). This 35% rise outpaced the 20% rise from 2007 to 2010, but falls short of the strong increase in the pre-crisis period 2004–07.

We study the structural drivers and trends behind the growing FX volumes. New counterparty information collected in the 2013 Triennial provides a much more detailed picture than before of the trading patterns of non-dealer financial institutions (such as lower-tier banks, institutional investors and hedge funds) and

<sup>1</sup> The authors would like to thank Claudio Borio, Stephen Cecchetti, Alain Chaboud, Richard Clarida, Dietrich Domanski, Jacob Gyntelberg, Michael King, Colin Lambert, Michael Melvin, Lukas Menkhoff, Michael Moore, Richard Olsen, Richard Payne, Lucio Sarno, Elvira Sojli, Christian Upper, Clara Vega, Philip Wooldridge and seminar participants at the Central Bank of Norway for useful comments and suggestions. We greatly appreciate the feedback and insightful discussion with numerous market participants at major FX dealing banks, buy-side institutions and electronic trading platforms. We are particularly grateful to Denis Pêtre for compiling the data and Anamaria Illes for excellent research assistance. The views expressed are those of the authors and do not necessarily reflect those of the BIS or the Central Bank of Norway.

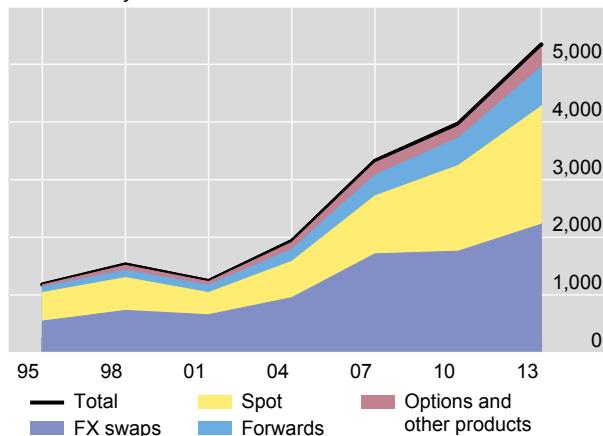
<sup>2</sup> Due to the decentralised structure of the FX market, where deals take place over the counter (OTC) and where liquidity is fragmented across different venues, the market is rather opaque and quantitative information on market activity quite sparse.

## Global FX market turnover<sup>1</sup>

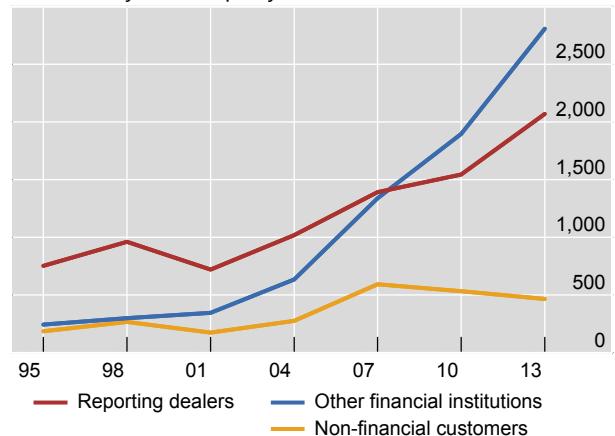
Net-net basis,<sup>1</sup> daily averages in April, in billions of US dollars

Graph 1

Turnover by instrument



Turnover by counterparty



<sup>1</sup> Adjusted for local and cross-border inter-dealer double-counting.

Sources: Triennial Central Bank Survey; BIS calculations.

their contribution to turnover. Improved data on execution methods further enable us to give a better description of the current state of market structure.

Non-dealer financial institutions were the major drivers of FX turnover growth over the past three years, confirming the trend in prior surveys (Graph 1, right-hand panel). The inter-dealer market, by contrast, has grown more slowly, and the trading volume of non-financials (mostly corporates) has actually contracted. These trends are most visible in the main FX trading centres, London and New York, where close to two thirds of all deals involved non-dealer financial counterparties.

The climb in FX turnover between 2010 and 2013 appears to have been mostly a by-product of the increasing diversification of international asset portfolios rather than a rise in interest in FX as an asset class in its own right.<sup>3</sup> With yields in advanced economies at record lows, investors increasingly diversified into riskier assets such as international equities or local currency emerging market bonds. By contrast, returns on currency carry trades (narrowly defined) and other quantitative FX investment strategies were quite unattractive in the run-up to the 2013 survey, suggesting that they were unlikely to have been significant drivers of turnover.

The FX market has become less dealer-centric, to the point where there is no longer a distinct inter-dealer-only market. A key driver has been the proliferation of prime brokerage (see glossary at the end of the article), allowing smaller banks, hedge funds and other players to participate more actively. The evolving market structure accommodates a larger diversity, from high-frequency traders, using computers to implement trading strategies at the millisecond frequency, to the private individual (retail) FX investor. Trading costs have continued to drop, thus attracting new participants and making more strategies profitable. This trend

<sup>3</sup> Over the last 10–15 years, market participants have increasingly recognised FX as a separate asset class. This is reflected in the number of products offered by major banks to institutional and retail investors (Secmen (2012), Pojarliev and Levich (2012)).

started with the major currencies, and more recently reached previously less liquid currencies, especially emerging market currencies.

Today's market structure involves a more active participation of non-dealer financial institutions in the trading process. Trading activity remains fragmented, but aggregator platforms allow end users and dealers to connect to a variety of trading venues and counterparties of their choice. With more counterparties connected to each other, search costs have decreased and the velocity of trading has increased. The traditional market structure based on dealer-customer relationships has given way to a trading network topology where both banks and non-banks act as liquidity providers. This is effectively a form of "hot potato" trading, but where dealers are no longer necessarily at the centre.<sup>4</sup>

In the next section, we start with a bird's eye view of the main facts to shed light on FX turnover growth since 2010. We then put the trading patterns of financial counterparties and recent changes in market structure under the microscope. Finally, we explore underlying drivers of FX trading volumes between 2010 and 2013 in greater detail.

## FX turnover growth: a look at the main facts

Trading in currency markets is increasingly dominated by financial institutions outside the dealer community ("other financial institutions" in the survey terminology). Transactions with non-dealer financial counterparties grew by 48% to \$2.8 trillion per day in 2013, up from \$1.9 trillion in 2010, and accounted for roughly two thirds of the rise in the total (Table 1). These non-dealer financial institutions are very heterogeneous in their trading motives, patterns and horizons. They include lower-tier banks, institutional investors (eg pension funds and mutual funds), hedge funds, high-frequency trading (HFT) firms and official sector financial institutions (eg central banks or sovereign wealth funds).

Non-financial customers – mostly comprising corporations, but also governments and high net worth individuals – accounted for only 9% of turnover, the lowest level since the inception of the Triennial in 1989. Reasons for their shrinkage include the sluggish recovery from the crisis, low cross-border merger and acquisition activity and reduced hedging needs, as major currency pairs mostly traded in a narrow range over the past three years. Another key factor is more sophisticated management of FX exposures by multinational companies. Firms are increasingly centralising their corporate treasury function, which allows hedging costs to be reduced by netting positions internally.

The declining importance of inter-dealer trading is the flip side of the growing role of non-dealer financial institutions (Table 1). The inter-dealer share is now down to only 39%, much lower than the 63% in the late 1990s. The primary reason is that major dealing banks net more trades internally. Due to higher industry concentration, top-tier dealers are able to match more customer trades directly on their own books. This reduces the need to offload inventory imbalances and hedge risk via the traditional inter-dealer market.

<sup>4</sup> The term "hot potato trading" was coined by Lyons (1997) and described the passing of currency inventory imbalances (due to an exogenous shift in the demand and supply of currencies) around the inter-dealer market.

## Dissecting the increase in global FX turnover

Net-net basis,<sup>1</sup> daily averages in April

Table 1

	Turnover in 2013 (USD bn)	Absolute change from 2010 (USD bn)	Growth since 2010 (%)	Contribution to FX market growth <sup>2</sup> (%)
Global FX market	5,345	1,373	35	100
<b>By counterparty</b>				
Reporting dealers	2,070	526	34	38
Other financial institutions	2,809	914	48	67
Non-financial customers	465	-66	-12	-5
<b>By instrument</b>				
Spot	2,046	558	38	41
Forwards	680	205	43	15
FX swaps	2,228	469	27	34
FX options	337	130	63	9
Currency swaps	54	11	26	1

<sup>1</sup> Adjusted for local and cross-border inter-dealer double-counting. <sup>2</sup> Percentage contribution to the total increase of \$1,373 billion from 2010 to 2013.

Sources: Triennial Central Bank Survey; BIS calculations.

Trading activity since 2010 has risen fairly evenly across instruments (Graph 1, left-hand panel, and Table 1). That said, spot was the largest contributor to turnover growth, accounting for 41% of the turnover rise. At \$2.05 trillion per day, spot trading almost reached the same volume as FX swaps (\$2.23 trillion).<sup>5</sup> Turnover in FX OTC derivatives such as forwards (up 43%) and FX options (up 63%) also grew strongly, albeit from a lower base.<sup>6</sup>

## Trading by non-dealer financials under the microscope

Non-dealer financial institutions have become the most active participants in currency markets. Who exactly are these players? What do they trade and why do they trade FX? With the new and more granular description of the group of non-dealer financial counterparties in the 2013 Triennial, we can now shed light on these important (yet hitherto unanswered) questions.

<sup>5</sup> To put these numbers into perspective, it is useful to compare these figures with those of other main asset classes. Total trading volume in all equity markets around the world, for instance, reached roughly \$300 billion per day in April this year, about 25% of the global FX spot volumes of non-dealer financial institutions.

<sup>6</sup> The surge in options reflects the period of intense yen trading in April 2013 (see below): almost half of the options traded that month were linked to JPY/USD. At the time, hedge funds expressed their directional views via the options market, where they accounted for 24% of turnover.

## Who are the key non-dealer financials and what do they trade?

A significant fraction of dealers' transactions with non-dealer financial customers is with lower-tier banks. While these "non-reporting banks" tend to trade smaller amounts and/or only sporadically, in aggregate they account for roughly one quarter of global FX volumes (Table 2). Smaller banks do not engage in market-making, but mostly serve as clients of the large FX dealing banks. As they find it hard to rival dealers in offering competitive quotes in major currencies, they concentrate on niche business and mostly exploit their competitive edge vis-à-vis local clients.<sup>7</sup> Like dealers, they extensively trade short-tenor FX swaps (less than one week), which are commonly used for short-term liquidity management.

The most significant non-bank FX market participants are professional asset management firms, captured under the two labels "institutional investors" (eg mutual funds, pension funds and insurance companies) and "hedge funds". The two groups each accounted for about 11% of turnover (Table 2).

Institutional investors differ from hedge funds not only in terms of their investment styles, horizons and primary trade motives, but also the mix of instruments they trade. These counterparties – also often labelled "real money investors" – frequently transact in FX markets, as a by-product of rebalancing

### Turnover driven by non-dealer financial counterparties (percentage shares)

Net-net basis,<sup>1</sup> daily averages in April 2013

Table 2

	Other financial institutions	Other financial institutions (disaggregated)				
		Non-reporting banks	Institutional investors	Hedge funds <sup>2</sup>	Official sector	Others
Total	53	24	11	11	1	6
By location:						
United Kingdom and United States	63	26	14	16	1	7
Asian centres <sup>3</sup>	26	14	6	1	1	2
Next five centres <sup>4</sup>	43	23	8	3	1	7
Others	34	23	6	1	1	3
By instrument:						
Spot	58	25	13	14	1	6
Forwards	59	14	19	17	1	8
FX swaps	45	27	7	5	1	5
FX options	61	19	16	21	0	6

<sup>1</sup> Adjusted for local and cross-border inter-dealer double-counting. <sup>2</sup> This counterparty segment also includes proprietary trading firms specialised in high-frequency trading. <sup>3</sup> Hong Kong SAR, Japan and Singapore. <sup>4</sup> Australia, France, Germany, the Netherlands and Switzerland.

Sources: Triennial Central Bank Survey; BIS calculations.

<sup>7</sup> While the 2013 Triennial is the first to collect information on lower-tier banks, stable numbers of reporting dealers suggest that it is unlikely that such trades were previously reported as inter-dealer trades. According to market sources, lower-tier banks have become more active in the FX market in recent years. A recent trend for these banks is to source liquidity from top-tier dealers and to effectively "resell" it (often referred to as "white-labelling") to smaller, local clients, who are less attractive to top dealers.

portfolios of core assets, such as international bonds and equities. They were behind a large fraction (19%) of trading volumes in forward contracts (Table 2), which they primarily use to hedge international bond (and to a lesser extent equity) portfolios. The management of currency exposure is often passive, requiring only a periodic resetting of the hedges, but can also take a more active form, resembling strategies of hedge funds.<sup>8</sup>

Hedge funds are especially active in options markets, accounting for 21% of the options volume (Table 2). Options provide them with a convenient way to take leveraged positions to express their directional views on exchange rate movements and volatility. Some of the more actively trading hedge funds and proprietary trading firms also specialise in algorithmic and high-frequency strategies in spot markets. Hedge funds were behind significant volumes in both spot and forwards, accounting for 14% and 17% of total volumes, respectively.

FX trading by official sector financial institutions, such as central banks and sovereign wealth funds, contributed only marginally (less than 1% according to the most recent Triennial data) to global FX market turnover. This small share notwithstanding, these institutions can have a strong impact on prices when they are in the market.

## Non-dealer financials and the geography of FX trading

The trading of non-dealer financials such as institutional investors and hedge funds is concentrated in a few locations, in particular London and New York, where major dealers have their main FX desks (Table 2). With a share of over 60% of global turnover, these two locations are the centre of gravity of the market. Dealers' trading with non-dealer financial customers exceeds that with non-financial clients by a factor greater than 10 in these centres (Graph 2, centre panel), much higher than in other key FX trading locations, eg Singapore, Tokyo and Hong Kong SAR. Investors seeking best trade execution often prefer to trade via sales and trading desks (see glossary) in London or New York (even though these investors may have their head office in other time zones). This is because liquidity in currency markets is typically highest at the London open and in the overlapping hours of London and New York.

Prime brokerage has been a crucial driver of the concentration of trading, as such arrangements are typically offered via major investment banks in London or New York (Graph 2, right-hand panel). Through a prime brokerage relationship with a dealer, non-dealer financials gain access to institutional platforms (such as Reuters Matching, EBS or other electronic communications networks (ECNs)) and can trade anonymously with dealers and other counterparties in the prime broker's name. Prime-brokered trades accounted for 23% of total FX volume in the United Kingdom and the United States, against an average of 6% in Asian and other FX trading locations. In spot, the share of prime-brokered trades by US and UK dealers was even higher, at 38% (Graph 2, right-hand panel). The rise in electronic and algorithmic trading also contributed significantly to the concentration in centres. For certain types of algorithmic trading, speed advantages at the millisecond level

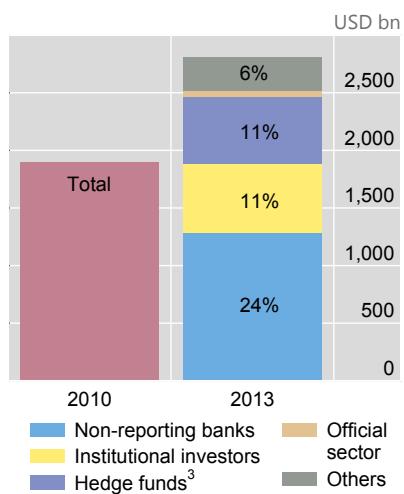
<sup>8</sup> Management of the FX component of asset portfolios is often delegated to overlay managers (see eg Pojarliev and Levich (2012)). Some of the FX management can be passive and simply targeted towards removing currency risk exposure. Under more active mandates, the goal is to add extra return to the portfolio and to generate diversification benefits via currency investments.

## Trading of non-dealer financials and the geography of FX trading

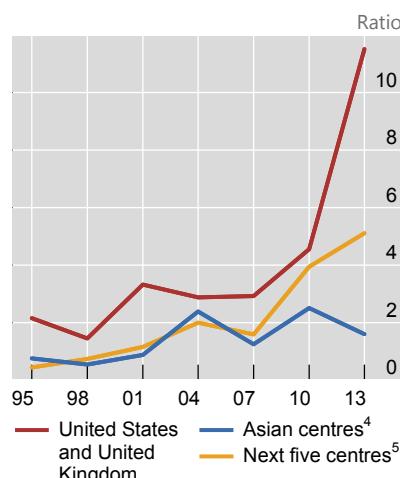
Net-net basis,<sup>1</sup> daily averages in April

Graph 2

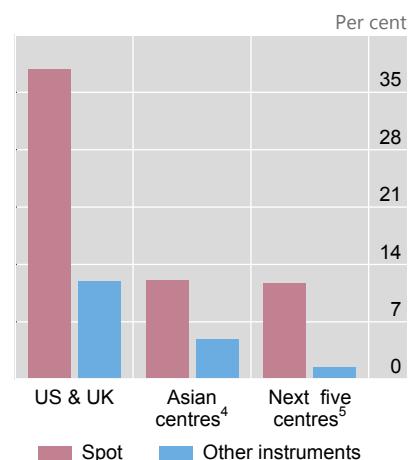
Turnover by other financial institutions<sup>2</sup>



Turnover by other financials relative to non-financials



Share of prime-brokered FX transactions



<sup>1</sup> Adjusted for local and cross-border inter-dealer double-counting. <sup>2</sup> Shares reported as of total FX turnover for 2013, eg the percentage share for institutional investors indicates that they were a counterparty in 11% of all FX deals in April 2013. <sup>3</sup> This counterparty segment also includes proprietary trading firms specialised in high-frequency trading. <sup>4</sup> Hong Kong SAR, Japan and Singapore. <sup>5</sup> Australia, France, Germany, the Netherlands and Switzerland.

Sources: Triennial Central Bank Survey; BIS calculations.

are critical. Such high-frequency trading requires co-location close to the main servers of electronic platforms typically in the vicinity of London and in New Jersey.

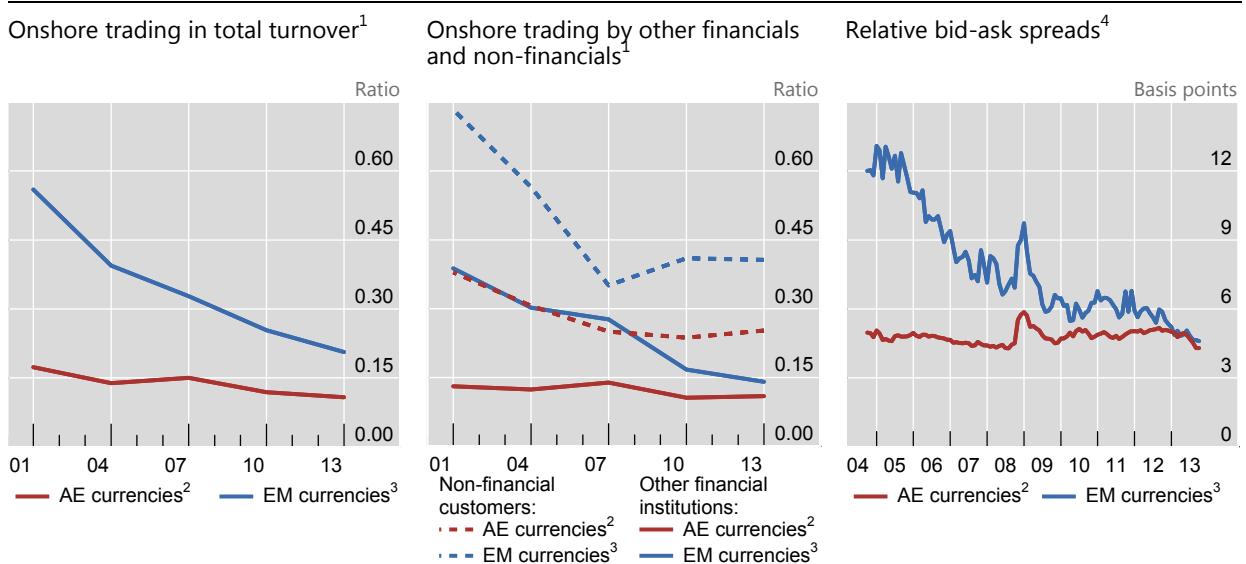
## Trading by financials and the rise of emerging market currencies

The trend towards more active FX trading by non-dealer financial institutions and a concentration in financial centres is particularly visible for emerging market (EM) currencies. A decade ago, EM currency trading mostly involved local counterparties on at least one side of the transaction (eg McCauley and Scatigna (2011)). Now, trading of EM currencies is increasingly conducted offshore (Graph 3, left-hand panel). It has especially been non-dealer financials (often trading out of financial centres) that have driven this internationalisation trend (Graph 3, centre panel).

