



Global liquidity and procyclicality

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It is an honour to join this distinguished group and to take part in this event. I feel especially privileged to have Maurice Obstfeld and Asli Demirgüç-Kunt as my discussants. I have learned a lot from Asli and Maury over the years, and no doubt will learn much from their comments today.

Exchange rates are back in the news. It is a cliché that the world has become more connected, but the external dimension of monetary policy has figured more and more prominently in central bankers' speeches lately. Financial markets, for their part, appear to be tethered more closely than ever to global events, and the real economy appears to dance to the tune of global financial developments, rather than the other way round. If you will excuse a rather extravagant metaphor, the financial tail appears to be wagging the real economy dog.

This is not how things are supposed to work. According to the traditional approach to international finance, financial flows are no more than the accounting counterparts to savings and investment decisions. The current account is the borrowing need of the country as a whole, and exchange rates steer net exports to restore external balance. When a country experiences an *appreciation* of its currency, this is presumed to be *contractionary*, as net exports fall.

However, events have not always played out this way, especially in emerging economies. Rather than dampening economic activity, episodes of sustained currency appreciation often go hand in hand with buoyant economic activity on the back of strong capital inflows. The boom may be accompanied by the build-up of financial vulnerabilities. Think back to the years before the latest bout of financial turbulence in emerging markets. My discussant Maurice Obstfeld has a well-known empirical paper with Pierre-Olivier Gourinchas (Gourinchas and Obstfeld (2012)) that sheds much light on this phenomenon. The combination of a rapid increase in leverage and a sharp appreciation of the currency emerges as a strong indicator of financial vulnerability and of subsequent crises.

There is also a flip side to the argument based on the current account. If a country is running current account surpluses, the argument goes, then its currency will tend to appreciate unless the authorities are keeping the currency artificially low. This is the familiar argument heard around the G20 table, directed at economies running current account surpluses. By the same token, the currency of a deficit country should *depreciate*. However, again, events do not always play out this way. In the mid-2000s, the US current account deficit widened to historical highs and many commentators expected an imminent depreciation of the dollar. In the event, the dollar went in the opposite direction. It appreciated strongly

¹ I am grateful to Raphael Auer, Fernando Avalos, Stefan Avdjiev, Morten Bech, Claudio Borio, Michael Chui, Ben Cohen, Dietrich Domanski, Peter Hoerdahl, Krista Hughes, Jonathan Kearns, Catherine Koch, Bob McCauley, Pat McGuire, Andreas Schrimpf, Ilhyock Shim, Vlad Sushko and Philip Turner for comments on earlier drafts and to Bat-el Berger, Emese Kuruc, Anamaria Illes, Denis Petre, Jeff Slee and Agne Subelyte for excellent research assistance. The views expressed here are my own and not necessarily those of the Bank for International Settlements.



with the onset of the crisis, wrong footing many commentators. The appreciation of the dollar was accompanied by a tightening of global financial conditions.

The wheel has turned full circle, and financial markets are once again keeping a wary eye on a stronger dollar. Observers are keenly attuned to every twist and turn in the monetary policy debate in the United States. Markets rally and the dollar weakens on any temporary reprieve from the normalisation of US interest rates, only to reverse course when monetary tightening is back on the agenda.

Why are global financial conditions so attuned to the strength of the dollar? And why is the real economy so sensitive to global financial conditions? These are the two questions I would like to address today.

I will start by describing a market anomaly in the currency market that is symptomatic of the strains being placed on global capital markets currently. In spite of the outward tranquillity, there are tensions beneath the surface. Market anomalies offer a window on these strains.

A telling market anomaly

There is an intriguing market anomaly in the foreign exchange market right now: the widespread failure of *covered interest parity*. Covered interest parity, or “CIP” for short, is the proposition that interest rates implicit in foreign exchange markets should be consistent with market interest rates.²

Before 2008, CIP held as an empirical regularity with very few exceptions worth mentioning. As an academic, I used to tell my students that CIP is about the only relationship that can be relied upon in international finance. I know better than to say this now. Textbooks still say that CIP holds, but it is no longer true.

Graph 1 shows the evidence. To explain these charts, I need to explain what an FX swap is, and what the forward exchange rate is. An FX swap is an arrangement where one party borrows US dollars by pledging another currency as collateral – ie, lending the other currency in exchange for dollars. The *forward rate* is the agreed exchange rate at which repayment takes place. From the forward rate and the current “spot” rate, we can calculate the implied interest rate on the US dollar. The top panels of Graph 1 plot the implied three-month interest rate on the dollar from forward rates embedded in FX swaps. Each series shows the particular currency pledged as collateral. In Graph 1, I have plotted for comparison the three-month US dollar Libor, the market interest rate for dollars. When the implied dollar interest rate from FX swaps is above Libor, this means that the borrower of dollars in the FX swap is paying more than the rate available in the open market. This has been the case for the yen, Swiss franc and euro.