The ease and costs of trading minor currencies have improved significantly in this process. Transaction costs in EM currencies, measured by bid-ask spreads, have steadily declined and converged to almost the levels for developed currencies (Graph 3, right-hand panel). As liquidity in EM currencies has improved, these markets have attracted the attention of international investors. Naturally, this has also boosted the share of key EM currencies in total global turnover, from 12% in 2007 to 17% in 2013. The strong growth is particularly visible in the case of the Mexican peso, whose market share now exceeds that of several well established advanced economy currencies. Another case is the renminbi, where most of the 250% growth is due to a surge in offshore trading. China set itself to promote more

## Currency internationalisation and trading costs

Graph 3



<sup>1</sup> Adjusted for local and cross-border inter-dealer double-counting, ie "net-net" basis; daily averages in April. <sup>2</sup> Advanced economy currencies: Australian dollar, Canadian dollar, Danish krone, euro (from 2004), Japanese yen, New Zealand dollar, Norwegian krone, Swedish krone, Swiss franc, pound sterling and US dollar. <sup>3</sup> Emerging market currencies: Brazilian real, Chinese renminbi (from 2007), New Taiwan dollar, Hong Kong dollar, Hungarian forint, Indian rupee, Korean won, Mexican peso, Polish zloty, Russian rouble, Singapore dollar, South African rand and Turkish lira. <sup>4</sup> Relative bid-ask spreads are expressed in basis points against the mid-quote; indicative quotes against the US dollar.

Sources: Triennial Central Bank Survey; Datastream, WM/Reuters; BIS calculations.

international use of its currency and introduced offshore renminbi (CNH) in 2010 (Ehlers and Packer (2013)).<sup>9</sup>

## The evolving market structure of FX trading

The growing participation of non-dealer financial institutions has been facilitated by the availability of alternative electronic platforms. The FX market of the 1990s was a two-tier market, with the inter-dealer market as clearly separate turf. This has changed. There is no distinct inter-dealer market any more, but a coexistence of various trading venues where also non-banks actively engage in market-making.

In today's market structure, electronic trading dominates. It is the preferred trading channel, with a share above 50% for all customer segments (Table 3), and is available for all instruments and investors across the globe. This market-wide presence, together with its slowing expansion, suggests that electronic trading has matured. Spot is the segment with by far the highest fraction of trades conducted electronically, at 64%.<sup>10</sup> Despite the prevalence of electronic trading, voice (via the

<sup>9</sup> Non-financial customers (still) play a larger role in renminbi trading than they do in other important EM currencies. They contributed about 19% to renminbi turnover in April 2013, whereas professional asset managers (institutional investors and hedge funds) accounted for only 9%.

<sup>10</sup> Due to the practical benefits from electronic execution, such as straight through processing, most of the voice trades are in fact eventually booked electronically. Some market reporters suggest that as much as 95% of all spot transactions could in fact be electronic.

## Execution method by counterparty in 2013 (percentage shares)<sup>1</sup>

Net-net basis, daily averages in April 2013

Table 3

	Voice			Electronic								<b>Total</b>	
	Direct <sup>2</sup>	Indirect <sup>3</sup>	<b>Total</b>	Direct <sup>2</sup>			Indirect <sup>3</sup>						
				Single-bank platforms <sup>4</sup>	Other <sup>5</sup>	Total	Reuters/E BS	Other ECNs <sup>6</sup>	Other	Total			
Reporting dealers	22	19	<b>41</b>	14	15	29	16	9	3	27	<b>56</b>		
Other financials	30	14	<b>43</b>	10	20	31	14	9	2	25	<b>55</b>		
Non-financials	37	4	<b>42</b>	18	10	28	3	9	12	24	<b>52</b>		

<sup>1</sup> Percentage shares of total FX volumes for each counterparty segment; totals do not sum to 100 due to incomplete reporting; adjusted for local and cross-border inter-dealer double-counting, ie "net-net" basis. <sup>2</sup> Refers to trades which are not matched via a third party. <sup>3</sup> Refers to deals matched via a third party – either a voice broker or an electronic broker. <sup>4</sup> Single-bank trading systems operated by a single dealer, eg BARX (Barclays), Autobahn (Deutsche Bank), Velocity (Citigroup). <sup>5</sup> Other electronic direct, eg Bloomberg Tradebook, Reuters Conversational or direct electronic price streams. <sup>6</sup> Electronic communication networks, eg Currenex, FXall, Hotspot.

Source: Triennial Central Bank Survey.

phone) and relationship trading remain sizeable in some segments (Table 3). The voice contact may, for instance, provide advice on alternative order execution strategies or ways to implement a trade idea. It may also help to avoid high-frequency traders as a counterparty, or to ensure execution in a busy market. Voice remains the preferred execution method for more complex FX derivatives such as options, where 62% of the deals were done by phone.

The emerging microstructure caters to the demands of a more diverse set of market participants. Non-financial institutions mostly prefer direct contact with their relationship bank, either via the phone or via a single-bank platform. Financial customers are less loyal to their dealer than non-financials and have more dispersed trading patterns (Table 3). They often trade either directly with dealers electronically (eg via Bloomberg Tradebook or direct electronic price streams), or indirectly via multi-bank platforms and electronic brokerage systems that were previously the exclusive venues of inter-dealer trading (EBS and Reuters Matching).

The shift away from a clearly delineated inter-dealer market is reflected in the execution methods data in the Triennial. On EBS and Reuters Matching, which used to be dealer-only electronic platforms, the absolute volume of dealers' trading with other financial customers is actually 17% larger than the volumes between dealers. There are two main reasons for this shift. First, as a response to competition from multi-bank platforms (eg FXall, Currenex or Hotspot), EBS and Reuters opened up to hedge funds and other customers via prime brokerage arrangements in 2004 and 2005, respectively. These platforms became active arenas for proprietary trading firms specialised in high-frequency trading. Second, due to increased concentration of FX flows in a handful of major banks, top-tier banks have been able to net more flows internally. By internalising trades, they can benefit from the bid-ask spread without taking much risk, as offsetting customer flows come in almost continuously.

As these banks have effectively become deep liquidity pools, their need to manage inventory via traditional inter-dealer venues is much reduced.

The trend towards flow internalisation left its traces in the data. Traditional inter-dealer venues (EBS and Reuters Matching) have seen their market share shrink.<sup>11</sup> Three years ago, dealers conducted 22% of their trades with other dealers via these venues. This is now down to 16%. The flip side is that dealers try to attract flows to their single-bank platforms to benefit further from internalisation. The share of dealer volume on single-bank platforms went up from 8% in 2010 to 14% in 2013.

## Underlying drivers of FX trading volumes

Why has FX turnover grown strongly over the past three years to exceed \$5 trillion in April this year? We now explore possible factors behind the rise in FX trading volumes in more detail, from both a macro and a micro perspective.

When interpreting the 2013 Triennial, it is necessary to bear in mind that the survey month was probably the most active period of FX trading ever recorded. The monetary policy regime shift by the Bank of Japan in early April triggered a phase of exceptionally high turnover across asset classes. In the months that followed, the rise in yen trading partly reversed (Bech and Sobrun (2013)). Without this effect, however, FX turnover would probably still have grown by about 25%.<sup>12</sup> Hence, we need to look beyond this scenario for reasons behind the growth in FX volumes.

To gain a better understanding of the drivers in FX volumes between 2010 and 2013, it is important to take a closer look at the trading motives of non-dealer financials, which have grown into the most dominant players. One possibility is that FX turnover rose due to growing interest in FX as a separate asset class; another is that trading volumes in currency markets grew as a by-product of international portfolio investments in other asset classes. It is also relevant to elicit the implications of the evolving market structure, characterised by an increased participation of non-dealer financial institutions, greater diversity and lower search costs.

## FX as an asset class vs international portfolio diversification

Market participants generally regard FX as an asset class in its own right. To exploit profit opportunities, currency hedge funds and overlay managers (see glossary), for instance, frequently pursue quantitative strategies that involve the simultaneous purchase and sale of multiple currencies (eg Menkhoff et al (2012)). The most popular and best known is the carry trade, which seeks to exploit interest rate

<sup>11</sup> EBS has so far experienced the largest drop in volumes (Graph 5, right-hand panel), which is natural given its lead in currency pairs where the internalisation ratios are the largest (as high as 75–85% for key EUR and JPY pairs). As internalisation ratios increase also for the smaller currency pairs that typically have been traded at Reuters, it is likely that Reuters will also experience a decrease in volume.

<sup>12</sup> This estimate is based on the assumption that yen trading would have grown at a similar rate as trading in other important advanced economy currencies such as the US dollar, euro, pound sterling and Swiss franc.

differentials across a range of countries. Another popular strategy is momentum trading, a bet on the continuation of exchange rate trends. A less known value strategy involves buying currencies perceived to be undervalued and selling those perceived to be overvalued, where the fundamental value can be determined by, for instance, a long-run equilibrium concept like purchasing power parity.

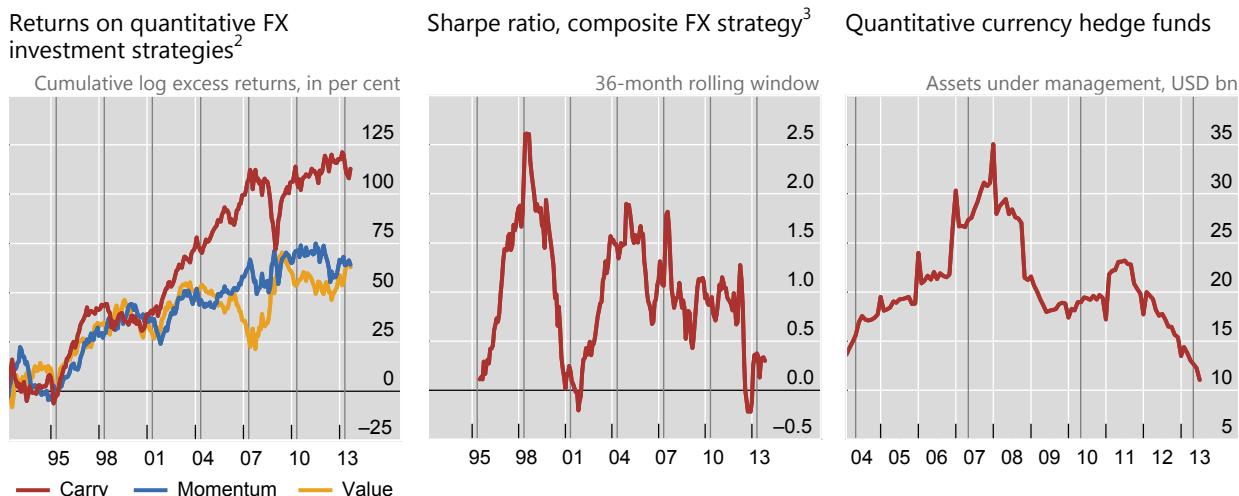
Such simple strategies have been profitable for some time (Graph 4, left-hand panel), attracting new entrants into the market. In particular, the carry trade provided investors with attractive and not very volatile returns in the run-up to the crisis. The 2004 and 2007 surveys also reported that turnover growth largely reflected the activity of investors engaged in such strategies (Galati and Melvin (2004), Galati and Heath (2007)).

It is unlikely, however, that quantitative FX strategies were the main drivers of turnover growth this time. Interest rate differentials have shrunk, as many central banks have been easing monetary policy. Major exchange rates mostly traded in a narrow range, characterised by temporary bouts of volatility and sudden policy actions, eg during the European sovereign debt crisis. Neither carry trades (narrowly defined) nor momentum trades performed well in these conditions (Graph 4, left-hand panel). Consequently, currency hedge funds suffered significant outflows over this period (Graph 4, right-hand panel), with some funds going out of business.<sup>13</sup>

A more compelling explanation for the stronger FX activity of non-dealer financials is the rise in international diversification of asset portfolios, triggering currency trading as a by-product. Over the past three years, equities provided

#### Quantitative FX investment strategies and hedge fund assets<sup>1</sup>

Graph 4



<sup>1</sup> The vertical lines represent the dates of the Triennial Central Bank Survey. <sup>2</sup> Returns on multicurrency quantitative FX investment strategies based on selected advanced economy currencies against the US dollar (Australian dollar, Canadian dollar, euro, Japanese yen, Norwegian krone, New Zealand dollar, Swedish krona, Swiss franc and pound sterling); for details on portfolio construction, see Kroencke et al (2013). <sup>3</sup> The Sharpe ratio measures the reward (mean excess return) over risk (standard deviation) in annualised terms. The graph shows the Sharpe ratio computed for a composite FX portfolio based on equal weights for the three FX strategies computed over a 36-month moving window.

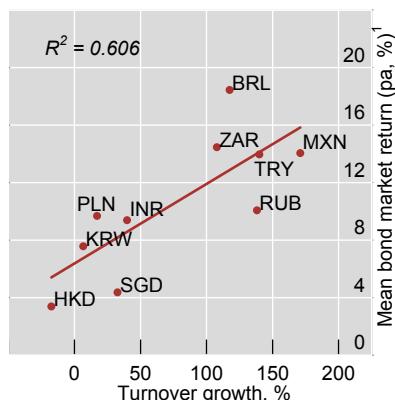
Sources: Datatstream, WM/Reuters; Hedge Fund Research; BIS calculations.

<sup>13</sup> While quantitative currency hedge funds faced a challenging environment, macro hedge funds with a discretionary investment style performed better, according to market sources. Such funds are likely to have played a significant role as drivers of yen volumes between late October 2012 and April 2013.

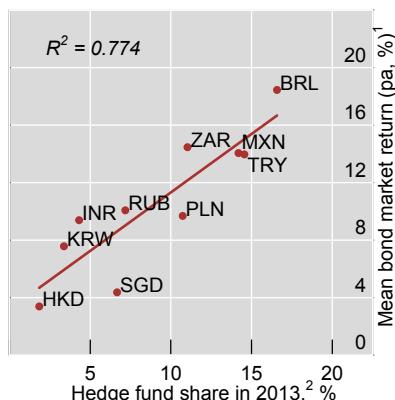
## International portfolio investments and algorithmic trading

Graph 5

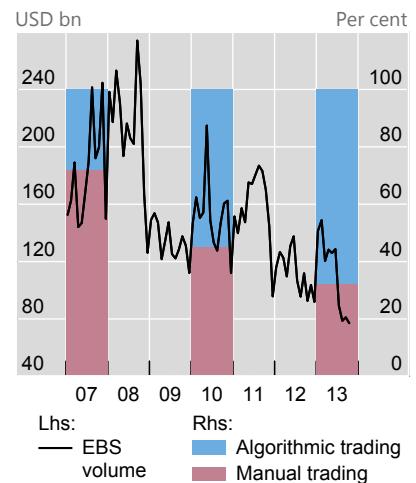
EM FX turnover and bond returns, 2010–13



Hedge funds share in FX turnover and EM bond returns, 2010–13



EBS trading volume, manual vs algorithmic



BRL = Brazilian real; HKD = Hong Kong dollar; INR = Indian rupee; KRW = Korean won; MXN = Mexican peso; PLN = Polish zloty; RUB = Russian rouble; SGD = Singapore dollar; TRY = Turkish lira; ZAR = South African rand.

<sup>1</sup> Bond market returns computed from JPMorgan GBI bond market indices in local currencies. <sup>2</sup> This counterparty segment also includes proprietary trading firms specialised in high-frequency trading; as a share of total FX trading in 2013, by currency.

Sources: Triennial Central Bank Survey; Datastream; EBS ICAP; BIS calculations.

investors with attractive returns and emerging market bond spreads dropped, while issuance in riskier bond market segments (eg local currency emerging market bonds) soared. Not only did this give rise to the need to trade FX in larger quantities and to rebalance portfolios more frequently, but it also went hand in hand with a greater demand for hedging currency exposures. Among the currencies of advanced economies, FX turnover picked up the most for countries that also saw significant equity price increases.<sup>14</sup> In the case of emerging markets, turnover mostly increased in currencies where local bond market investments offered attractive returns (Graph 5, left-hand panel). In fact, for these currencies the participation of hedge funds was particularly strong (Graph 5, centre panel).

### A new form of hot potato trading

Factors at the micro level have also contributed to the growth in FX volumes in recent years. First, a greater diversity and involvement of non-dealer market participants have increased the scope for more gains from trade; second, a rise in the connectivity among the different players has led to a significant drop in search costs; and third, the velocity of trading has increased due to a proliferation of computerised (algorithmic) strategies.

<sup>14</sup> The Japanese case clearly stands out, where equity prices surged more than 55% in local currency terms between October 2012 and April 2013. Given the depreciation pressure faced by the yen over this period, real money investors heavily engaged in hedging. Triennial data show that institutional investors were behind 32% of the volume in yen forward contracts in April 2013.

## Retail trading in the FX market

In the late 1990s, FX trading was mainly the domain of large corporations and financial institutions. Banks charged small "retail" investors prohibitively high transaction costs, as their trades were considered too tiny to be economically interesting. This changed when retail-oriented platforms (eg FXCM and OANDA) started offering online margin brokerage accounts to private investors around 2000, streaming prices from major banks and EBS. Their business model was to bundle many small trades together and lay them off in the inter-dealer market. With trade sizes now much larger, dealers were willing to provide liquidity to such "retail aggregators" at attractive prices.

Retail FX trading has since grown quickly. New breakdowns collected in the 2013 Triennial show that retail trading accounted for 3.5% and 3.8% of total and spot turnover, respectively. The largest retail volumes in absolute terms are in the United States and Japan. That said, Japan, which has a very active retail segment, is clearly biggest in spot (Graph A, left-hand panel). In April 2013, retail trading in Japan accounted for 10% and 19% of total and spot, respectively. Retail investors differ from institutional investors in their FX trading patterns. They tend to trade directly in relatively illiquid currency pairs rather than via a vehicle currency (Graph A, right-hand panel).<sup>①</sup>

The retail figures in the 2013 Triennial are lower than the level King and Rime (2010) reported based on anecdotal evidence. By design, the Triennial only captures retail trades that ultimately end up with dealers directly or indirectly through retail aggregators. Trades internalised on the platform are not captured. Nevertheless, this is probably not a big problem, as the scope for internalisation on retail platforms is limited.<sup>②</sup> The boundaries of retail are also becoming more blurred. Regulatory changes (eg leverage limits for margin brokerage accounts for private investors) in countries such as the United States have slowed growth in the retail segment and led some platforms to target themselves towards professional investors (eg small hedge funds). Furthermore, the recent poor returns on popular strategies, such as momentum and carry trades, suggest that growth in the retail segment may have slowed.

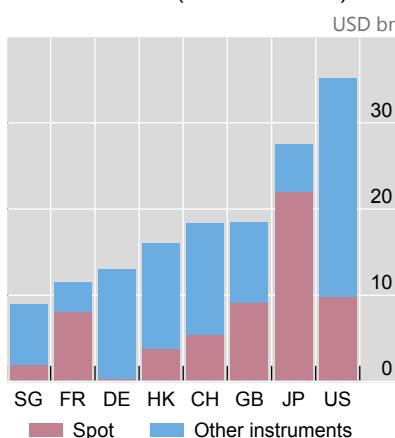
<sup>①</sup> For example, to conduct a carry trade, they go long in NZD/JPY, instead of entering a long position in NZD/USD and a short position in JPY/USD. <sup>②</sup> Internalisation is crucial for large dealers in major pairs, where internal netting may be as high as 75–85%. But the scope for internalisation is limited for retail platforms with smaller flows, predominantly in minor currencies. Reports indicate that even a liquid pair such as GBP/USD has an internalisation ratio of 15–20%, suggesting that the scope for internalisation in eg JPY/ZAR is much lower. That said, internalisation ratios can differ strongly across retail platforms and jurisdictions but are unlikely to exceed 50%.

## Retail-driven FX trading volumes

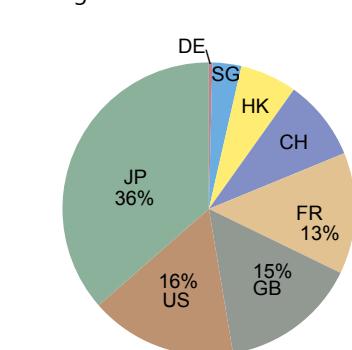
Net-net basis,<sup>1</sup> daily averages in April 2013

Graph A

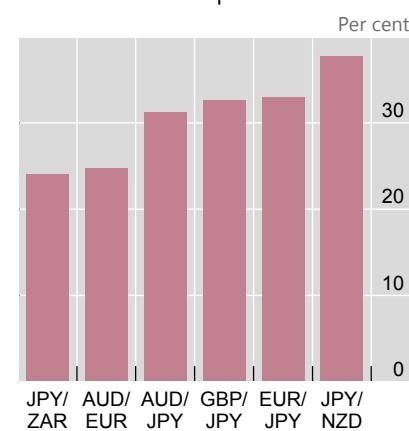
FX centres with the largest retail-driven turnover (absolute terms)



Global distribution of retail spot trading<sup>2</sup>



Currency pairs with the highest retail concentration in Japan<sup>3</sup>



<sup>1</sup> Adjusted for local and cross-border inter-dealer double-counting. <sup>2</sup> As a share of total retail-driven spot FX turnover. <sup>3</sup> As a share of total spot trading in Japan.

Source: Triennial Central Bank Survey.

Recent years have seen a greater diversity of participants active in the global FX market. New types of participants have entered, such as retail investors (see box), high-frequency trading firms and smaller regional banks (eg headquartered in emerging markets). Greater activity by more heterogeneous players expands the universe of trade motives, and extends investment horizons, factors associated with more scope for trading (Banerjee and Kremer (2010)).

The more fragmented structure that emerged after the demise of the inter-dealer market as the main pool of liquidity could potentially harm trading efficiency by raising search costs and exacerbating adverse selection problems. Yet, one of the most significant innovations to prevent this has been the proliferation of liquidity aggregation. This new form of aggregation effectively links various liquidity pools via algorithms that direct the order to a preferred venue (eg the one with the lowest trading costs). It also allows market participants to pick preferred counterparties and choose from which liquidity providers, both dealers and non-dealers, to receive price quotes. This suggests that search costs, a salient feature of OTC markets (Duffie (2012)), have significantly decreased.

Widespread use of algorithmic techniques and order execution strategies allows the sharing of risk to occur faster and among more market participants throughout the network of connected venues and counterparties. The opening of EBS and Reuters to non-dealers via prime brokerage agreements was a key catalyst, but today all platforms offer ways to connect computer-generated trading. Over the period 2007–13, algorithmic trading at EBS grew from 28% to 68% of volumes (Graph 5, right-hand panel).

Furthermore, non-dealer financial institutions are increasingly engaged in providing liquidity, as the ease of customising the types of counterparty connections reduces exposure to adverse selection risk. As a consequence, a given imbalance can be matched against the quotes of more liquidity providers, both dealers and non-dealers, and shuffled faster through the network of trading venues (via algorithms). This has increased the velocity of trading, and effectively is a new form of hot potato trading, but no longer with only dealers at the centre.

Algorithmic trading is essential to the efficiency of this process, and has become pervasive among dealers and end users alike. It is, however, important to distinguish algorithmic from high-frequency trading (HFT), a subset characterised by extremely short holding periods at the millisecond level and a vast amount of trades often cancelled shortly after submission (eg Markets Committee (2011)). EBS estimates that around 30–35% of volume on its trading platform is HFT-driven. HFT strategies can both exploit tiny, short-lived price discrepancies and provide liquidity at very high frequency benefiting from the bid-ask spread. Speed is crucial, and as competition among HFT firms has increased, additional gains from being fast have diminished.<sup>15</sup> It is thus unlikely that HFT has been a significant driver of turnover growth since 2010.<sup>16</sup>

<sup>15</sup> Some electronic platform providers have also recently introduced microstructural changes to reduce competition for speed (eg by increasing minimum tick size or by modifying the treatment of incoming orders in the queue).

<sup>16</sup> According to market sources, the HFT segment in foreign exchange markets has seen a consolidation in recent years. In this process, major HFT firms have mostly turned to market-making as their main strategy.

## Conclusion

Trading activity in the foreign exchange market reached an all-time high of \$5.3 trillion in April 2013, 35% higher than in 2010. The results of the 2013 Triennial Survey confirm a trend in the market already seen in prior surveys: first, a growing role of non-dealer financial institutions (smaller banks, institutional investors and hedge funds); second, a further internationalisation of currency trading and at the same time a rising concentration in financial centres; and lastly, a fast-evolving market structure driven by technological innovations that accommodates the diverse trading needs of market participants.

New and more granular breakdowns introduced in the 2013 Triennial allow a more detailed analysis of these developments. With more detailed information on non-dealer financial institutions, the linkages between their trading motives and FX turnover growth can be better understood. The once clear-cut two-tier structure of the market, with separate inter-dealer and customer segments, no longer exists. At the same time, the number of ways the different market participants can interconnect has increased significantly, suggesting that search costs and trading costs are now considerably reduced. This has paved the way for financial customers to become liquidity providers alongside dealers. Hence, financial customers contribute to increased volumes not only through their investment decisions, but also by taking part in a new hot potato trading process, where dealers no longer perform an exclusive role.

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## Glossary

**Algorithmic trading:** Automated transactions where a computer algorithm decides the order submission and execution (also see "High-frequency trading").

**Bid-ask spread:** The difference in the price the customer receives for selling a security or currency (bid) and the price at which the customer buys (ask).

**Broker:** A financial intermediary who matches counterparties to a transaction without being a party to the trade. The broker can operate electronically (electronic broker) or by telephone (voice broker).

**Buy-side:** Market participants that act as a customer of the dealer. This need not mean that the specific entity is actually buying or selling.

**Dealer:** A financial institution that is entering into transactions on both sides of markets, seeking profits by taking risks in those markets and by earning a spread; sometimes also referred to as "sell-side".

**Electronic communications network (ECN):** A computer system that facilitates electronic trading, typically in OTC markets.

**High-frequency trading (HFT):** An algorithmic trading strategy that profits from incremental price movements with frequent, small trades executed in milliseconds for very short investment horizons. HFT is a subset of algorithmic trading.

**Liquidity aggregator:** Technology that allows participants to stream prices from several liquidity providers/pools simultaneously. Computer algorithms allow customisation of the price streams, by both the liquidity provider and the receiving counterparty.

**Multi-bank trading platform:** An electronic trading system that aggregates and distributes quotes from multiple FX dealers.

**Overlay management:** The management of the currency exposure of international bond and equity portfolios.

**Prime brokerage:** A service offered by banks that allows a client to source funding and market liquidity from a variety of executing dealers while maintaining a credit relationship, placing collateral and settling with a single entity.

**Reporting dealer:** A bank that is active as a market-maker (by offering to buy or sell contracts) and participates as a reporting institution in the Triennial.

**Retail aggregator:** A term used for online broker-dealers who stream quotes from the top FX dealers to customers (individuals and smaller institutions) and aggregate a small number of retail trades.

**Sales and trading desk:** FX deals are traditionally arranged via sales desks, which are responsible for maintaining the relationship with the customer. Once an incoming client order is received, it is passed on to the trading desk for execution.

**Single-bank trading system:** A proprietary electronic trading system operated by an FX dealer for the exclusive use of its customers.



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## FX market trends before, between and beyond Triennial Surveys<sup>1</sup>

*This special feature looks at trading activity in the foreign exchange market between the Triennial Surveys conducted in 2010 and 2013 and in the months following. We estimate that the \$5.3 trillion per day reported for April 2013 was a peak, with activity falling subsequently by \$300 billion to \$5 trillion per day in October. The decrease in activity was primarily driven by a drop in spot transactions involving mainly euros or yen against the US dollar. The decline in euro trading extends a trend that began in the third quarter of 2011, while the fall in yen trading reflects a partial reversal of a sharp rise that occurred in late 2012 and early 2013.*

*JEL classification:* C82, F31, G15.

Every three years, the Triennial Central Bank Survey of foreign exchange market activity ("the Triennial") provides a detailed snapshot of the global foreign exchange (FX) market during the month of April. By increasing market transparency, the survey aims to help policymakers and market participants to monitor patterns of activity and exposures. The Triennial is coordinated by the BIS under the auspices of the Markets Committee<sup>2</sup> and has been conducted since 1989.

The Triennial offers unrivalled coverage in terms of geography, instruments and currencies. The latest survey involved 53 jurisdictions and some 1,300 banks and other dealers. It reports turnover in spot, outright forward, FX swap, currency swap and FX option transactions in 40 different currencies. Moreover, the data are broken down by several categories, including type of counterparty, execution method, trading relationship and maturity.

The Triennial's comprehensive nature is its greatest strength, but also its weakness. The data collection process is resource-intensive and hence not practical to conduct more often. Fortunately, the Triennial is not the only source of information on global FX market activity.

A number of central bank-sponsored industry groups, known as foreign exchange committees (FXCs), conduct semiannual surveys on market turnover in their respective jurisdictions. As such, the FXC surveys provide a significant improvement in reporting frequency – but six months is still a long time in the ever

<sup>1</sup> The views expressed in this article are those of the authors and do not necessarily reflect those of the BIS. We are grateful to Claudio Borio, Maria Canelli, Andreas Schrimpf and Philip Wooldridge for useful comments on earlier drafts.

<sup>2</sup> See [www.bis.org/about/factmktc.htm](http://www.bis.org/about/factmktc.htm).

changing FX market. In this respect, electronic trading platforms and settlement systems are helpful, as they provide information on FX market turnover at even higher frequencies.

Nonetheless, a number of challenges emerge when using these alternative sources. For instance, the currencies of many smaller or emerging market economies are not (or only sparsely) covered by the FXC surveys or are not eligible for trading or settlement in the respective systems. Moreover, computing global aggregates is tricky due to methodological differences and data limitations. For example, only the Triennial corrects for double-counting of transactions across jurisdictions.

Bech (2012) uses a statistical technique known as benchmarking to overcome some of these difficulties. The result is a monthly time series of global FX market activity that is consistent with the global turnover number from the Triennial. In this special feature, we update that analysis using data up to October 2013.

Moreover, we show how the benchmarking technique provides further insights about FX activity trends before, between and beyond Triennials. Before the release of the latest survey, the benchmarking technique estimated that daily average FX trading activity in April 2013 was in the \$5.2–\$5.5 trillion range. Between the two most recent Triennials, we show that turnover probably reached \$5 trillion per day around August 2011 before falling back below \$4.5 trillion in October 2012. However, in late 2012 trading activity surged – reaching \$5.3 trillion in April 2013. Beyond the last Triennial, we estimate that activity has been falling, by about 6% to \$5 trillion in October.

Furthermore, by using new and more detailed data from the leading settlement system for FX transactions (CLS Bank), we compute monthly turnover series broken down by FX instrument and currency pair. The disaggregated series show that the drop in turnover since April has been driven by a fall in FX spot transactions. In particular, trading involving the euro and the yen has declined. The fall in euro trading extends a trend that began in the third quarter of 2011, while the decrease in yen trading reflects a partial reversal of a sharp rise that occurred in late 2012 and early 2013.

## Sources of data on FX market activity

In general, there are two types of data sources on FX market activity: surveys of financial institutions, and turnover data obtained from either trading platforms or settlement systems. In addition to the Triennial, we use data from the semiannual surveys of markets in Australia, Canada, London, New York, Singapore and Tokyo as well as monthly data from CLS Bank.

### Foreign exchange committee surveys

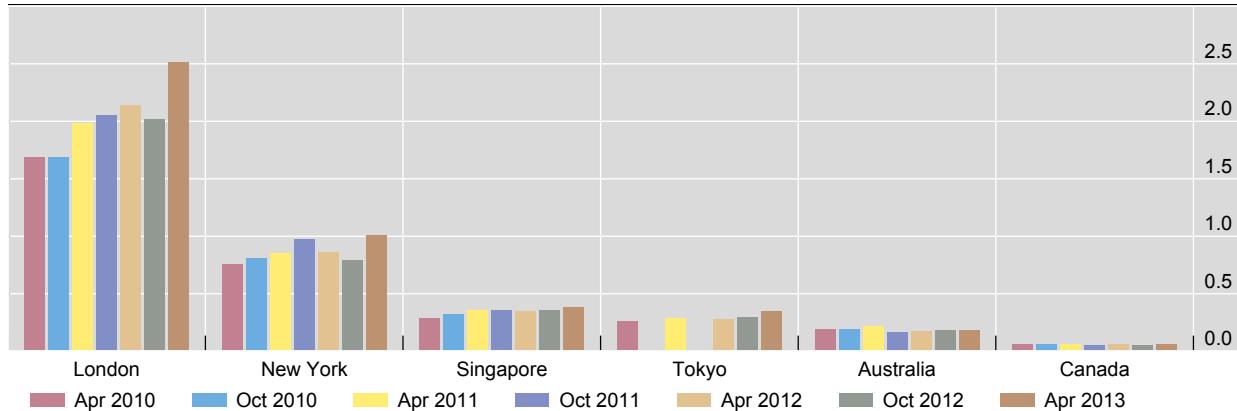
Several central banks in the world's major FX centres sponsor FXCs, which provide a forum for market participants to discuss issues of common interest.<sup>3</sup> In order to

<sup>3</sup> The current slate of committees includes: the Foreign Exchange Joint Standing Committee (FXJSC) in London, the Foreign Exchange Committee (FXC) in New York, the Singapore Foreign Exchange Market Committee (SFEMC), the Tokyo Foreign Exchange Market Committee (TFEMC), the

## Foreign exchange committee survey turnover

In trillions of US dollar equivalents

Graph 1



Source: FXC surveys.

supply more frequent information on the size and structure of FX trading activity, the committees conduct semiannual volume surveys of their respective markets, carried out in April and October. The survey results are released in a coordinated fashion roughly three months after the survey month. The latest set of results, covering April 2013, was released on 29 July. Graph 1 shows the level of activity across the different markets and time.

Like the Triennial, the FXC surveys show that most trading takes place in London. At about \$2.5 trillion per day in April 2013, the reported London turnover is larger than all the other surveyed markets put together. According to FXC surveys, FX trading activity increased by some 40%, on a weighted basis, between April 2010 and April 2013 – broadly in line with the growth of 35% reported by the Triennial (Rime and Schrimpf (2013)).

### CLS Bank<sup>4</sup>

CLS Bank International (CLS) is the main settlement institution for FX transactions. It was founded in response to concerns raised by the G10 central banks about settlement risk in those transactions (BIS (1996)). CLS eliminates the risk by ensuring that settlement of both legs of an FX transaction occurs simultaneously – a process known as payment versus payment (PvP) (Galati (2002)). Settlements have grown sharply since its start in 2002, reflecting a combination of market growth and increasing market share. CLS currently settles FX transactions in 17 currencies.<sup>5</sup>

Based on the settlement instructions processed across its books, CLS publishes monthly reports on the number and value of FX transactions traded between

Australian Foreign Exchange Committee (AFXC) and the Canadian Foreign Exchange Committee (CFEC).

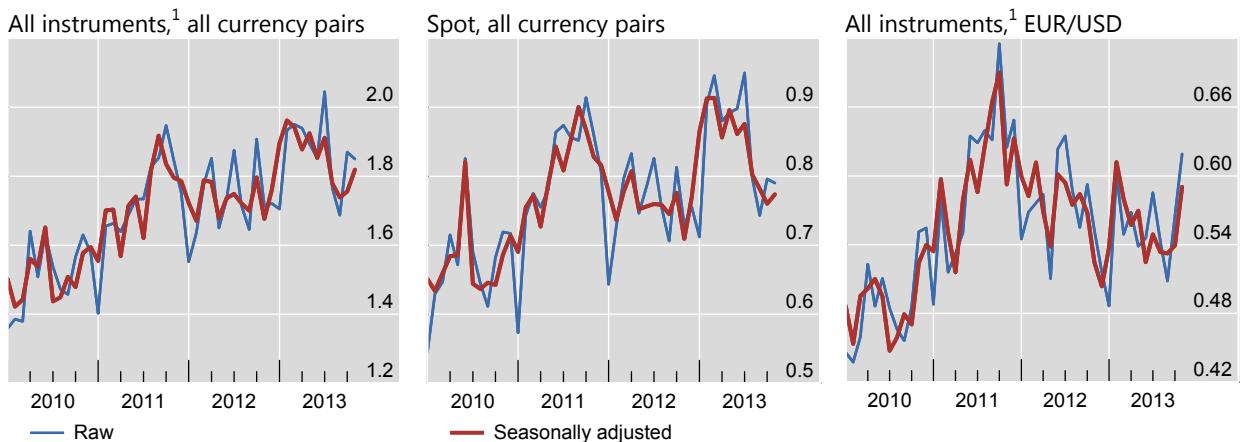
<sup>4</sup> See [www.cls-group.com](http://www.cls-group.com) for further information.

<sup>5</sup> Australian dollar, Canadian dollar, Danish krone, euro, Hong Kong dollar, Israeli shekel, Japanese yen, Korean won, Mexican peso, New Zealand dollar, Norwegian krone, Singapore dollar, South African rand, Swedish krona, Swiss franc, pound sterling and US dollar.

## CLS average daily turnover

In trillions of US dollar equivalents

Graph 2



<sup>1</sup> Sum of spot, FX swaps and outright forwards.

Sources: CLS; BIS calculations.

participants (Graph 2).<sup>6</sup> In addition to the aggregate numbers, CLS also reports breakdowns by instrument and currency pair.<sup>7</sup> The CLS information is usually available within a couple of weeks after the turn of the month. For example, the report covering October 2013 was published on 14 November.

A potential issue with the CLS information is that it can be hard to distinguish overall market trends from market share trends. For instance, CLS regularly adds new users.<sup>8</sup> And due to the data's monthly frequency, seasonal patterns and/or calendar effects can be a problem when analysing turnover trends. The data available for this analysis start in January 2010.

## Benchmarking FX activity

Following Bech (2012), we use benchmarking to translate the information from the FXC surveys and CLS into monthly estimates of trading activity that are consistent with the numbers reported in the Triennial. The underlying premise is that the Triennial provides the most reliable information on the level of global FX turnover, followed by the FXC surveys and the data from CLS. However, FXC and CLS data are available at higher frequencies and are published more quickly.

We apply a three-step approach to arrive at the monthly series. First, we construct aggregate volume series for the FXC surveys. We do this by simply adding up the individually reported volumes while adjusting – using simple interpolation –

<sup>6</sup> See [www.cls-group.com/MarketInsight/Pages/ReportArchive.aspx](http://www.cls-group.com/MarketInsight/Pages/ReportArchive.aspx). Bech (2012) uses information on the value of settlements.

<sup>7</sup> CLS reports the value of the currency bought or, for derivatives, the far leg of the trade – consistent with the methodology used in the Triennial and FXC surveys.