Covered interest parity held with barely a blip until the crisis (Akram et al (2008)). Large deviations from CIP did take place during the 2008 crisis and the euro area crisis of 2011-12. However, these were periods when financial intermediaries came under severe stress (Avalos and Moreno (2013), Baba and Packer (2009), Baba and Shim (2010)). What is remarkable now is that deviations from CIP have appeared during periods of relative calm. Recent deviations have been especially large for the yen, although the Swiss franc also had a large deviation following the surprise revaluation of the Swiss franc in January 2015.

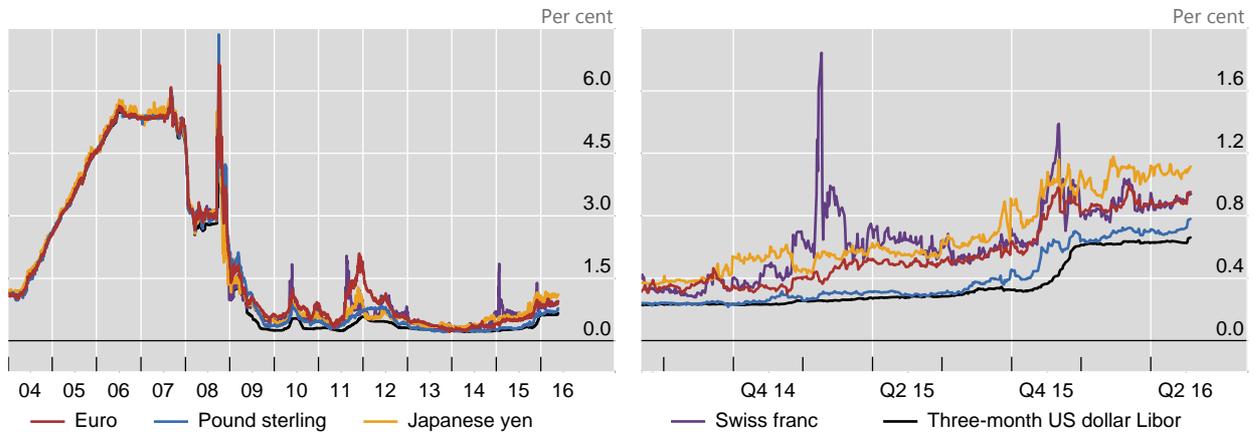
² Formally, covered interest parity is the statement that $1 + r_A = \frac{F}{S}(1 + r_B)$, where r_A and r_B are the market interest rates on two currencies A and B, and S and F are the spot and forward exchange rate of A in terms of B.



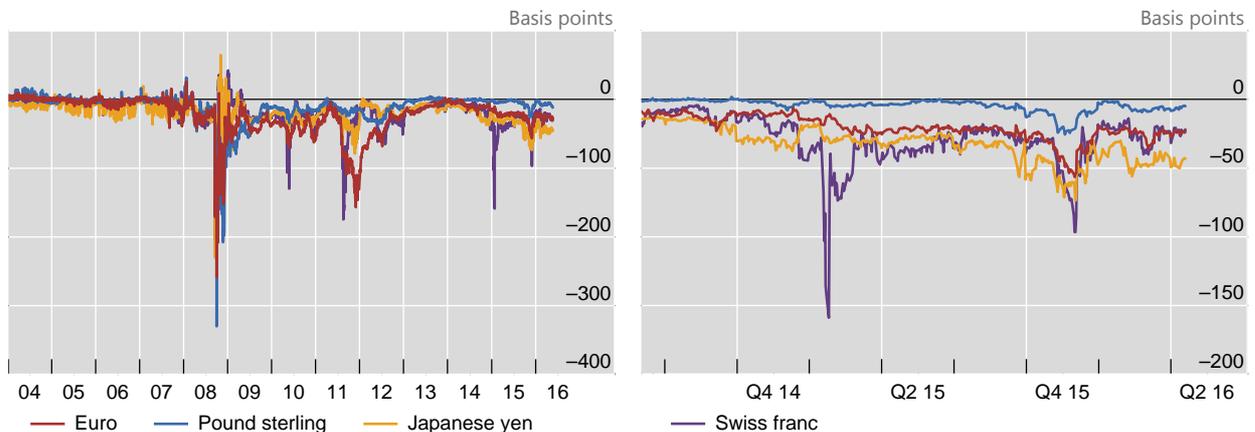
US dollar interest rate implied by FX swaps

Graph 1

Three-month US dollar interest rate implied by FX swaps¹



FX swap spread, three-month²



¹ Implied US dollar interest rate in an FX swap involving the indicated currency. Three-month US dollar Libor rate is plotted for comparison. ² Spread between three-month US dollar Libor and three-month dollar rate implied by FX swaps.