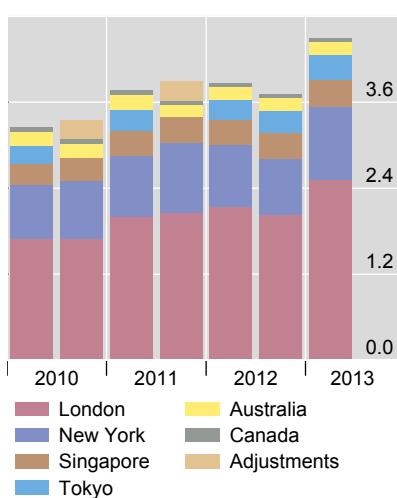
<sup>8</sup> The latest currencies added were the Israeli shekel and the Mexican peso (May 2008).

## Benchmarking average daily FX trading activity

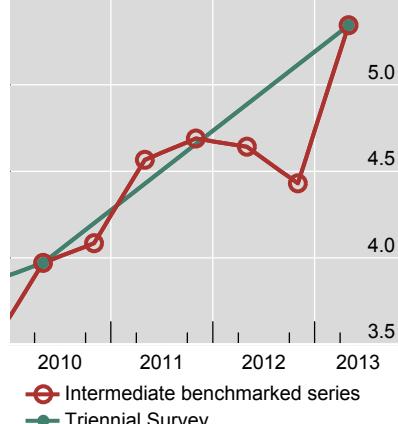
In trillions of US dollar equivalents

Graph 3

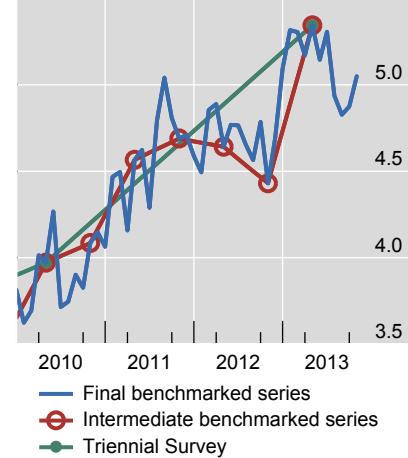
Step 1: Aggregation of FXC surveys



Step 2: From triennial to semiannual frequency



Step 3: From semiannual to monthly frequency



Sources: Triennial Central Bank Survey; CLS; FXC surveys; BIS calculations.

for the fact that the Japanese survey was conducted only annually before October 2011 (Graph 3, left-hand panel).<sup>9</sup>

Second, we use this aggregate volume series for the FXC surveys to convert the Triennial numbers to a semiannual series. Here we rely on the proportional Denton technique (see box), which preserves the movement in the FXC series as closely as possible while ensuring the resulting series matches the data points provided by the Triennial (Graph 3, centre panel). Finally, we use the same method to convert the constructed semiannual series to monthly frequency using seasonally adjusted data on average daily trading activity from CLS (Graph 3, right-hand panel).

Our analysis shows that global turnover rose from \$4 trillion in April 2010 to over \$5 trillion in August 2011 only to fall below \$4.5 trillion in October 2012. In late 2012, however, expectations of a major shift in monetary policy in Japan led to a significant jump in trading activity.<sup>10</sup> Since April, total turnover is estimated to have dropped by roughly \$300 billion to around \$5 trillion.

<sup>9</sup> The FXC surveys differ from the Triennial in a couple of ways. First, there are methodological differences. For example, the Triennial collects data based on the location of the sales desk, whereas some of the FXC surveys are based on the location of the trading desk. Second, while the FXC surveys correct for double reporting of trades between reporting entities within its jurisdiction, only the Triennial corrects for double-counting of trades across jurisdictions.

<sup>10</sup> On 4 April 2013, the Bank of Japan unveiled a new policy framework aimed at ending deflation, known as Quantitative and Qualitative Monetary Easing. See BIS (2013), p 5.

## The proportional Denton technique and updating as new information arrives

The proportional Denton technique is based on the principle of movement preservation (Bloem et al (2001)). It seeks to make the growth rates in the benchmarked series match those of the higher-frequency indicator series as closely as possible. At the same time, it ensures that the benchmarked series matches the lower-frequency (but more reliable) series when the latter is available. "Closeness" is achieved by minimising the sum of squared deviations in the growth rates of the two series. In mathematical terms, the technique can be written as

$$\min_{\{X_t\}_{t=1}^T} \sum_{t=2}^T \left[ \frac{X_t}{X_{t-1}} - \frac{I_t}{I_{t-1}} \right]^2 \quad \text{s.t. } X_s = A_s \text{ for } s \in \Omega \subset \{1, \dots, T\}$$

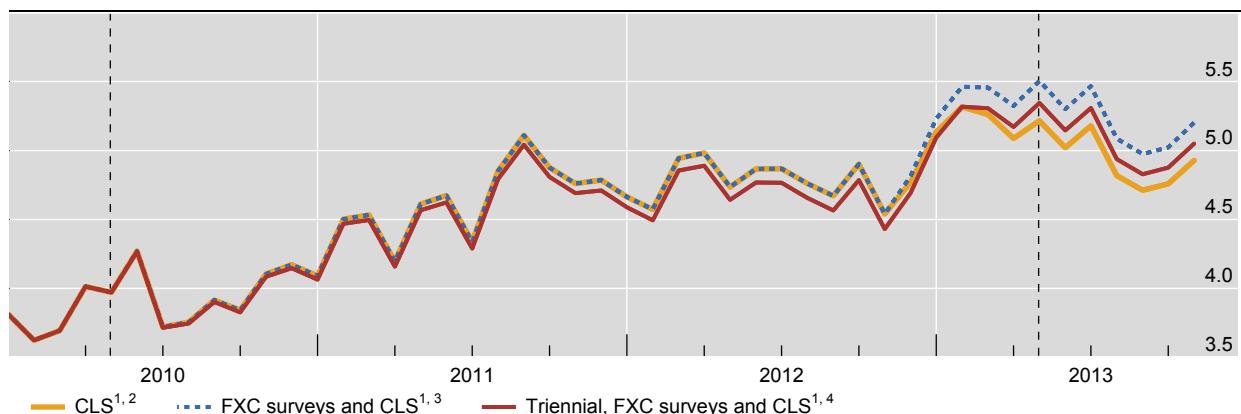
where  $\{X_t\}_{t=1}^T$  is the benchmarked series, ie the outcome of the procedure,  $\{I_t\}_{t=1}^T$  is the related high-frequency (or indicator) series,  $\{A_s\}_{s \in \Omega}$  is the low-frequency series and  $\Omega$  is the set of dates at which the low-frequency series is observed. See the appendix in Bech (2012) for details on how to solve this problem.

An important feature of the benchmarking approach is that the values are updated as new information arrives. Graph A illustrates this using the publication of the 2013 Triennial as an example. When CLS data became available in early May, global FX turnover was estimated to be roughly \$5.2 trillion in April 2013. However, the turnover number for April was revised to \$5.5 trillion when the FXC surveys were released in late July. Finally, when the Triennial was published in September 2013, the April 2013 number was updated to match the reported \$5.3 trillion on average per day. This change then led to a revision of all values back to the previous Triennial in April 2010 due to the minimisation of squared deviations described above.

In a similar manner, the current predictions beyond April 2013 will be revised when the October 2013 FXC surveys are released in late January 2014, and again when the next Triennial is published in 2016.

Benchmarked FX trading activity under different information sets

Graph A



<sup>1</sup> Benchmarking using October 2013 data from CLS. <sup>2</sup> October 2012 for the Triennial and the FXC surveys. <sup>3</sup> October 2012 for the Triennial and April 2013 for the FXC surveys. <sup>4</sup> April 2013 for the Triennial and the FXC surveys.

Sources: Triennial Central Bank Survey; CLS; FXC surveys; BIS calculations.

## Trading activity by instrument and currency pair

An improvement relative to Bech (2012) is that more detailed data from CLS allow us to compute monthly turnover numbers broken down by CLS-eligible FX instrument (spot, FX swap and outright forwards)<sup>11</sup> and currency pair.

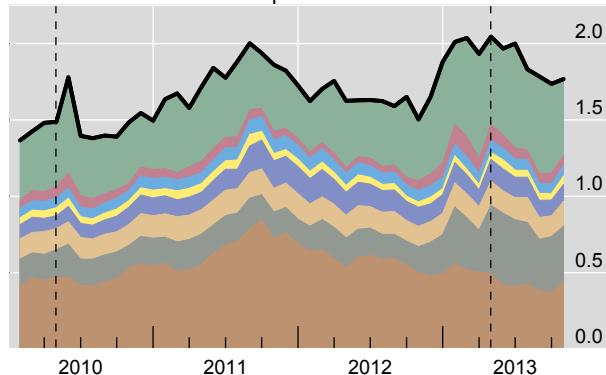
<sup>11</sup> According to the latest Triennial, these three instruments account for 93% of turnover.

## Average daily FX trading activity by instrument and major currency pair<sup>1</sup>

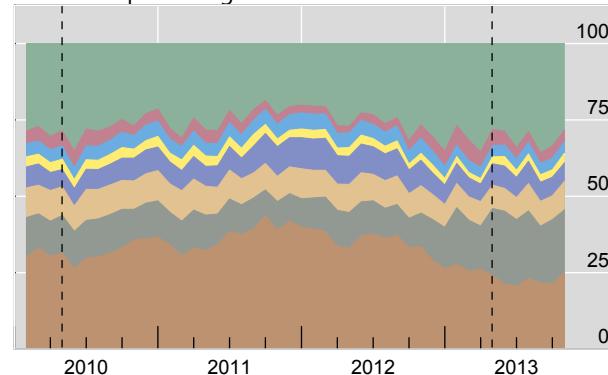
Graph 4

### Spot

In trillions of US dollar equivalents

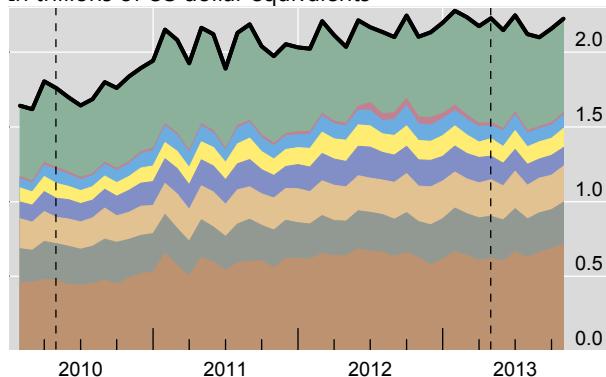


Share as a percentage of total

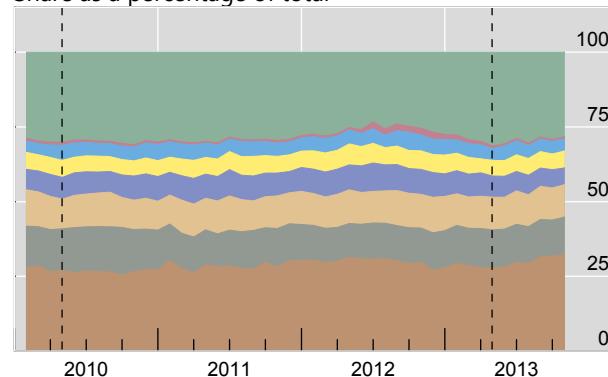


### FX swaps

In trillions of US dollar equivalents

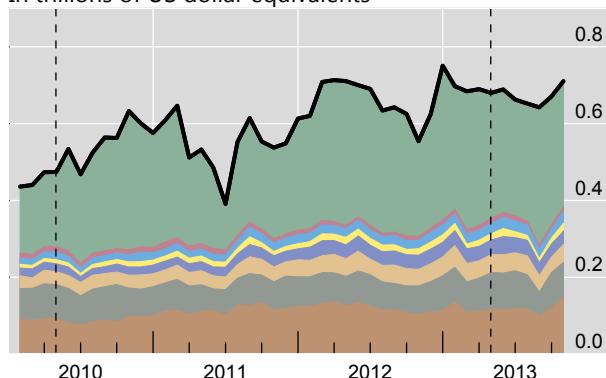


Share as a percentage of total

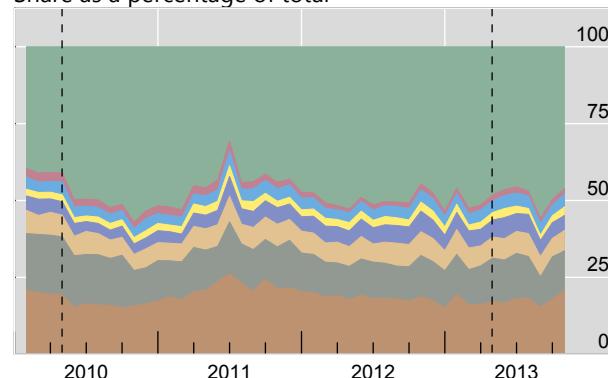


### Outright forwards

In trillions of US dollar equivalents



Share as a percentage of total



The vertical lines indicate the dates Triennial Surveys were conducted, ie April 2010 and April 2013.

<sup>1</sup> Benchmarked series are calculated using the proportional Denton technique (see box). Based on breakdowns by currency pairs from the foreign exchange committees in Australia, London, New York, Singapore and Tokyo. The breakdown for USD/CHF and USD/CAD is not available from the Tokyo foreign exchange committee. The CLS data are seasonally adjusted before the benchmarking technique is applied.

Sources: Triennial Central Bank Survey; CLS; FXC surveys; BIS calculations.

Graph 4 shows the results for seven major currency pairs and an "other" category.<sup>12</sup> The left-hand panels show the daily average value traded for each instrument by currency pair since January 2010. The right-hand panels show the relative share of the different currency pairs for each instrument over the same period. The turnover developments for the different instruments and individual currency pairs are markedly different.

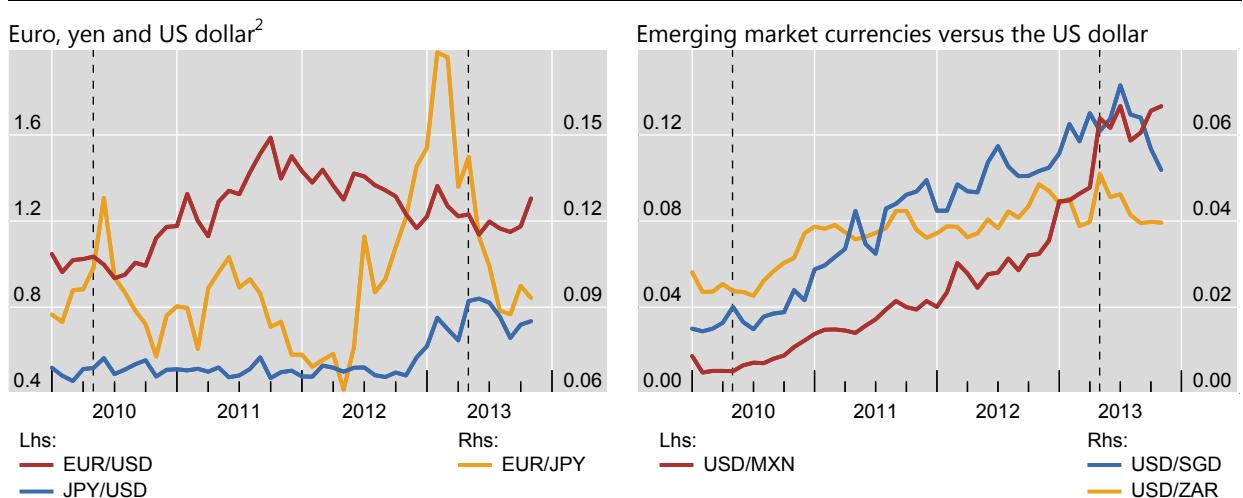
Looking across FX instruments, trading activity for spot transactions and outright forwards has been more volatile than for FX swaps. For instance, spot transactions reached \$2.0 trillion on average per day in August 2011 but then fell to \$1.5 trillion per day in October 2012 before jumping above \$2.0 trillion again in early 2013. Subsequently, spot turnover dropped to \$1.8 trillion on average per day. In contrast, trading activity in FX swaps fluctuated between \$2.0 trillion and \$2.2 trillion per day since early 2011. The disaggregation by instrument also shows that the spike in aggregate activity in late 2012 and early 2013 was driven by increases in spot transactions and outright forwards rather than FX swaps.<sup>13</sup>

Looking at individual currency pairs provides further insights. The most striking trends relate to transactions involving the euro and the yen. Euro trading has diminished since late 2011. Between September 2011 and October 2013, spot trading of the euro vis-à-vis the US dollar fell by \$400 billion, corresponding to a drop from 40% to 25% in this currency pair's share in all spot transactions (Graph 4,

#### Average daily benchmarked total FX trading activity<sup>1</sup>

In trillions of US dollar equivalents

Graph 5



The vertical lines indicate the dates Triennial Surveys were conducted, ie April 2010 and April 2013.

<sup>1</sup> Benchmarked series are calculated using the proportional Denton technique (see box). The Triennial figures (which include currency swaps and options) are benchmarked using CLS data and the foreign exchange committee survey data, which do not include currency swaps and options. The CLS data are seasonally adjusted before the benchmarking technique is applied. <sup>2</sup> Based on breakdowns by currency pair from the foreign exchange committees in Australia, London, New York, Singapore and Tokyo. <sup>3</sup> Based on data from the foreign exchange committees in London (for all three currency pairs), Singapore (for USD/SGD) and New York (for USD/MXN).

Sources: Triennial Central Bank Survey; CLS; FXC surveys; BIS calculations.

<sup>12</sup> According the latest Triennial, the currency pairs shown in the graph accounted for 65% of FX trading.

<sup>13</sup> Based on information from the FXC surveys, we estimate that daily trading activity in currency swaps and options rose 32%, from \$296 billion in October 2012 to \$391 billion in April 2013. This large increase was mainly driven by JPY/USD transactions.

top left-hand panel). At the same time, trading in other instruments registered moderate increases. This resulted in euro trading in all instruments against the US dollar moving from \$1.6 trillion in September 2011 to \$1.3 trillion in October 2013 (Graph 5, left-hand panel).

In contrast, trading in the yen was fairly stable until late 2012, after which it rose significantly. Against the US dollar, trading was around \$500 billion per day since early 2010 but rose to over \$800 billion per day in April 2013, before falling back to roughly \$700 billion per day in October 2013. EUR/JPY also saw a significant increase in late 2012 and early 2013.

A key finding of the Triennial is the significant increase in turnover of emerging market currencies such as the Mexican peso and Chinese renminbi (Ehlers and Packer (2013)). Our approach can shed further light on these developments to the extent that the currencies in question are covered by the FXC surveys and eligible for settlement by CLS. The right-hand panel of Graph 5 shows the rapid increase in the benchmarked turnover for the Mexican peso, the Singapore dollar and the South African rand vis-à-vis the US dollar since 2010.

## Conclusion

The FX market is one of the largest financial markets, but owing to its decentralised structure timely information on quantitative developments is not always easy to come by. In this article, we show how different sources of data on FX activity can be leveraged to obtain a more timely understanding of turnover developments. We produce monthly time series – both in aggregate and broken down by instrument and major currency pair – that, despite some caveats, are comparable to the figures from the BIS Triennial Survey.

The results show that the \$5.3 trillion per day reported by the Triennial for April 2013 was a local peak, with activity falling to \$5 trillion per day in October 2013. The fall in activity was primarily driven by a drop in spot transactions involving the euro or yen. The fall in euro trading extends a trend that started in the latter part of 2011, whereas the fall in yen trading reflects a partial reversal of a sharp rise in late 2012 and early 2013.

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## FX and derivatives markets in emerging economies and the internationalisation of their currencies<sup>1</sup>

*Derivatives markets in emerging economies have continued to grow since 2010, driven mostly by very strong growth in the OTC market. Emerging market currencies have become more international as offshore markets are a major contributor to FX turnover. The Chinese renminbi is actively traded within emerging Asia. Trading of emerging market currencies is positively related to the size of cross-border financial flows.*

*JEL classification:* F31, G15, G20, P45.