Sources: Bloomberg; Datastream; BIS calculations.

The bottom two panels of Graph 1 show the magnitude of the deviation from CIP, where the deviation is measured as US dollar Libor minus the FX swap-implied dollar interest rate. The difference is called the “cross-currency basis”, and for the currencies listed in Graph 1, the cross-currency basis is negative, meaning that dollar borrowers in FX swaps pay more than Libor.

Traditionalists will be surprised – shocked even – to discover that covered interest parity fails. But there it is, in the full glare of daylight. Not only does covered interest parity fail systematically, the observed deviations from CIP have become more pronounced in the last 18 months or so.³ In textbook settings where someone could borrow and lend without limit at prevailing market interest rates, the cross-currency basis could not deviate from zero, at least not by much, and not for too long. This is because someone could borrow at the cheaper dollar interest rate and lend out at the higher dollar interest rate. However,

³ The recent evidence is examined by Du et al (2016), who find that the cross-currency basis is not confined to Libor and appears across many market interest rates. Borio et al (2016) show that that the sign of the cross-currency basis depends on the net swap position of the banking sector.

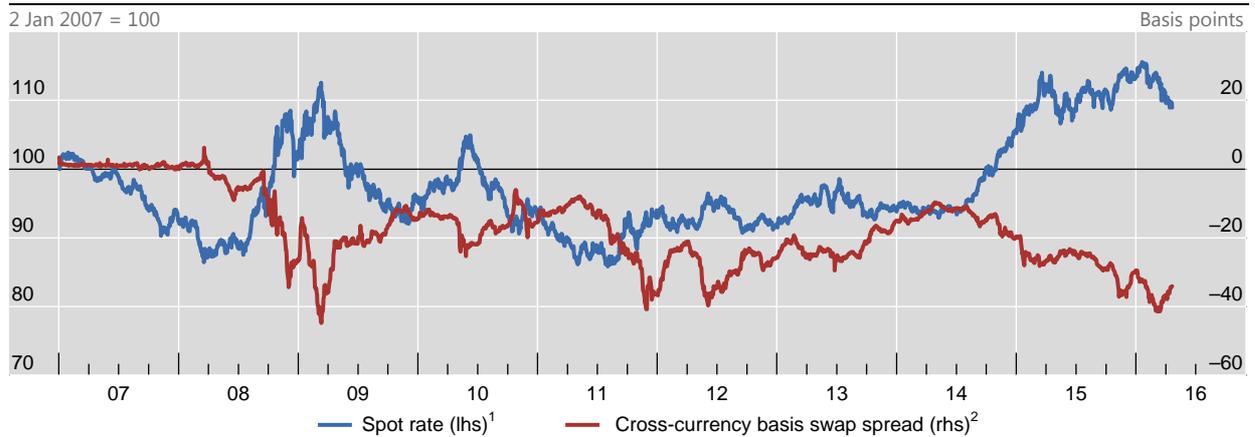


executing such a trade entails a sequence of transactions, often through intermediaries. As such, it makes demands on the risk-taking capacity of dealer banks as well as counterparties.⁴

What is the link between CIP violations and the dollar? I would like to propose a parallel with recent strains in emerging markets. At first sight, advanced economy currency markets seem a million miles away from stresses in emerging markets, but the common element is that a stronger dollar and tighter credit conditions go together. Let me show you one chart from on-going work with my BIS colleagues Stefan Avdjiev and Catherine Koch, together with Wenxin Du of the Federal Reserve (Avdjiev, Du, Koch and Shin (2016)). A picture paints a thousand words, and I find this chart quite striking.

US dollar exchange rate and the cross-currency basis

Graph 2



¹ Simple average of bilateral exchange rate of the dollar against CAD, EUR, GBP, SEK, CHF and JPY. Higher values indicate a stronger US dollar. ² Simple average of the five-year cross-currency basis swaps against CAD, EUR, GBP, SEK, CHF and JPY vis-à-vis the US dollar.

Sources: Avdjiev, Du, Koch and Shin (2016); Bloomberg; BIS calculations.

Graph 2 plots the value of the US dollar (in blue), calculated as the simple average of the exchange rates against six advanced economy currencies as indicated. When the blue line goes up, the dollar strengthens. On the same chart, I have plotted (in red) the average cross currency basis. Notice how the cross-currency basis is the mirror image of the strength of the dollar. When the dollar strengthens, the cross-currency basis widens. This is especially so in the last 18 months or so, reflecting the stronger dollar.

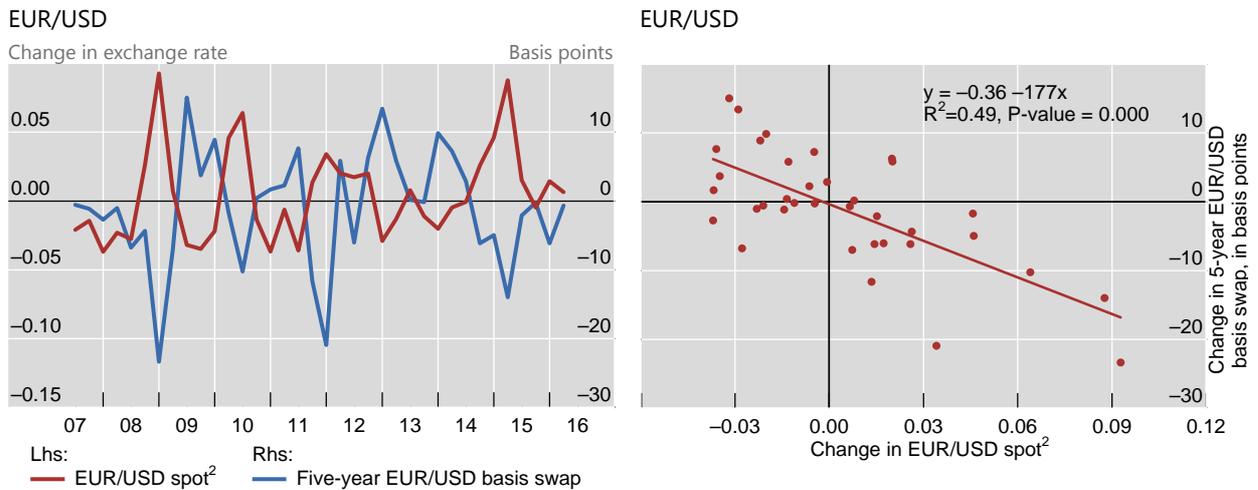
The relationship is even clearer if we plot *changes* in exchange rates and changes in the cross currency basis. Graph 3 shows this for the bilateral exchange rate of the euro against the dollar. See the reflected symmetry in the left panel, just like mountains reflected in a lake, where a *strengthening* of the dollar is associated with a widening of the deviation from CIP. The right panel shows the same information as a scatter chart. The negative slope is clear to see; a strengthening of the dollar goes hand in hand with a widening of the deviation from CIP.

The key takeaway is that a stronger dollar is associated with more severe market anomalies. The amazing thing is that this is true not only for emerging markets, but also for “safe haven” currencies such as the yen and the Swiss franc. In order to understand the nature of this relationship, we need to cast the net wider, and take in the larger picture concerning the role of the dollar in the global banking system.

⁴ Gabaix and Maggiori (2015) propose a theory of exchange rate determination based on intermediary balance sheet constraints. More generally, banks’ risk-taking capacity is limited by its capital, as described in two of my recent speeches (Shin (2016a, b)).

Change in EUR/USD exchange rate and change in cross-currency basis¹

Graph 3



¹ Changes in quarterly averages. ² An increase represents an appreciation of the US dollar against the euro.

Sources: Avdjiev, Du, Koch and Shin (2016); Bloomberg; BIS calculations.

The global banking system and the US dollar

The global role of the US dollar is reflected in its pre-eminent role in the global banking system. The dollar is the unit of account in debt contracts in that borrowers borrow in dollars and lenders lend in dollars, irrespective of whether the borrower or lender is located in the United States.

Graph 4 gives a sense of the size of cross-border bank claims denominated in US dollars, arranged by region. The size of the arrows represents the size of the claims. In 2002, the arrow from the United States to Europe was \$462 billion, meaning that banks resident in the United States had claims of \$462 billion to borrowers in Europe. This grew to \$1.54 trillion by 2007. The return leg from Europe to the United States went from \$856 billion in 2002 to over \$2 trillion in 2007.⁵

I will return to Graph 4 when discussing the macro implications. For now, notice that the US dollar is used widely throughout the global banking system, even when neither the lender nor the borrower is a US resident.