Over the past decade, FX and derivatives markets in emerging market economies (EMEs) have grown rapidly. In previous work, Milhaljek and Packer (2010) noted that EME derivatives were strongly outgrowing those of advanced economies, as well as becoming increasingly international. Has this trend continued? In EMEs, which derivatives are now traded, and who trades them? Which EME currencies are now most traded, and where are they traded? Have some EME currencies become regional lead currencies? Is there a relationship between turnover in EME currencies and cross-border financial flows into and out of emerging markets?

Our main findings are as follows. First, average daily turnover in EME derivatives has continued to grow since 2010, driven mainly by very strong growth in the over-the-counter (OTC) segment. Second, growth of FX derivatives turnover has been strongest with “other financial institutions”, which include official sector financial institutions. Third, offshore trading of EME currencies has surged, far outpacing the growth in total FX turnover in EME currencies. Among the currencies with the highest turnover growth are the Chinese renminbi, Mexican peso, Turkish lira and Russian rouble. Fourth, the Chinese renminbi is playing an increasingly prominent role in emerging Asia, although the regional significance of other EME currencies is much more limited. Fifth, the trading of EME currencies is positively related to the size of cross-border financial flows.

The remainder of this article is organised as follows. The first section looks at the overall trends in derivatives trading in EME jurisdictions, both over-the-counter and on exchanges. In the second section, we shift our focus to EME currency

<sup>1</sup> The views expressed in this article are those of the authors and do not necessarily reflect those of the BIS. We are grateful to Claudio Borio, Robert McCauley, Andreas Schrimpf, Ilhyock Shim, Chang Shu, Christian Upper and Philip Wooldridge for comments on earlier drafts of the article. We thank Jimmy Shek, Denis Petre and Bat-el Berger for their help with statistical analysis.

trading, which goes well beyond the shores of the home economies. The third section analyses the link between financial flows and FX turnover in EME currencies. The final section concludes.

## The size and structure of derivatives markets in EMEs

Derivatives markets in EMEs remain small compared with those in advanced economies. Across the 32 EMEs for which data are available, average daily turnover in EME jurisdictions calculated on a "net-net" basis (ie correcting for both local and cross-border inter-dealer double-counting) was \$1.1 trillion in April 2013, which is around 4% of those countries' GDP, compared with \$10.3 trillion in advanced economies, or 24% of GDP (Graph 1).

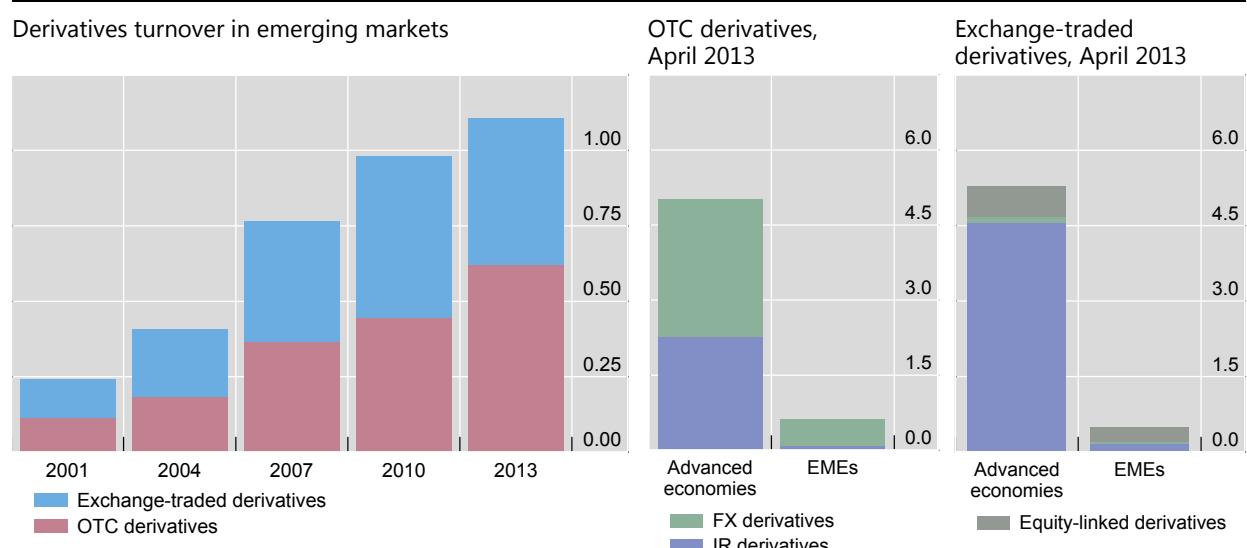
The overall pace of growth exceeds that of advanced economies, although it remains rather modest at 13%. As discussed below, this reflects declining trading on EME exchanges; growth in OTC transactions has been strong. Another caveat to keep in mind is that trading in emerging market jurisdictions accounts for only a part of trading in EME derivatives owing to active offshore trading.

Derivatives turnover in EME jurisdictions tends to be more concentrated in the exchange rate segment. FX derivatives account for just over half of total daily turnover, and equity and interest rate instruments for around one fifth each. By contrast, derivatives in advanced economies are used for the most part to trade interest rate risk (around 66% of overall turnover) with FX and equity market derivatives turnover accounting for only 28% and 6%, respectively. The smaller role of interest rate derivatives in EMEs likely reflects the lesser depth and liquidity of

### Derivatives turnover in advanced and emerging markets<sup>1</sup>

Daily average in April, in trillions of US dollars

Graph 1



<sup>1</sup> OTC derivatives are adjusted for local and cross-border inter-dealer double-counting (ie "net-net" basis). OTC derivatives comprise FX derivatives and interest rate derivatives; exchange-traded derivatives comprise FX derivatives, interest rate derivatives and equity-linked derivatives. The Triennial Survey does not cover risk categories other than foreign exchange and interest rates.

Sources: Triennial Central Bank Survey; FOW TRADEdata; Futures Industry Association; various futures and options exchanges.

their bond and money markets, together with the greater relevance of exchange rate risk for many EME economies.

OTC derivatives appear to play a bigger role in EMEs than exchange-traded derivatives. Around 56% of the derivatives are traded over the counter in emerging markets, relative to a ratio of less than one half traded over the counter in advanced economies.<sup>2</sup> This ratio of OTC to total derivatives transactions continues to rise in EMEs; for the remainder of the paper, we will focus on developments in OTC derivatives markets as well as FX spot markets.

### OTC FX derivatives markets

Growth in OTC FX derivatives turnover in emerging market economies has been very strong in recent years. Turnover rose from \$380 billion to \$535 billion, or by more than 40% over the period 2010–13 (Table 1). Growth has been considerable across the entire range of instruments, including outright forwards (45%), FX swaps (35%), currency swaps (29%) and options (102%). In each of these instruments, growth in turnover was greater than in advanced economy markets.

The OTC markets' growth in FX derivatives – at 41% over the 2010–13 period – far exceeds the growth in FX spot market turnover (17%). FX derivatives transactions constituted 69% of all OTC FX transactions during the survey period of 2013, compared with 65% in 2010, and 61% in 2007. The share of FX derivatives in OTC FX market turnover is now significantly higher (and spot turnover significantly lower) than the corresponding shares in advanced economies.

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### OTC FX market turnover in emerging market jurisdictions – by instrument

Daily average in April<sup>1</sup>

Table 1

	2007	2010	2013	Growth 2010–13	Contribution to FX market growth in EMEs 2010–13	Share in EME FX market 2013	Share in advanced economies 2013
	In billions of US dollars			In per cent			
FX derivatives	299.2	380.3	535.5	40.8	26.6	69.3	60.4
<i>Outright forwards</i>	46.7	73.0	105.8	45.0	5.6	13.7	12.6
<i>FX swaps</i>	230.6	276.8	373.0	34.8	16.5	48.3	40.6
<i>Currency swaps</i>	4.0	6.8	8.8	29.4	0.3	1.1	1.0
<i>Options and other products</i>	17.8	23.8	47.9	101.8	4.1	6.2	6.3
Spot	187.9	202.8	236.8	16.8	5.8	30.7	39.6
Derivatives-to-spot ratio:							
Emerging market economies	1.6	1.9	2.3				
Advanced economies	2.5	1.6	1.5				

<sup>1</sup> Adjusted for local and cross-border inter-dealer double-counting (ie "net-net" basis).

Sources: Triennial Central Bank Survey; BIS calculations.

<sup>2</sup> This may be due to partial coverage of emerging market economies in the BIS exchange-traded derivatives data.

The major contribution of FX derivatives to the growth in EME currencies turnover is consistent with the view that hedging demand and speculation by foreign portfolio investors – interested in mitigating the exchange rate risks of their local currency investments or speculating on currency movements – has grown in importance. At the same time, international capital flows are increasingly having an impact on the stability of domestic economies and financial systems (Lane (2013)). The relatively smaller share of spot trading in the FX market turnover of EME currencies may also reflect the still limited scale of high-frequency trading (HFT) in these currencies, as HFT is more common in spot than in derivatives markets.

### The increasing importance of "other financial institutions"

Growth of OTC FX derivatives turnover in emerging markets has differed considerably across types of counterparty (Table 2). Increased dealing is most evident with "other financial institutions", which include non-reporting banks, institutional investors, hedge funds and proprietary trading firms as well as official sector financial institutions. The share of FX derivatives in total OTC derivatives turnover increased from 30% to 32% over the period 2010–13, after an even more pronounced increase in 2007–10. Meanwhile, the share of trade with reporting dealers, usually commercial and investment banks, has fallen from 61% to 58% in 2007 and 2010, and to 57% in 2013.

Several factors underpin this trend. In particular, whereas trading in major currencies has incurred very low transaction costs for some time, many EME currencies have only recently achieved lower costs of trading (see Rime and

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### OTC FX market turnover in emerging market jurisdictions – by counterparty

Daily average in April<sup>1</sup>

Table 2

	2007	2010	2013	Growth 2010–13	Share in EME FX market 2013	Share in advanced economies 2013
	In billions of US dollars			In per cent		
FX market	487.0	583.1	772.3	32.5	100.0	100.0
<i>Reporting dealers</i>	287.2	318.9	422.1	32.4	54.7	36.0
<i>Other financial institutions</i>	114.2	183.0	234.7	28.2	30.4	56.3
<i>Non-financial customers</i>	85.7	81.1	115.5	42.4	15.0	7.6
Spot	187.9	202.8	236.8	16.8	30.7	39.6
<i>Reporting dealers</i>	103.3	98.2	119.3	21.5	15.4	12.2
<i>Other financial institutions</i>	43.7	67.7	64.8	-4.3	8.4	24.4
<i>Non-financial customers</i>	40.9	36.9	52.7	42.7	6.8	3.0
FX derivatives	299.2	380.2	535.5	40.8	69.3	60.4
<i>Reporting dealers</i>	183.9	220.7	302.8	37.2	39.2	23.9
<i>Other financial institutions</i>	70.5	115.3	169.8	47.3	22.0	31.9
<i>Non-financial customers</i>	44.8	44.2	62.8	42.0	8.1	4.7

<sup>1</sup> Adjusted for local and cross-border inter-dealer double-counting (ie "net-net" basis).

Sources: Triennial Central Bank Survey; BIS calculations.

Schrimpf (2013)).<sup>3</sup> It is also possible that high interest rate differentials and the scope for leveraged carry trades in some EME currencies have increased investor interest: particularly strong growth was seen between April 2010 and April 2013 in many high-interest rate currencies commonly identified as carry trade targets, such as the Indian rupee, Mexican peso and Turkish lira. The reduction of barriers to capital mobility in some countries may also account for an increasing importance of turnover with "other financial institutions". In the past, limited capital account openness reduced the share of trading with financial customers (Tsuyuguchi and Wooldridge (2008)).

Another possible explanation is that the activity of "other financial institutions" may in part reflect official sector interaction with currency markets, such as FX intervention where the official sector has leaned against appreciation pressures. The new survey breaks down the category of other financial institutions into subcategories. Notably, official sector financial institutions generally occupy a larger share in the category of "other financial institutions" in emerging economies (around 7%) than in advanced ones (2%). The share is highest in emerging Asia (8%), even more so when the region's two largest financial centres are not included (10%).

### OTC interest rate derivatives

Interest rate derivatives markets in EMEs are still at an early stage of development. They have grown by one third over the past three years, but the average daily turnover of \$84 billion (Table 3) remains at only 15% the size of FX OTC markets. Interest rate derivatives turnover in EMEs is also less than 4% of that in advanced economies, compared with a much larger proportion of 19% for OTC FX derivatives turnover. When it comes to turnover on exchanges only, EMEs also lag, at 3% of the turnover on advanced economy exchanges.

Growth in EME interest rate derivatives turnover was almost completely driven by Asia. Activity was particularly strong in Hong Kong SAR and Singapore, which together accounted for 16 percentage points of the 33% growth. By contrast, turnover fell by 35% in Latin America, owing to a 50% decline in interest rate derivatives in Brazil, the most active market in the region.

The lagging development of EME interest rate derivatives relative to FX markets is also reflected in the large share of the reporting dealer segment. Nearly 60% of transactions go through reporting dealers, only marginally lower than in previous surveys. By contrast, in advanced economies the turnover share of reporting dealers is barely more than one third.<sup>4</sup>

<sup>3</sup> High-frequency trading was a reason cited earlier for the rapid growth in advanced economies of trading with "other financial institutions" (King and Rime (2010)). But we think that is unlikely to be the case in emerging markets, at least not to the same extent, because HFT is more common in spot than in derivatives markets. High-frequency trading in EME currencies, however, may pick up in the future, as EME currencies are increasingly featured on the relevant electronic trading platforms.

<sup>4</sup> The other main category, "other financial institutions", accounts for only 33% of OTC IR derivatives turnover in EMEs (59% in advanced economies). Although a further breakdown of this category is not available, this likely reflects the smaller turnover share of institutional investors, hedge funds and proprietary traders. Typically, this is an indication of an early stage of market development.

## OTC interest rate derivatives turnover in emerging market jurisdictions<sup>1</sup>

Daily average in April<sup>2</sup>

Table 3

	2007	2010	2013	Growth 2010–13	Contribution to IR derivatives market growth in EMEs 2010–13	Share in EME market 2013
	In billions of US dollars			In per cent		
Total emerging economies	66.8	63.0	83.8	32.9	32.9	100
Total advanced economies	1,618.7	1,990.7	2,259.2	13.5	.	.
Asia	58.0	49.0	67.1	37.0	29.4	80.1
<i>Hong Kong SAR</i>	11.6	12.1	18.7	54.4	10.7	22.3
<i>Singapore</i>	37.4	22.0	25.5	16.1	5.7	30.4
<i>Korea</i>	3.9	8.1	5.8	-28.0	-3.7	6.9
<i>Other</i>	5.2	6.8	17.1	150.8	16.7	20.4
Latin America	2.1	7.9	5.2	-34.5	-4.5	6.2
<i>Brazil</i>	0.1	6.6	3.3	-49.7	-5.4	4.0
<i>Mexico</i>	2.0	1.2	1.7	42.2	0.8	2.0
Central and eastern Europe	3.1	1.5	2.5	68.1	1.6	3.0
<i>Poland</i>	2.0	1.2	2.1	81.9	1.5	2.5
Other emerging market economies	3.5	4.6	9.0	94.3	7.1	10.8
<i>Memo:</i>						
With reporting dealers	43.3	39.0	49.3	26.7	.	58.9
With other financial institutions	20.1	21.2	27.3	28.7	.	32.6
With non-financial customers	2.7	2.8	7.0	148.5	.	8.4

<sup>1</sup> Forward rate agreements, interest rate swaps, interest rate options and other interest rate products. <sup>2</sup> Adjusted for local and cross-border inter-dealer double-counting (ie "net-net" basis).

Source: Triennial Central Bank Survey.

## The trading of EME currencies: onshore versus offshore

The earlier analysis has focused on FX trading in EME *jurisdictions*, but in recent years the trading of EME *currencies* – in particular offshore – has been even more buoyant. Global OTC FX spot and derivatives transactions grew by more than 71% in the 2010–13 period (Table 4). This is well above the growth of FX transactions taking place in EME jurisdictions alone. This increase in global turnover is far greater than the 34% increase in turnover seen for advanced economy currencies.

Among emerging market currencies, those of emerging Asia still account for almost half (47%) of total turnover, while those of Latin America and central/eastern Europe account for 22% and 24%, respectively. Turnover in Latin American currencies has increased the most, by 144% between 2010 and 2013. Although starting from a much lower base, Latin America contributed virtually the same amount to the growth of EME currency turnover as did emerging Asia. Among specific currencies, turnover growth in the Chinese renminbi, Mexican peso and Brazilian real has been particularly rapid at 249%, 171% and 117%, respectively.

The most rapid growth in the turnover of EME currencies has been in the offshore component:<sup>5</sup> the offshore share of total FX transactions has steadily increased across a broad spectrum of currencies (Graph 2). While the offshore trading share of a currency is not the only indicator, it is an important gauge of how international a currency is.<sup>6</sup> Overall, growth in the daily offshore turnover of Asian currencies contributed 35 percentage points to their total growth of 41% in the 2010–13 period. A similar pattern emerges for the other major EME regions Latin America and central/eastern Europe. This is also consistent with previous periods such as 2007–10, when offshore trades were an equally dominant driver of turnover

### Emerging market currencies – global FX OTC market turnover

Daily average in April<sup>1</sup>

Table 4

	2007	2010	2013	Growth 2010–13	Contribution to growth in EME currencies 2010– 13	Global share 2013
	In billions of US dollars			In per cent		
Emerging market currencies	415.7	587.5	1,006.6	71.4	71.4	18.8
Emerging Asian currencies	236.0	332.9	468.2	40.7	23.0	8.8
<i>Chinese renminbi</i>	15.0	34.3	119.6	249.0	14.5	2.2
<i>Hong Kong dollar</i>	89.9	94.0	77.4	-17.6	-2.8	1.4
<i>Singapore dollar</i>	38.8	56.3	74.6	32.5	3.1	1.4
<i>Korean won</i>	38.4	60.3	64.2	6.5	0.7	1.2
<i>Indian rupee</i>	23.6	37.7	52.8	39.8	2.6	1.0
Latin American currencies	63.7	90.4	220.9	144.3	22.2	4.1
<i>Mexican peso</i>	43.6	49.9	135.3	170.9	14.5	2.5
<i>Brazilian real</i>	13.1	27.2	59.2	117.4	5.4	1.1
Central and eastern Europe	78.6	126.9	243.3	91.6	19.8	4.6
<i>Russian rouble</i>	24.9	35.8	85.4	138.2	8.4	1.6
<i>Turkish lira</i>	5.9	29.3	70.3	140.1	7.0	1.3
<i>Polish zloty</i>	25.4	32.0	37.4	16.9	0.9	0.7
Other emerging market economies	37.4	37.2	74.3	99.6	6.3	1.4
<i>South African rand</i>	30.3	28.7	59.6	107.8	5.3	1.1
Advanced economies	5,984.4	7,173.4	9,599.2	33.8	.	179.6
<i>US dollar</i>	2,845.4	3,370.0	4,652.2	38.0	.	87.0
<i>Euro</i>	1,231.2	1,550.8	1,785.7	15.1	.	33.4
<i>Japanese yen</i>	573.4	754.2	1,231.2	63.3	.	23.0

<sup>1</sup> Adjusted for local and cross-border inter-dealer double-counting (ie “net-net” basis).

Sources: Triennial Central Bank Survey; BIS calculations.