Why is the US dollar so important in the global banking system? One answer invokes the dollar's broad international role in cross-border transactions, including its dominant role as an invoicing currency for international trade.⁶ Trade financing or associated hedging activity can account for some of the US dollar-denominated bank credit.

A second answer builds on the first. The dollar's role as an invoicing currency spills over to the currency denomination of lending that finances real assets. For export firms, if the invoice is in dollars, it may make sense to borrow in dollars. Graph 4 shows only the bank claims, but an important funding source for emerging market firms has been dollar-denominated bonds. This is especially so for the oil and

⁵ McGuire and Tarashev (2007) and McCauley, McGuire and von Peter (2010) map the geography of cross-border lending.

⁶ Goldberg and Tille (2009) and Gopinath (2015).



gas sector. My colleague Jaime Caruana gave a wide-ranging lecture on these issues at the LSE earlier in the year (Caruana (2016)), and Chui et al (2016) provide further evidence.

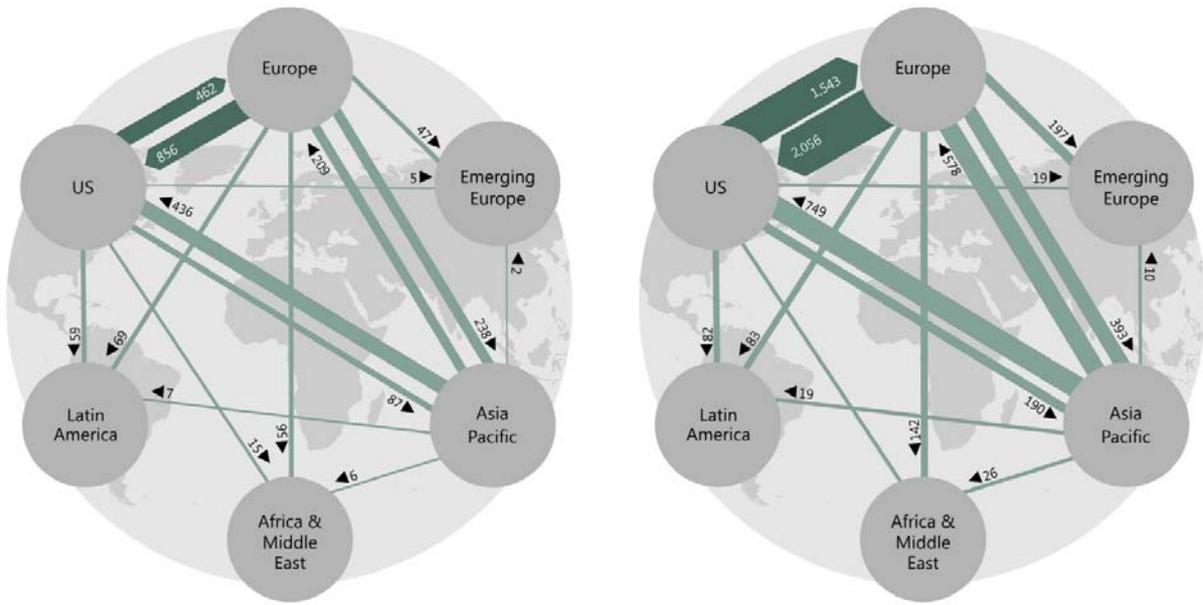
US dollar-denominated cross-border claims

In billions of US dollars

Graph 4

2002

2007



Source: BIS locational banking statistics.

The story does not end there, however. There is a third level to this reasoning. The role of the dollar as the funding currency of choice means that the universe of dollar-denominated assets extends beyond the United States. For large institutional investors with a global portfolio of assets, there may be a currency mismatch between the assets they hold and the commitments they have to their domestic stakeholders. For instance, pension funds and life insurance companies have obligations to their beneficiaries and policy holders. These obligations are denominated in domestic currency – in euros, yen or Swiss francs. However, a large investor will not be limited to domestic assets and will look abroad to form a diversified portfolio of global assets, including securities issued in US dollars.

To the extent that investors face currency risk, they will hedge that risk. We know that investors from emerging economies with large funded pension systems hedge actively.⁷ However, institutional investors from rich economies will face the problem most acutely, as they have the largest portfolios of global assets. The hedging counterparty is typically a bank, and the bank lays off its own currency risk by borrowing dollars. That way, dollar claims are counterbalanced by dollar debts.

The upshot is that banks take on liabilities denominated in dollars in the process of providing hedging services. This is the third level of the argument. The consequence of the dollar’s international role in transactions is that the global banking system runs on dollars.