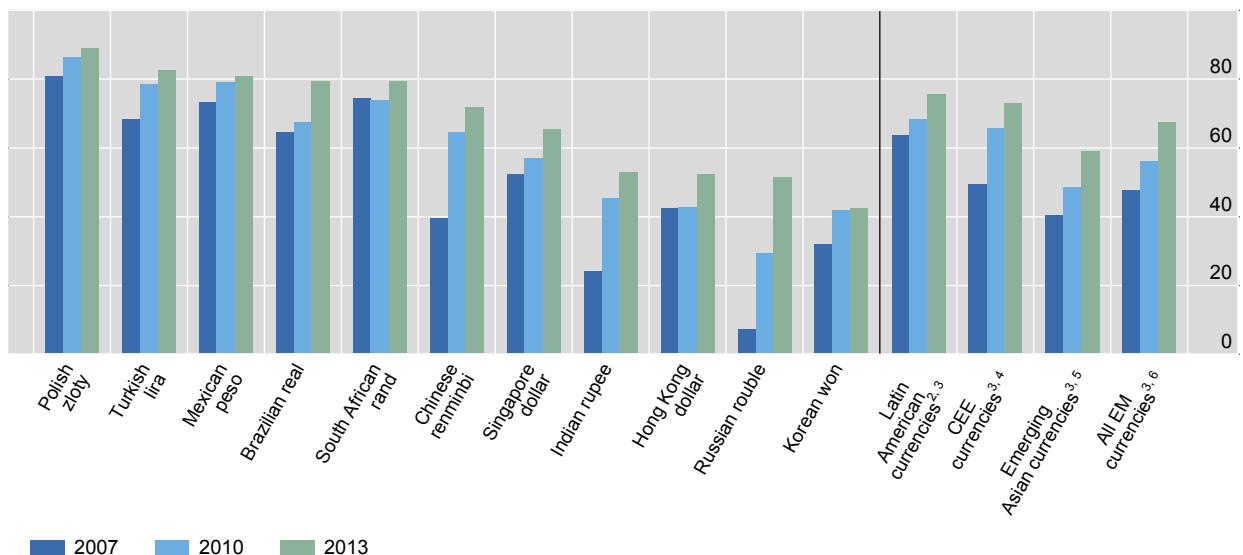
<sup>5</sup> We define offshore trades as all trades executed outside the jurisdiction where a currency is issued.

<sup>6</sup> A currency’s internationalisation involves many more dimensions than just the location of its trades. More generally, internationalisation implies a currency’s increasing use by non-residents as a store of value (eg international reserve holdings), a medium of exchange (eg invoicing of trade), and a unit of account (Frankel (2012)). See also the discussion in Goldberg (2013).

## Offshore share of total FX turnover

In per cent<sup>1</sup>

Graph 2



<sup>1</sup> Based on data adjusted for local and cross-border inter-dealer double-counting (ie “net-net” basis). <sup>2</sup> Latin American currencies = Argentine peso, Brazilian real, Chilean peso, Colombian peso, Mexican peso and Peruvian new sol. <sup>3</sup> Weighted averages based on FX turnover. <sup>4</sup> Central and eastern European currencies = Bulgarian lev, Czech koruna, Hungarian forint, Lithuanian litas, Latvian lats, Polish zloty, Romanian leu, Russian rouble and Turkish lira. <sup>5</sup> Emerging Asian currencies = Chinese renminbi, New Taiwan dollar, Hong Kong dollar, Indian rupee, Indonesian rupiah, Korean won, Malaysian ringgit, Philippine peso, Singapore dollar and Thai baht. <sup>6</sup> All emerging market currencies = Asia, CEE, Latin America, Bahrain dinar, Israeli new shekel, South African rand and Saudi riyal.

Sources: Triennial Central Bank Survey; BIS calculations.

in EME currencies.<sup>7</sup> Growth in EME FX turnover is also far in excess of related country trade growth, suggesting that the “financialisation” of EME currencies has continued as in earlier periods (McCauley and Scatigna (2013)).

### Role of the renminbi and limited regional trading of EME currencies

Despite the growth in offshore trading, the trading of most EME currencies within their proximate geographical region remains quite limited. Emerging Asia currencies are the most regionally traded among the major emerging market regions, with more than a quarter (26%) of trading taking place offshore, but within emerging Asia (Table 5). Nevertheless, offshore trading in the United Kingdom (19%) and the United States (8%) together account for a larger share in the turnover of emerging Asia currencies – and this despite the large offshore trading hubs in Hong Kong SAR and Singapore.

Within emerging Asia, the Chinese renminbi is playing an increasingly prominent role, as a significant part of its turnover is generated offshore within the region. Offshore turnover amounts to \$86 billion per day, equivalent to 72% of its total volume globally, and nearly two thirds is within emerging Asia. In this respect the Chinese renminbi is unique among all major emerging market currencies. Even

<sup>7</sup> Since 2013 the reporting of offshore trades in 24 non-G8 currencies is compulsory, correcting a downward bias affecting previous surveys. Until 2010, the reporting for “non-major” currencies was compulsory only in the issuing country, whereas reporting of offshore trades in non-major currencies was left to the discretion of the offshore jurisdiction.

though the high offshore ratio is in part due to restrictions on onshore trading, its greatly increased turnover within emerging Asia reflects China's increasingly dominant economic and financial role in the region (Park and Song (2011), Cheng et al (2013)).

No other major emerging market region possesses a regional currency with similar importance. Even though both Latin American and central/eastern European (CEE) currencies are to a large extent traded outside their home jurisdiction (offshore ratios of 76% and 73% respectively), their offshore penetration within their respective geographical regions is virtually zero. While the Mexican peso and the Brazilian real are now the first and fifth most traded EME currencies globally, their growth has been driven mainly by derivatives markets located in the United States (41%) and the United Kingdom (26%). Meanwhile, the euro area's role for the trading of CEE currencies has become quite limited (8% of total and 11% of offshore turnover) – perhaps the result of its banks shifting trading desks to London.

### Offshore trading of emerging market currencies, 2013

Daily average in April,<sup>1</sup> shares in total – onshore and offshore – OTC FX market turnover

Table 5

	Offshore turnover	Offshore share in global turnover	Intra-regional share <sup>2</sup>	Share of regional financial centres <sup>3</sup>	UK	US	Euro zone	Other
	USD bn	In per cent						
Emerging market currencies <sup>4</sup>	678.7	67.4	12.6	...	29.9	16.4	4.6	3.9
Emerging Asian currencies <sup>4</sup>	277.2	59.2	26.6	25.3	18.8	8.4	2.6	2.8
<i>Chinese renminbi</i>	86.1	72.0	45.5	43.7	18.0	5.8	1.5	1.2
<i>Hong Kong dollar</i>	40.7	52.6	10.7	8.1	22.9	8.9	5.1	5.0
<i>Singapore dollar</i>	48.8	65.4	12.6	11.4	27.8	15.5	3.7	5.8
<i>Korean won</i>	27.4	42.7	21.2	21.1	11.3	7.1	1.5	1.6
<i>Indian rupee</i>	28.0	53.0	27.0	26.9	15.1	8.5	1.1	1.5
Latin American currencies <sup>4</sup>	167.5	75.8	0.5	0.4	26.1	40.7	5.2	3.3
<i>Mexican peso</i>	109.6	81.0	0.4	0.3	27.5	45.7	4.3	3.2
<i>Brazilian real</i>	47.1	79.6	0.2	0.1	29.3	39.8	7.9	2.5
Central and eastern Europe <sup>4</sup>	177.9	73.1	0.6	0.1	50.1	10.0	7.8	4.6
<i>Russian rouble</i>	44.0	51.6	0.6	0.0	35.9	7.4	4.5	3.1
<i>Turkish lira</i>	58.1	82.6	0.1	0.0	61.0	11.3	4.2	6.0
<i>Polish zloty</i>	33.3	89.0	0.7	0.0	54.1	14.0	13.0	7.2
Other emerging market economies <sup>4</sup>	56.0	75.4	...	...	44.9	15.4	5.1	10.1
<i>South African rand</i>	47.4	79.5	...	...	45.1	17.7	5.5	11.2

<sup>1</sup> Adjusted for local and cross-border inter-dealer double-counting (ie "net-net" basis). <sup>2</sup> Intraregional is defined as all offshore trades within the respective emerging market region. <sup>3</sup> Regional financial centres are defined as Hong Kong SAR and Singapore for emerging Asia, Brazil and Mexico for Latin America, and Turkey and Russia for central and eastern Europe. <sup>4</sup> For a full list of currencies of respective regions, see the footnote of Graph 2.

Sources: Triennial Central Bank Survey; BIS calculations.

## The UK as offshore trading hub and the US dollar as vehicle currency

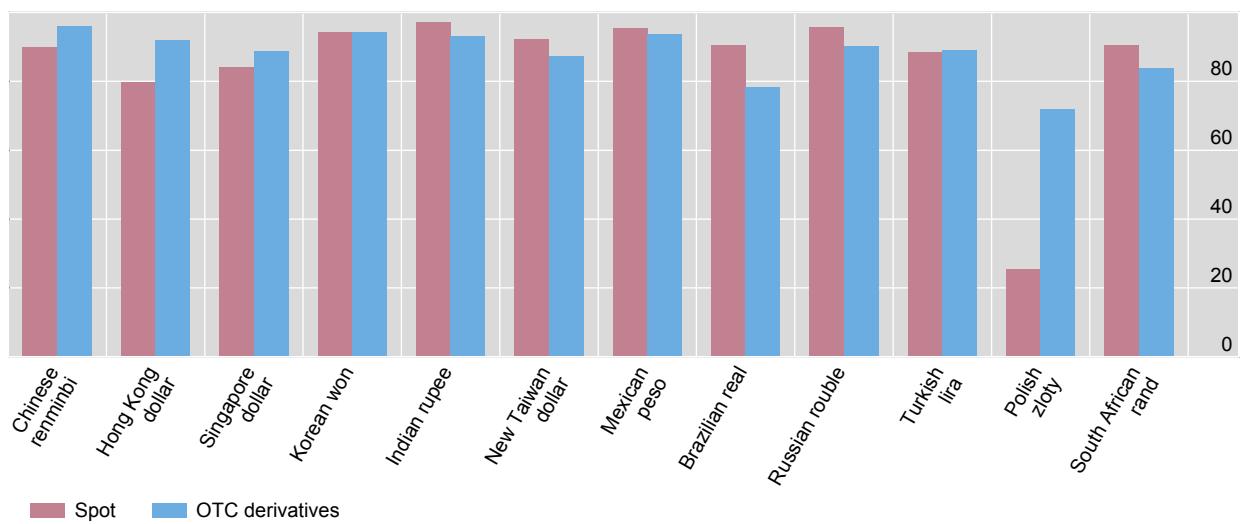
As EME currencies became increasingly international, the United Kingdom established itself as their leading offshore trading hub. In total, 30% of all FX OTC market turnover involving EME currencies takes place in the United Kingdom (Table 5). The next largest offshore trading hub is the United States at 16%, with growth driven largely by the Mexican peso and Brazilian real. The United Kingdom, however, hosts a large share of turnover in all EME currencies, with virtually no exceptions. And its role as an offshore trading hub has been expanding. In 2007, the United Kingdom reported a share of 13% of the global FX market for EME currencies, which had risen to 22% by 2010, and further to 30% by 2013.<sup>8</sup>

Consistent with the growing internationalisation but limited regionalisation of EME currencies is the dominant and established role of the US dollar as a vehicle currency. The improved reporting of offshore trades against major EME currencies in the 2013 survey allows, for the first time, a precise and comprehensive view on EME currency trades against the US dollar.<sup>9</sup> Graph 3 shows all EME currencies for which these data have been collected. Overwhelmingly, the major EME currencies

## The US dollar as the dominant vehicle currency<sup>1</sup>

Share of global trades against the US dollar, in per cent, April 2013

Graph 3



<sup>1</sup> Based on data adjusted for local and cross-border inter-dealer double-counting (ie "net-net" basis).

Sources: Triennial Central Bank Survey; BIS calculations.

<sup>8</sup> As reporting requirements have changed over time, this growth to some extent reflects underreporting in previous periods. See also footnote 5.

<sup>9</sup> In addition to offshore trades of the US dollar against the Brazilian real, Chinese renminbi, Hong Kong dollar, Indian rupee, Korean won and South African rand as well as the G8 currencies covered in the 2010 survey, the latest survey requires reporting of US dollar trades against six additional emerging market currencies plus two advanced economy currencies: the Mexican peso, the Polish zloty, the Russian rouble, the Singapore dollar, the New Taiwan dollar and the Turkish lira; plus the New Zealand dollar and the Norwegian krone. Reporting of offshore turnover against the euro and Japanese yen has also been extended (for more details, see [www.bis.org/publ/rpfx13.htm](http://www.bis.org/publ/rpfx13.htm)).

are traded against the US dollar – and this holds true for both the spot and the OTC derivatives market.<sup>10</sup>

## Cross-border financial flows and the internationalisation of emerging market currencies

The large increase in FX turnover has coincided with surging cross-border financial flows to and from emerging markets over the same period. Very low interest rates and unconventional monetary policies in advanced economies during 2010–13 have increased the appetite of international investors and banks for emerging market assets (Caruana (2013), Rey (2013)). In addition, Europe's crises have encouraged many international investors to shift their focus more towards emerging markets.

Whereas the link between more broad-based macroeconomic measures, such as GDP per capita or cross-border trade, and FX market development is well documented, the link between cross-border financial linkages and FX market development has been less intensively studied.<sup>11</sup> We investigate the potential importance of this link by analysing the correlation between mutual fund flows<sup>12</sup> and FX market turnover. From EPFR, a data provider, we obtain weekly equity and bond mutual fund flows and their allocation to individual EMEs. We then approximate daily absolute turnover by averaging the sum of absolute weekly flows in April (divided by the average number of working days) over the 12 months leading up to the respective Triennial Survey dates (April 2007, 2010 and 2013). FX market turnover is measured as the global turnover of the respective EME currencies from the Triennial Surveys.

Graph 4 shows the bivariate correlations of mutual fund portfolio flows and FX turnover for the major EME regions. The scatter plots depict one point for each country's gross cross-border portfolio flows (x-axis, in logs) and global FX market turnover in the corresponding currency (y-axis, in logs). In each panel we plot all available portfolio flow–currency turnover pairs for the last three Triennial Surveys together.

Consistent with the idea that international investors could be an important driver of the growing demand for EME currencies, each panel in Graph 4 exhibits a positive and statistically highly significant relationship between portfolio flows into and out of emerging markets and the FX market turnover in the respective currencies. The estimated size of the link varies across EME regions, but is in all cases economically meaningful. In the case of Asia, for instance, a 10% increase in cross-border fund flows is associated with a 7% increase in global FX turnover in

<sup>10</sup> This applies to both onshore trades and offshore trades (89% and 86% of trades are made against the US dollar respectively). An exception is the Polish zloty, which particularly in the spot market is exchanged mainly with the euro.

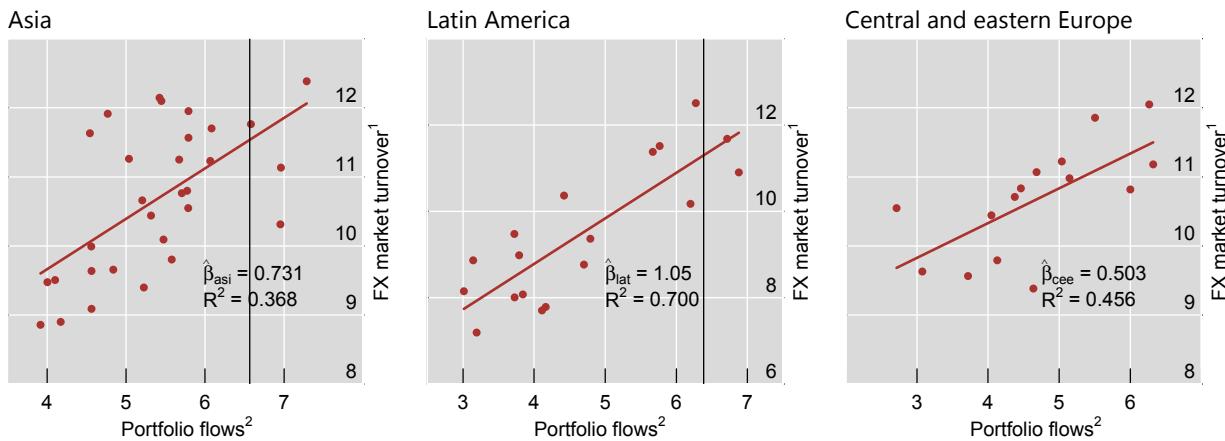
<sup>11</sup> One exception is Thimann (2008), who finds that the development of financial instruments denominated in an emerging economy's domestic currency helps to explain the size of cross-border portfolio holdings.

<sup>12</sup> Mutual fund flows are also proxy for the investment activity of international investors, who are likely to be a main driver for currency hedging demand. Hence, our measure allows a more direct interpretation of the results, but it is narrower than the portfolio flows from balance of payments data used in the literature (Forbes and Warnock (2012)).

## Cross-border portfolio flows and FX market turnover in EME currencies

In logarithms of millions of US dollars, for respective countries in April 2007, 2010 and 2013

Graph 4



<sup>1</sup> In logarithms of millions of US dollars. Average daily turnover in April 2007, 2010 and 2013 for currencies issued in respective countries (adjusted for local and cross-border inter-dealer double-counting, ie "net-net" basis). <sup>2</sup> In logarithms of millions of US dollars. Estimated absolute cross-border portfolio flows by country allocation. Previous 12-month average of sum of weekly inflows plus outflows in April (divided by 21.5 working days). The t-statistics on the x-coefficient regressions presented in the first, second, and third panels are 4.0, 6.1 and 3.3, respectively.

Sources: Triennial Central Bank Survey; EPFR; BIS calculations.

emerging Asia currencies; in Latin America the link is even stronger, at 10%.<sup>13</sup> While the results are tentative and should be interpreted with caution, they are nevertheless suggestive of a significant role for financial flows in explaining the increased turnover in EME currencies.

## Conclusion

FX market growth in emerging market currencies is driven mainly by growth in derivatives markets. At the same time, an increasing share of emerging market currencies is traded offshore and, in that sense, these currencies are becoming more international. However, with the significant exception of the Chinese renminbi in emerging Asia, the offshore trading of EME currencies within their proximate geographical region is relatively small. One explanation for both the strong growth in the derivatives market and the internationalisation of EME currencies is the increasing demand from international investors to expand or hedge exposure to currency risk, as reflected in the strong correlation between growth in EME currency turnover and cross-border mutual fund flows.

<sup>13</sup> This represents the total effect of financial flows on FX OTC turnover, including the potential effects of other variables such as GDP or trade on financial flows. When GDP is included in the regression, the coefficients on fund flows remain consistently positive, but the coefficients on GDP are insignificant or negative. Estimates are highly similar when looking at the correlation between cross-border flows and derivatives market turnover only.

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## The OTC interest rate derivatives market in 2013<sup>1</sup>

*This feature analyses the market for OTC interest rate derivatives using data from the Triennial Central Bank Survey. Low and stable interest rates after the financial crisis went hand in hand with low but still positive turnover growth in most currencies. The increase was entirely driven by a larger volume of contracts with financial institutions other than dealers. The share of inter-dealer trades has shrunk to 35%, the lowest since the survey's inception. Despite rapid growth in emerging market currencies, trading remains concentrated in major currencies and financial centres. Changes in regulation have led to more contracts being centrally cleared.*

*JEL classification:* E43, G15, G23.

After growing rapidly prior to the financial crisis, activity in the market for over-the-counter (OTC) interest rate derivatives, such as swaps and forward rate agreements (FRAs), has since expanded at a more moderate pace. Even so, daily turnover averaged \$2.3 trillion in April 2013, 14% higher than three years before (Graph 1, left-hand panel).

Activity in this market remains opaque. Admittedly, transparency has improved from the mid-1990s, when central banks expanded their regular survey of activity in foreign exchange markets to also cover turnover and amounts outstanding in OTC interest rate derivatives. And data warehouses and clearing houses provide some data on the transactions they process. Even so, the Triennial Survey remains to date the most comprehensive source of information.