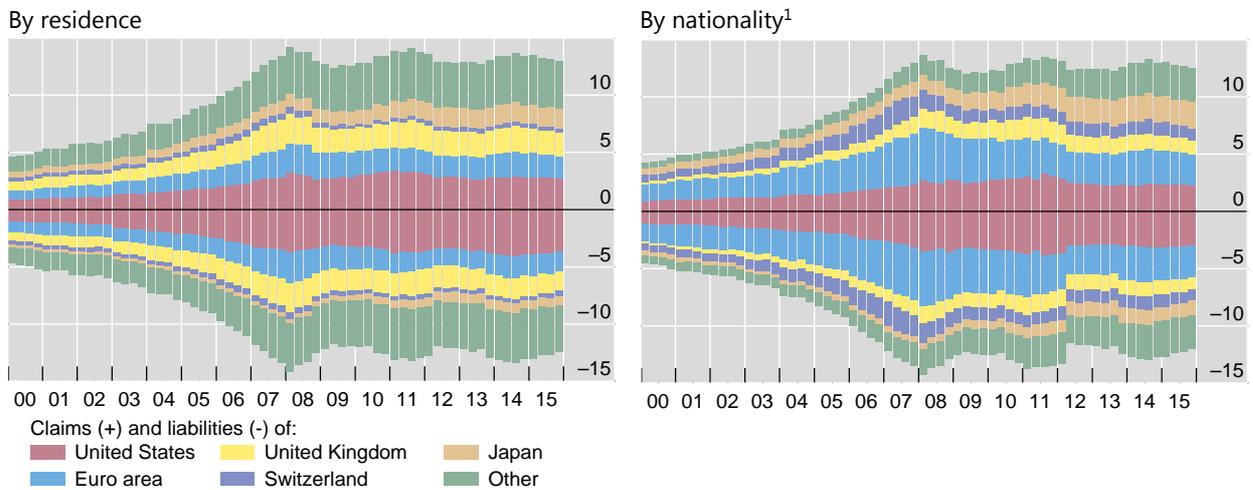
⁷ See Avalos and Moreno (2013) for evidence from Chile.



Cross-border US dollar denominated positions of BIS reporting banks

In USD trillion

Graph 5



¹ The break in the series between Q1 2012 and Q2 2012 is due to the Q2 2012 introduction of a more comprehensive reporting of cross-border positions (for more details, see http://www.bis.org/publ/qtrpdf/r_qt1212v.htm).

Source: BIS locational banking statistics, Tables A5 (by residence) and A7 (by nationality).

Graph 5 provides a window on the total dollar-denominated cross-border assets and liabilities of BIS reporting banks, arranged by region. The two panels are plotted using data that we have started posting on the BIS website as part of our effort to make more detailed data available. Please come to our website and check out these new series.⁸

In both panels, upward-pointing bars indicate assets and downward-pointing bars indicate liabilities. The left-hand panel breaks out the total by residence, while the right-hand panel breaks out the total by nationality, meaning the location of the headquarters. So, for instance, the cross-border claims of a German bank office in London would be classified as "UK" in the left hand panel, but as "euro area" in the right hand panel. By comparing the two panels of Graph 5, we see that Swiss and euro area banks have been active in other jurisdictions, especially in the UK and the US.

Notice how the undulations in cross-border dollar liabilities track global financial conditions. The totals in Graph 5 grew strongly up to 2008 but contracted with the onset of the global financial crisis, and then also with the euro area crisis of 2011-12. Interestingly, the most recent period of dollar strength from mid-2014 has been associated with a decline in the aggregate cross-border liabilities. The inference is that banks have been less willing to roll over hedges put in place by institutional investors during the earlier period of more ample dollar liquidity.

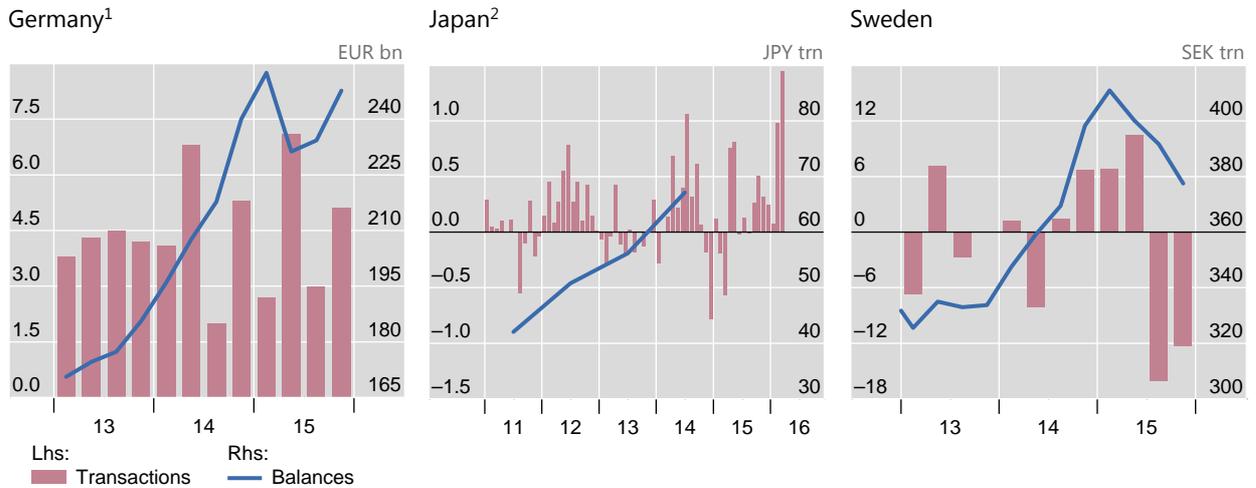
Direct evidence on institutional investor holdings is not very comprehensive. However, there is some evidence from national data from a few countries that institutional investors have increased their holding of external bonds. Graph 6 gathers some evidence on the outward portfolio flows of insurance companies from Germany, Japan and Sweden. The bars indicate flows, while the blue line plots outstanding amounts, where available. The outstanding amounts of foreign bond holdings have fluctuated in recent years, but the general trend has been upward.

⁸ See BIS locational banking statistics, Tables A5 and A7, www.bis.org/statistics/bankstats.htm.



Outward bond investment of insurance companies

Graph 6



¹ For Germany, long-term debt securities of insurance companies. Transactions indicate acquisitions minus external financing. ² For Japan, life insurance companies. Positive (negative) transactions indicate a net purchase (sale) of medium- and long-term bonds.

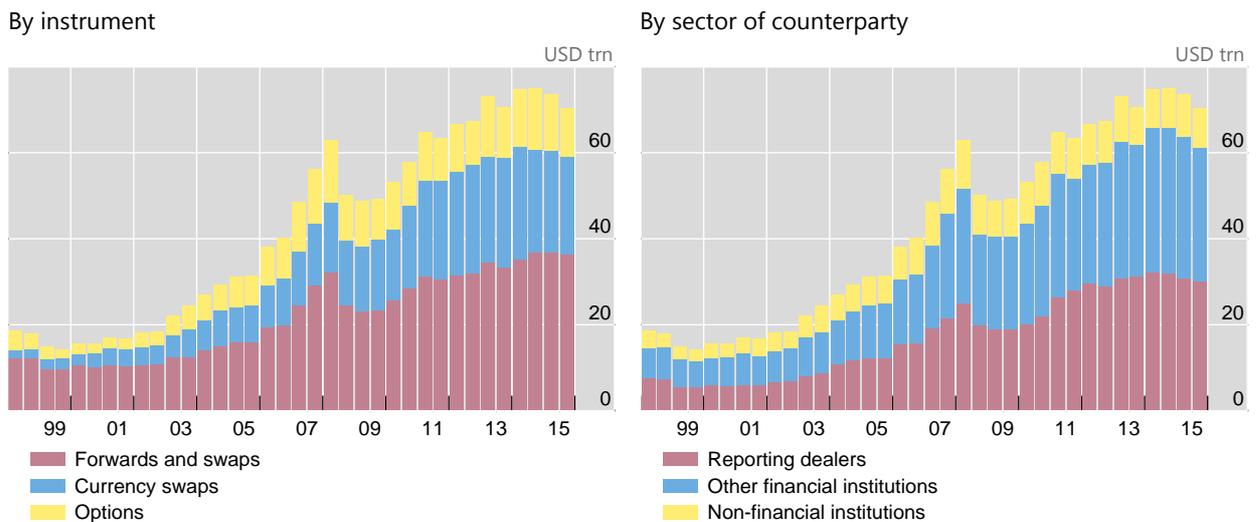
Sources: Deutsche Bundesbank; Japanese Ministry of Finance; Statistics Sweden; Life Insurance Association of Japan; BIS calculations.

Another source of information on FX hedging comes from the twice-yearly BIS surveys of over-the-counter (OTC) foreign exchange derivatives. The left-hand panel of Graph 7 shows the outstanding notional amounts by instrument, while the right-hand panel shows the breakdown by counterparty. There was a sharp pull-back during the 2008 crisis, but strong growth in its aftermath. We see, however, that there has been a decline since end-2014, coinciding with the period when the cross-currency basis has widened.