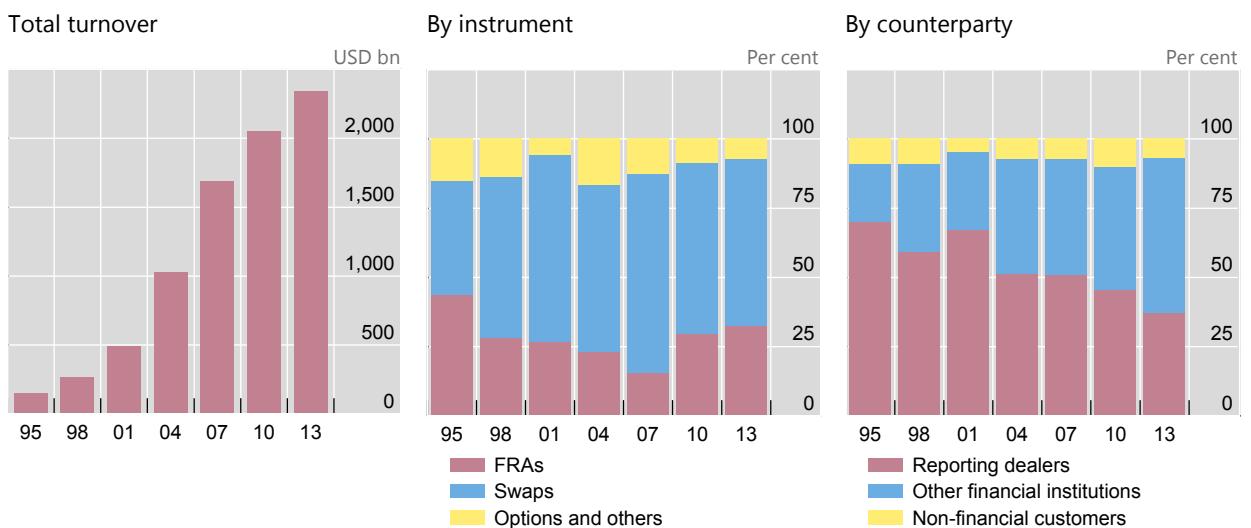
This special feature uses data from the latest Triennial Survey, covering April 2013, to shed light on the structure of the OTC interest rate derivatives market and to analyse the main drivers for activity. We find that low and stable interest rates after the financial crisis have gone hand in hand with low but still positive turnover growth in most currencies. A larger volume of contracts with financial institutions other than dealers coincided with declining inter-dealer activity, causing the share of inter-dealer trades to shrink to 35%, the lowest since the inception of the Survey. The volume of transactions with non-financial firms also declined. Despite rapid growth in emerging market currency activity, trading remained concentrated in

<sup>1</sup> The views expressed in this article are those of the authors and do not necessarily reflect those of the BIS or the CGFS. We are grateful to market participants, the ECB and market infrastructure providers, particularly LCH.Clearnet, for providing data and useful discussions. We thank Claudio Borio, Dietrich Domanski, Robert McCauley and Philip Wooldridge for comments. And for excellent help with the data we are deeply obliged to Magdalena Erdem and Denis Petre.

## OTC interest rate derivatives turnover

Net-net basis,<sup>1</sup> daily averages in April

Graph 1



<sup>1</sup> Adjusted for local and cross-border inter-dealer double-counting.

Source: Triennial Central Bank Survey.

major currencies and financial centres. Changes in regulation have resulted in more contracts being centrally cleared.

The first section briefly reviews the main instruments, currencies, trading locations and players in this market. In the second section, we look at some of the potential reasons for the slowdown in turnover growth. The final section concludes.

## The OTC interest rate derivatives market in April 2013

As interest rates deeply influence the performance of both financial and non-financial firms, the enormous size of markets for derivatives that facilitate their hedging and reallocation should come as no surprise. With an average of \$7.4 trillion per trading day in April 2013, total turnover in interest rate derivatives, including both exchanges and OTC markets, was well above the \$5.5 trillion traded in the FX segment.<sup>2</sup>

OTC contracts account for only one third of turnover in the interest rate segment but make up the bulk of the open positions. Notional amounts outstanding of OTC interest rate derivatives stood at \$561 trillion in mid-2013, far above the \$62 trillion of open interest on the international derivatives exchanges. This discrepancy reflects differences in the structure of the two markets and in the maturity of the contracts. Exchange-traded futures and options tend to have much shorter maturities than OTC derivatives. Shorter maturity increases turnover relative to outstanding amounts. Furthermore, on an exchange, offsetting positions are

<sup>2</sup> The Triennial Survey measures turnover and amounts outstanding in terms of notional amounts, or face value, of the contracts. Most interest rate contracts involve the exchange of interest payments calculated on the basis of the notional amount. The notional amounts as such are not exchanged.

routinely netted out. In contrast, OTC market contracts tend to "pile up". As a result, OTC market participants end up with a large number of offsetting or partially offsetting contracts, resulting in a high total notional amount relative to both turnover and net exposure. That said, this difference between exchange-traded and OTC markets has diminished as market participants make increased use of multilateral termination services to trim the size of their derivatives book (Ledrut and Upper (2007)).

While turnover in OTC interest rate derivatives expanded rapidly up to 2007, growth slowed noticeably after the financial crisis. The annual compound rate of turnover growth fell from well over 20% between 1995 and 2007 to 6% in the subsequent six years (Graph 1, left-hand panel). Turnover growth has varied across instruments. Turnover growth in FRAs (26%) across all currencies outstripped that in swaps (11%). The trading volumes of options contracted slightly, by 4%.

Interest rate swaps remain the most heavily traded contract in the OTC interest rate segment, followed by forward rate agreements (FRAs) and interest rate options (Graph 1, centre panel). The share of interest rate swaps in total turnover stood at 60% in the 2013 survey. This is well below its share on the eve of the crisis, in 2007 (72%), but is in line with the values recorded in previous surveys. The share of FRAs expanded from 15% in 2007 and 29% in 2010 to 32% in 2013, while that of options and other products fell to 7%.

### Declining role of inter-dealer trading

A relatively small number of major derivatives dealers have dominated the OTC derivatives market since its inception in the 1980s. These dealers continue to be important as counterparties for other market participants, but the share of inter-dealer trading is falling. In April 2013, transactions between dealers accounted for only 35% of turnover, down from 44% in 2010 and a peak of 66% in 2001 (Graph 1, right-hand panel). It is an open question whether this reflects a reduction in proprietary trading in response to regulatory changes, or increasing market concentration, or changes in how dealers offset the risk from their client positions.

The declining share of inter-dealer trading has coincided with a surge in transactions with other financial institutions. This rather diverse group accounted for 58% of total turnover in April 2013, up from 46% in the previous survey. In addition to smaller banks outside the survey's reporting population, it includes institutional investors such as mutual and pension funds as well as insurance companies, hedge funds and special purpose vehicles.

Non-financial customers continue to play a relatively minor role in this market. This group, which includes non-financial corporations and governments, was on one side of a mere 7% of all trades, roughly in line with the average of past surveys. Non-financial entities trade predominantly interest rate swaps (\$139 billion), followed by FRAs (\$16 billion) and interest rate options and other products (\$13 billion).

### High currency concentration despite rapid growth in EME currencies

Trading in OTC interest rate derivatives is still highly concentrated in a small number of currencies. Turnover in euros went up by 37%, lifting the share of this currency to just under one half of global interest rate turnover (Table 1). Turnover in contracts

## OTC interest rate derivatives turnover,<sup>1</sup> by currency

Net–net basis,<sup>2</sup> daily averages in April

Table 1

	2007	2010	2013	Growth 2010–13
	In billions of US dollars			In per cent
All currencies	1685.5	2053.7	2343.0	14.1
EUR	655.8	833.9	1145.8	37.4
USD	532.4	653.6	656.9	0.5
GBP	172	213.5	186.8	-12.5
AUD	18.7	36.6	76.1	107.7
JPY	136.7	124	69.6	-43.9
SEK	32.9	20.2	36.2	78.7
CAD	15.5	48.3	29.7	-38.4
BRL	1.7	3	16.3	450
ZAR	3.2	5.4	15.8	191.3
CNY	0.2	1.9	14.5	652.8
CHF	18.6	20.4	14.4	-29.3
KRW	4.8	16.4	12.1	-26.2
MXN	5.3	4.6	9.6	109.9

<sup>1</sup> Forward rate agreements, interest rate swaps, interest rate options and other interest rate products. <sup>2</sup> Adjusted for local and cross-border inter-dealer double-counting.

Sources: Triennial Central Bank Survey; authors' calculations.

on US dollar interest rates remained stable. As a consequence, the share of the dollar in global turnover fell to 28%. The markets for listed futures and options are approximately the same size: \$1.8 trillion for the euro and \$2.1 trillion for the dollar. Sterling kept its place as the third most important currency, with a market share of 8% despite a 13% fall in activity.

The importance of the other advanced economy currencies has gradually changed over the years. Rapid growth in contracts on Australian and Swedish rates contrasted with lower activity in most other advanced economy currencies. Turnover in Australian dollar-based contracts even overtook trading in yen-denominated derivatives.

Another notable development of the last few years has been the surge in turnover in emerging market currency contracts – albeit from a comparatively low base (see Ehlers and Packer (2013)). The surge in turnover was most notable for the Brazilian real, the South African rand and the Chinese renminbi. The turnover levels are, however, still much lower than those for the top three currencies.

Turnover growth also varied greatly across currencies by instrument. In the FRA market, rapid turnover increases in contracts on euro and sterling interest rates contrasted with lower volumes in US dollar contracts (Table 2). In the swap market, turnover increased by just under one quarter in both the euro and dollar segments, whereas activity in sterling and yen-denominated contracts declined sharply.

## OTC interest rate derivatives turnover,<sup>1</sup> by currency and instrument

Net–net basis,<sup>2</sup> daily averages in April

Table 2

	2007	2010	2013	Growth 2010–13	Contribution to total growth 2010–13
	In billions of US dollars			In per cent	
All currencies	1685.5	2053.7	2343.0	14.1	
FRAs	258.4	599.7	753.7	25.7	7.5
Swaps	1210.4	1272.0	1415.2	11.3	7.0
Options and other products	216.7	181.9	174.1	−4.3	−0.4
EUR	655.8	833.9	1145.8	37.4	
FRAs	66.5	202.1	398.5	97.2	23.6
Swaps	527.5	561.3	693.5	23.5	15.8
Options and other products	61.8	70.4	53.8	−23.6	−2.0
USD	532.4	653.6	656.9	0.5	
FRAs	97.9	281.7	193.8	−31.2	−13.4
Swaps	321.7	302.2	373.7	23.6	10.9
Options and other products	112.9	69.7	89.5	28.3	3.0
GBP	172.0	213.5	186.8	−12.5	
FRAs	41.6	53.2	87.7	65.0	16.2
Swaps	124.2	141.5	92.3	−34.8	−23.0
Options and other products	6.2	18.8	6.7	−64.2	−5.7
AUD	18.7	36.6	76.1	107.7	
FRAs	3.2	8.1	11.2	39.3	8.6
Swaps	14.1	27.6	62.9	127.8	96.2
Options and other products	1.5	1.0	2.0	103.3	2.8
JPY	136.7	124.0	69.6	−43.9	
FRAs	3.9	2.2	0.3	−87.0	−1.6
Swaps	109.7	113.9	59.6	−47.6	−43.8
Options and other products	23.1	7.9	9.7	22.8	1.5
SEK	32.9	20.2	36.2	78.7	
FRAs	18.5	9.6	19.4	101.0	48.1
Swaps	13.5	6.8	14.6	114.3	38.6
Options and other products	1.0	3.8	2.2	−42.6	−7.9
CAD	15.5	48.3	29.7	−38.4	
FRAs	1.0	9.1	2.0	−78.0	−14.7
Swaps	11.6	38.2	26.8	−29.8	−23.6
Options and other products	2.8	1.0	1.0	−2.6	−0.1

<sup>1</sup> Forward rate agreements, interest rate swaps, interest rate options and other interest rate products. <sup>2</sup> Adjusted for local and cross-border inter-dealer double-counting.

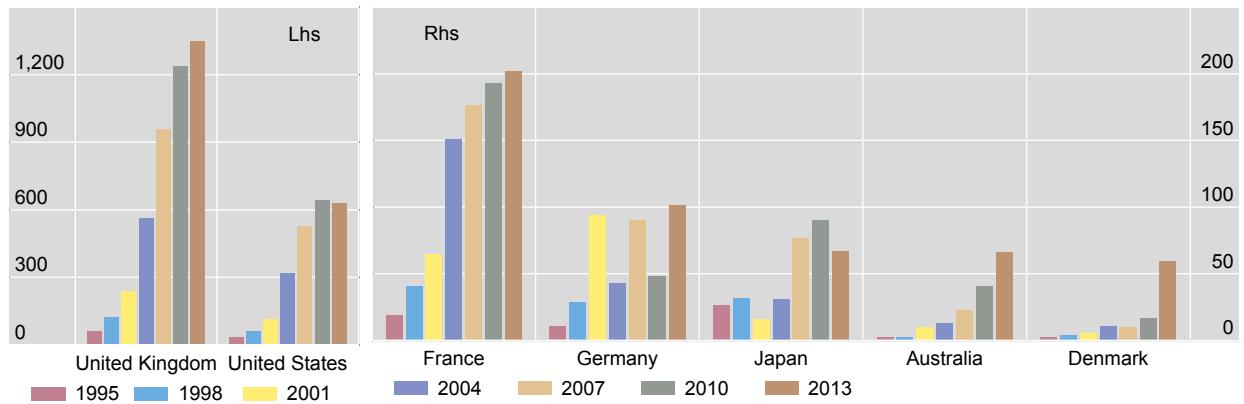
Sources: Triennial Central Bank Survey; authors' calculations.

## Geographical distribution of interest rate market turnover

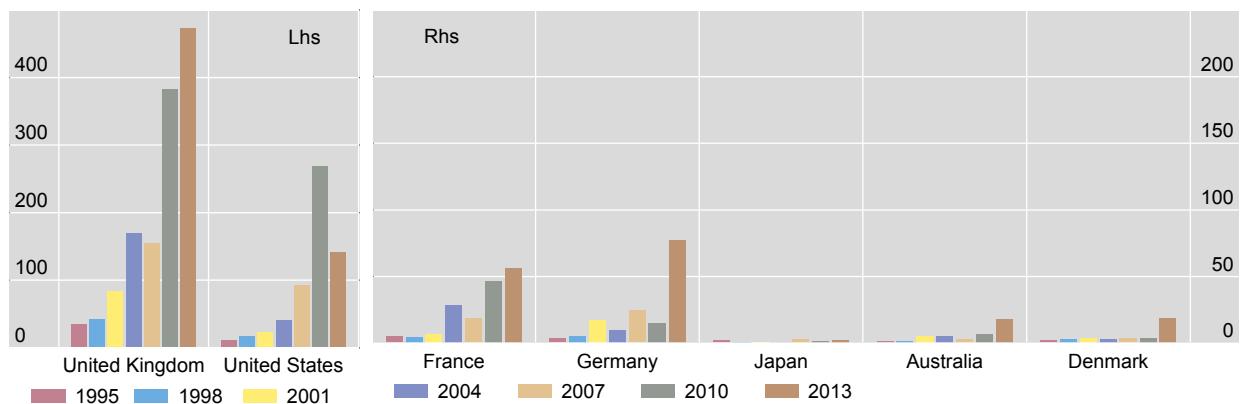
Net-gross basis,<sup>1</sup> daily averages in April, in billions of US dollars

Graph 2

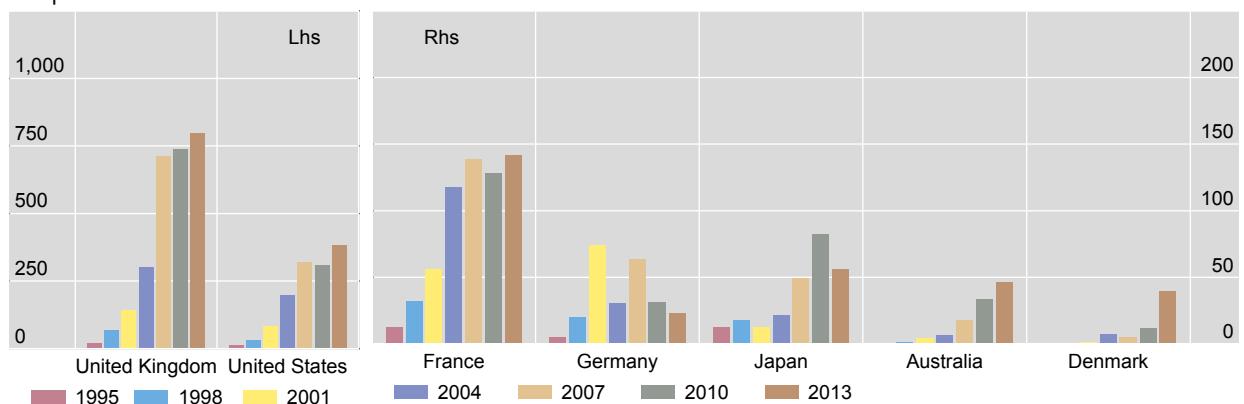
### Total



### FRAs



### Swaps



<sup>1</sup> Adjusted for local inter-dealer double-counting.

Source: Triennial Central Bank Survey.

## A globalised market

Trading is also highly concentrated geographically. Just under one half of the global total was traded via sales desks located in the United Kingdom and another 23% in

the United States (Graph 2, top panel).<sup>3</sup> In continental Europe, turnover in France reached \$202 billion, and \$101 billion in Germany. France has a strong position in trading swaps, whereas Germany is particularly strong in FRAs (Graph 2, centre and bottom panels). Turnover in Denmark surged from \$16 billion in April 2010 to \$59 billion three years later. Of this, \$48 billion is in euro-denominated contracts. Danish financial institutions often use derivatives on euro interest rates to hedge exposures in Danish kroner, as they believe that the greater liquidity of the euro market outweighs the potential currency risk.

In the Asia-Pacific region, turnover in Japan stood at \$67 billion, just ahead of Australia's \$66 billion. Singapore and Hong Kong SAR traded to the tune of \$37 billion and \$28 billion, respectively. Turnover in other regions was far lower. Trading volumes in South Africa, the largest financial centre in Africa, reached \$11 billion. And all Latin American centres combined traded \$6 billion, which is well below the \$32 billion turnover in contracts denominated in Latin American currencies.

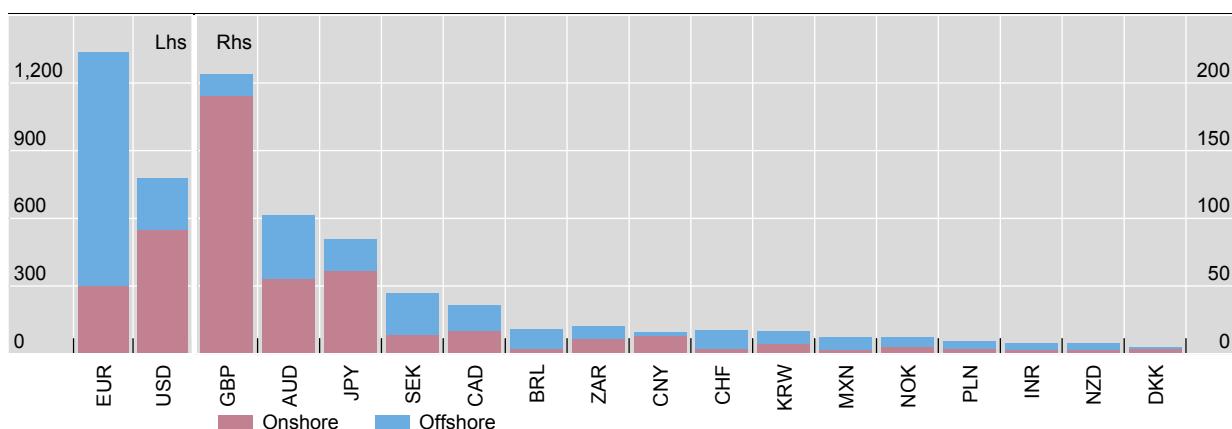
Contracts in most currencies are more heavily traded outside than inside their country, reflecting the market's global character. The bulk of transactions in contracts denominated in currencies as diverse as the Brazilian real, Mexican peso, Swiss franc and the euro are traded offshore (Graph 3). Paradoxically, the least internationalised currencies include the British pound and the US dollar, the home currencies of the two largest financial centres. Other currencies mostly traded in the home country are the Chinese renminbi (81% onshore trading), the Japanese yen (72%) and the Danish kroner (70%).

The home country's time zone helps explain in which offshore centre currencies are traded. The United Kingdom dominates offshore trading in European currencies and the South African rand (Graph 4, left-hand panel). Contracts on Latin American interest rates are traded mainly in the United States (Graph 4, right-hand panel) and those on Asian rates in Hong Kong and Singapore (Graph 4, centre panel). But there

## Onshore and offshore trading

Net-gross basis,<sup>1</sup> daily averages in April, in billions of US dollars

Graph 3



<sup>1</sup> Adjusted for local inter-dealer double-counting.

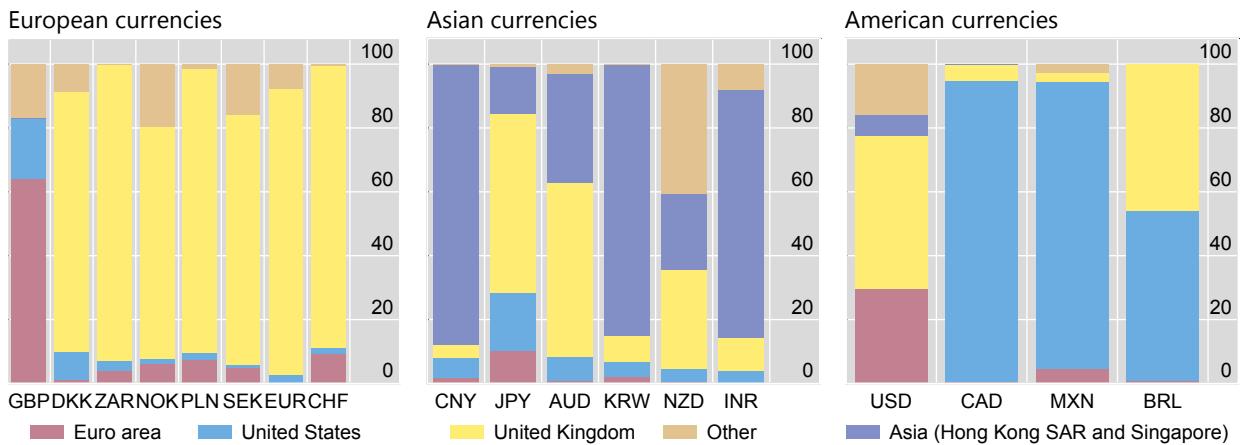
Sources: Triennial Central Bank Survey; authors' calculations.

<sup>3</sup> The discussion of trading location is based on net-gross figures, which strip out local inter-dealer double-counting, whereas that of the previous sections was based on net-net figures, which correct for cross-border as well as local inter-dealer double-counting.

## Offshore trading by financial centre

In per cent

Graph 4



<sup>1</sup> Adjusted for local inter-dealer double-counting.

Sources: Triennial Central Bank Survey; authors' calculations.

are exceptions. The United Kingdom is only slightly behind the United States in trading derivatives on Brazilian rates. The yen, the Australian dollar and the New Zealand dollar are more heavily traded in the United Kingdom than in the Asian centres, although there is also significant New Zealand dollar activity in Australia.

## Central clearing

A significant change in the OTC interest rate derivatives market post-crisis is the increasing role of central clearing. Answers to a supplementary Triennial Survey question indicate that 57% of all FRAs and 35% of all swaps are centrally cleared.<sup>4</sup> This is roughly in line with data provided by LCH.Clearnet, the largest central counterparty in the OTC interest rate derivatives market. The LCH.Clearnet data show significant dispersion of the share of centrally cleared contracts across currencies (Graph 5), although this could in part reflect variations in their market share.

## Drivers of turnover growth

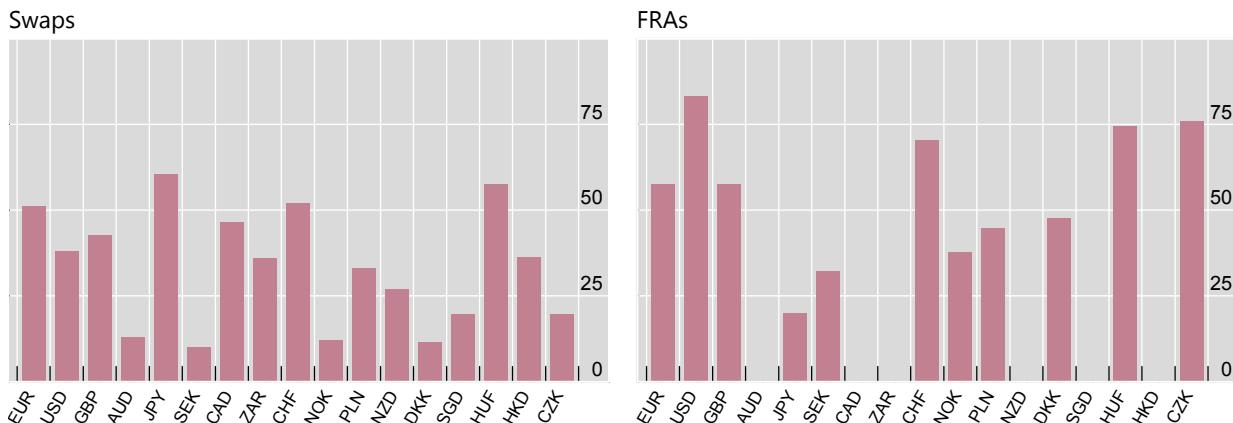
What explains the slowdown in turnover growth after the financial crisis? And what explains the sizeable differences in growth across currencies and instruments? In this section we seek some clues in recent regulatory developments and the various motives for trading interest rate derivatives. We will focus mostly on the variation of growth across currencies. A more thorough analysis of the time series dimension requires better data and will thus be left for future research.

<sup>4</sup> Based on a selection of countries accounting for 76% of global FRA and 67% of total swap turnover.

## Share of centrally cleared transactions

In per cent

Graph 5



Sources: Triennial Central Bank Survey; LCH.Clearnet Ltd; authors' calculations.

## Transforming interest rate exposures and costs

OTC interest rate derivatives, particularly swaps, allow both borrowers and lenders to manage their interest rate exposures and costs without directly adjusting the underlying assets and liabilities.

Evidence suggests that banks and non-financial firms that rely more on debt than equity financing are also more active users of interest rate swaps (Faulkender (2005), Purnanandam (2007)).<sup>5</sup> The relatively low growth in swap turnover may reflect the relatively moderate increase in the volume of outstanding bonds between 2010 and 2013 compared with earlier periods. Our best estimate of the nominal amounts of all outstanding bonds went up by 4% to just under \$100 trillion at the end of March 2013, compared to an increase of 28% between 2007 and 2010.<sup>6</sup> The importance of the bond market's size as a determinant for swap turnover is confirmed at the currency level, where we find a positive correlation between the growth of the volume of bonds outstanding and the increase in swap turnover (Graph 6, left-hand panel).

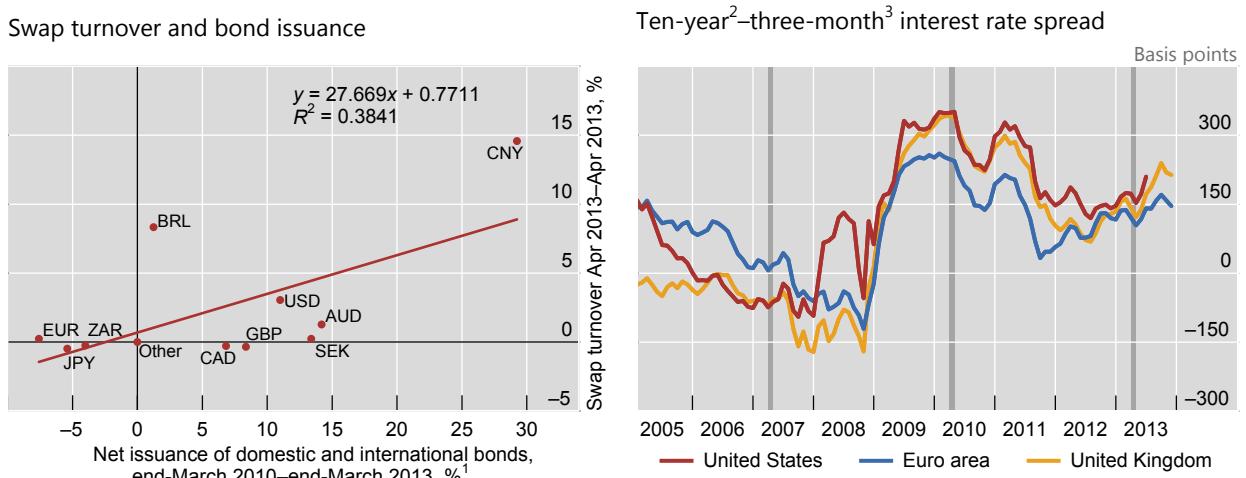
The more moderate growth in swaps may also have been driven by the yield curve flattening for major currencies between 2010 and 2013 (Graph 6, right-hand panel). This follows from evidence that swap market activity depends on the spread between long-term and short-term interest rates (Chernenko and Faulkender (2011)). Banks, partly due to regulatory demands, use swaps to actively manage the maturity gap on their balance sheet. The flatter yield curve should reduce the incentive to enter swaps that receive long-term fixed rates and pay floating rates.

<sup>5</sup> Some firms also use options such as interest rate caps and floors, but the corresponding volumes are an order of magnitude smaller than that of swaps. See Covitz and Sharpe (2005).

<sup>6</sup> Data on global bond issuance in April, which could indicate the hedging activity of bond issuers, are not available. Commercial data providers, such as Dealogic, provide data at high frequencies, but cover only part of the bond market.

## Swap turnover, bond market activity and yield curve slope

Graph 6



<sup>1</sup> Estimated, by currency, as a percentage of total amounts outstanding at end-March 2010. <sup>2</sup> Ten-year government bonds, for euro area German 10-year bond rates. <sup>3</sup> Three-month money market rates.

Sources: national central banks; Bloomberg; Dealogic; Euroclear; Thomson Reuters; Xtrakter Ltd; BIS calculations.

Corporate borrowers typically use swaps to manage the interest rate exposure of their liabilities. Here the reduced relative cost of borrowing long-term at fixed rates could have increased the incentive to swap floating rate liabilities such as syndicated loans into long-term fixed rates. At the same time, non-financial corporations have increasingly turned to the bond market to raise long-term fixed rate funds (BIS (2013)), which reduces the need for swaps as a means of locking in long-term rates. The falling volume of interest rate swaps and other instruments with non-financial corporations suggests that the second factor has dominated in recent years.

Swaps and other rate derivatives are also used by bond investors to manage the interest rate exposures of their portfolios. Portfolio managers often use derivatives to implement overlay strategies, by which a portfolio's interest rate sensitivity is managed separately from its selection of the bonds. Such overlay strategies may involve relatively frequent trading and could account for a significant fraction of swap market turnover. Turnover will, however, not depend mechanically on the size of the bond portfolios but also on the interest rate expectations of the portfolio manager.

Market participants also use FRAs and options to take short-run positions and hedge short-term interest rate risk. This motivation is likely to have lost significance in the survey's last two issues. Major central banks have kept policy rates low since the financial crisis, resulting in low and stable money market rates (Graph 7, left-hand panel). Some central banks have resorted to asset purchases and forward guidance to compress longer-term rates too. As a consequence, the volatility of three-month Libor in the major advanced economy currencies is close to zero (Graph 7, right-hand panel).

The fall in both FRA and options turnover for several of the major currencies since the April 2010 survey is consistent with the decline in interest volatility. Options on short-term interest rates are the preferred instrument for taking

leveraged positions on changes in policy rates. Turnover in interest rate options<sup>7</sup> fell in most currencies, in some cases significantly. For instance, turnover volumes for options on euro and sterling interest rates shrank by 24% and 64%, respectively. That said, there were exceptions to this pattern. Turnover in options on dollar rates increased by 28% between 2010 and 2013, but this followed a steep decline in the previous three years. Developments in the OTC market were mirrored on exchanges, where turnover in interest rate options in the main currencies fell sharply.

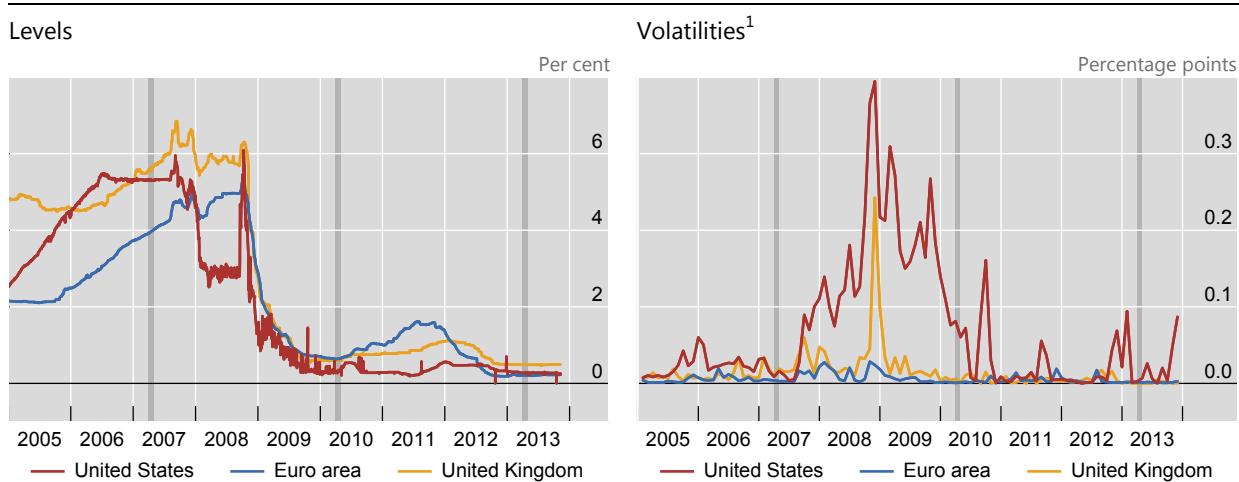
The continued prospect of low and stable short-term rates also reduces the need for FRA contracts to hedge future interest rate changes. But rates were low and stable in all currencies with liquid FRA markets, whereas changes in turnover volumes varied significantly across currencies. Turnover volumes declined noticeably in the Japanese yen, as well as in the US and Canadian dollars. But turnover in FRAs on euro interest rates almost doubled, also increasing substantially for sterling and other European currencies despite sagging short-term interest rate volatility. This contrasts with developments on exchanges, where turnover in futures on short-term interest rates denominated in the main currencies fell between 2010 and 2013. Moreover, market sources state that April was a relatively quiet month in this market, making the observed surge even more surprising.<sup>8</sup>

### Managing interest rate derivatives portfolios

The surge in turnover of FRAs on European currencies is one of the more puzzling findings of the 2013 Triennial Survey. A possible explanation may be greater use of

Three-month interest rates and volatilities

Graph 7



<sup>1</sup> Thirty-day rolling standard deviation of daily changes in three-month interest rates.

Sources: Bloomberg; national data; authors' calculations.

<sup>7</sup> Our data do not provide a breakdown of option volume into contracts on short-term and long-term interest rates.

<sup>8</sup> Traditionally, FRAs were used mainly by banks to lock in the cost of unsecured money market funding. But with the collapse of the unsecured term market during the financial crisis, this motivation cannot explain the recent activity in such contracts.

FRAs on these instruments to manage the risk of their derivatives books (rather than the exposure of their underlying assets and liabilities).

Transaction-level data in OTC interest rate derivatives indicate that approximately two thirds of all transactions reflect "administrative activity" (Fleming et al (2012)). Some of these transactions, such as novations (in which an existing trade is transferred to a central counterparty or other third party), and some internal trades are excluded from the Triennial Survey.<sup>9</sup>

Among the administrative transactions included in the survey are FRA switches, which account for 16% of the turnover recorded by Fleming et al (2012). The rationale for such trades is that banks and other large investors tend to manage their interest rate risk on a continuous basis with swaps (see above). But liquidity in the swap market tends to be concentrated in particular expiry dates, which invariably exposes users to a small amount of basis risk whenever two offsetting swaps offer slightly different terms or settle on different days. In recent years, more active use of FRAs has helped to reduce this basis risk. According to market sources, such portfolio risk mitigation trades account for a significant proportion of turnover in the FRA market in most currencies, particularly in those where the growth in FRA activity is most pronounced.

## Regulatory reform

Since the financial crisis, policymakers have significantly tightened the regulation of OTC derivatives markets. While derivatives were not the cause of the crisis, the complex and opaque network of counterparty exposures arguably both propagated and amplified financial stress. Global regulatory authorities responded by introducing a series of measures aimed at reducing counterparty risks and making OTC derivatives markets more transparent. These included mandating central clearing of OTC derivatives contracts wherever appropriate and raising the capital charges and margin requirements in other cases. In the United States, the Commodities and Futures Trading Commission published rules requiring interest rates swaps to be traded electronically on swap execution facilities (SEFs), although these rules were not yet effective at the time of the survey. Another regulatory change not directly aimed at OTC derivatives markets but still likely to affect them concerns US and EU proposals to separate investment banking operations such as proprietary trading from commercial banking.<sup>10</sup>

The longer-term impact of these regulatory reforms on turnover is not clear. Most of them, for instance the requirement that transactions be centrally cleared, affect turnover only indirectly, with effects running in both directions. For example, lower counterparty risk owing to central clearing and higher collateralisation could spur turnover, whereas higher transaction costs owing to tighter collateral requirements could reduce it. Another possible outcome is that some market participants will begin to use exchange-traded contracts – how far this is already the case is unclear. Turnover in government bond futures, which could substitute for swaps, has increased slightly between 2010 and 2013, but the data do not show any obvious shift in activity between the two types of contract.

<sup>9</sup> See [www.bis.org/statistics/triennialrep/2013survey\\_guidelinesturnover.pdf](http://www.bis.org/statistics/triennialrep/2013survey_guidelinesturnover.pdf).

<sup>10</sup> See Gambacorta and van Rixtel (2013) for a review of the Volcker, Vickers and Liikanen proposals.

## Conclusion

The market for OTC interest rate derivatives has grown massively since its inception in the 1980s. Its structure remained stable between the late 1980s and the mid-2000s, but is now changing rapidly. This is partly the result of regulatory changes that aim to make the market more transparent and reduce counterparty risk. For instance, an increasing share of transactions is being centrally cleared. But there are also other changes, such as the declining role of the inter-dealer market. The market continues to revolve around a limited number of large dealers, but they trade less among themselves than previously. That said, the inter-dealer segment is still recognisable, in contrast to the case in the FX market (see Rime and Schrimpf (2013)).

These changes will have implications for market liquidity. Tighter regulation will make trading in this market more costly. But at the same time, it will reduce counterparty risk. How both factors will impact market liquidity remains to be seen.

The changes will also affect how OTC derivatives markets statistics will be collected. More data will be stored centrally by electronic trading platforms, central counterparties, data warehouses and trade repositories. Several jurisdictions are introducing mandatory trade reporting to regulators. All this should reduce the cost of providing market-wide information. At the same time, all these potential data sources cover only part of the market. As things stand today, they can therefore complement a more comprehensive data collection exercise such as the Triennial Survey, but not yet replace it. But this could change if the coverage of these sources increases.

Administrative trades are another factor affecting the way turnover data are collected and interpreted. A large chunk of OTC derivatives transactions are not "price-forming" trades, in the terminology of Fleming et al (2012), but administrative transactions used to manage derivatives books. At the moment, neither the Triennial Survey nor other publicly available sources differentiate between price-forming and administrative transactions. This makes it difficult to interpret the data.

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