Over-the-counter (OTC) foreign exchange derivatives

Notional principal¹

Graph 7



¹ At half-year end (end-June and end-December). Amounts denominated in currencies other than the US dollar are converted to US dollars at the exchange rate prevailing on the reference date.

Source: BIS OTC derivatives statistics.



The category consisting of non-dealer financial institutions saw the largest decline in notional amounts since the end of 2014. This decline has come after a period of strong growth, and is consistent with the market having entered a phase where FX derivative stocks have declined amid a strengthening dollar and subdued risk-taking in the banking sector more generally.

Thus far, I have described the activities of advanced economy banks and investors. But there is a consistent theme that runs through to events in emerging economies, also. For this reason, I would like to broaden the perspective by turning to the recent events in emerging economies, especially the activities of EME corporates borrowing in dollars. Swiss and Japanese life insurance companies could not be more different from emerging market corporates, but they all have in common their strong links to the banking system, and their exposure to the procyclical tendencies driven by the “risk-taking channel” of exchange rate changes. Let me turn to this now. It is the core of my presentation today.

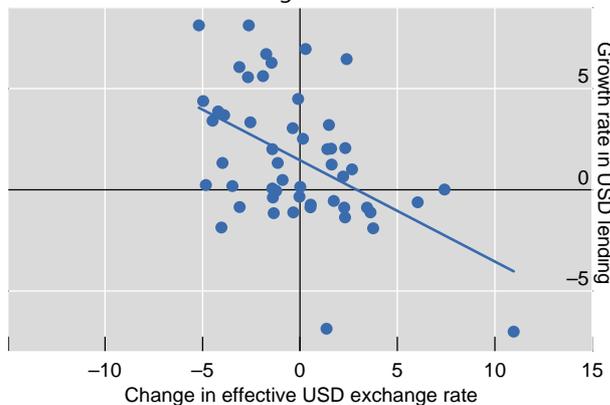
The risk-taking channel and the exchange rate

In a nutshell, the proposition is this: *when an international currency depreciates, there is a tendency for foreigners to borrow more in that currency.* Graph 8 illustrates the risk-taking channel for the US dollar. It is taken from joint work with my BIS colleagues Stefan Avdjiev and Catherine Koch.⁹ The precise mechanism will depend on the context, but the key feature of the risk-taking channel is that when the dollar depreciates, banks lend more in US dollars to borrowers outside the United States. Similarly, when the dollar *appreciates*, banks lend less, or even shrink outright the lending of dollars. In this sense, the value of the dollar is a barometer of risk-taking and global credit conditions.

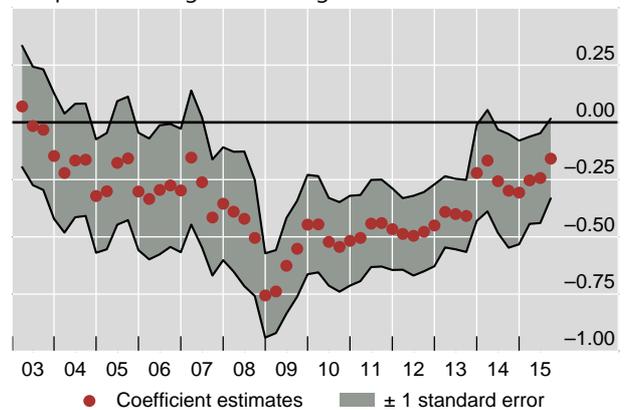
US dollar cross-border bank lending and the dollar exchange rate

Graph 8

Cross-border bank lending to non-residents vs NEER¹



20-quarter rolling window regressions²



¹ Plot of quarterly growth rate of cross-border bank lending in US dollars on quarterly changes in the US dollar nominal effective exchange rate (NEER) for Q1 2003–Q3 2015. Lending refers to loans by BIS reporting banks to all (bank and non-bank) borrowers outside the US. The line is a fitted regression line. Positive changes indicate an appreciation of the dollar. ² Rolling regression coefficient for 20-quarters window.

Sources: BIS locational banking statistics; BIS effective exchange rate indices; BIS calculations.

A weaker dollar is associated with greater lending in dollars, lower volatility and more risk-taking, but a stronger dollar is associated with higher volatility and a recoiling from risk-taking. For instance, a standard carry trade motive would be consistent with the risk-taking channel (Menkhoff et al (2012)).

⁹ Avdjiev, Koch and Shin (2016).

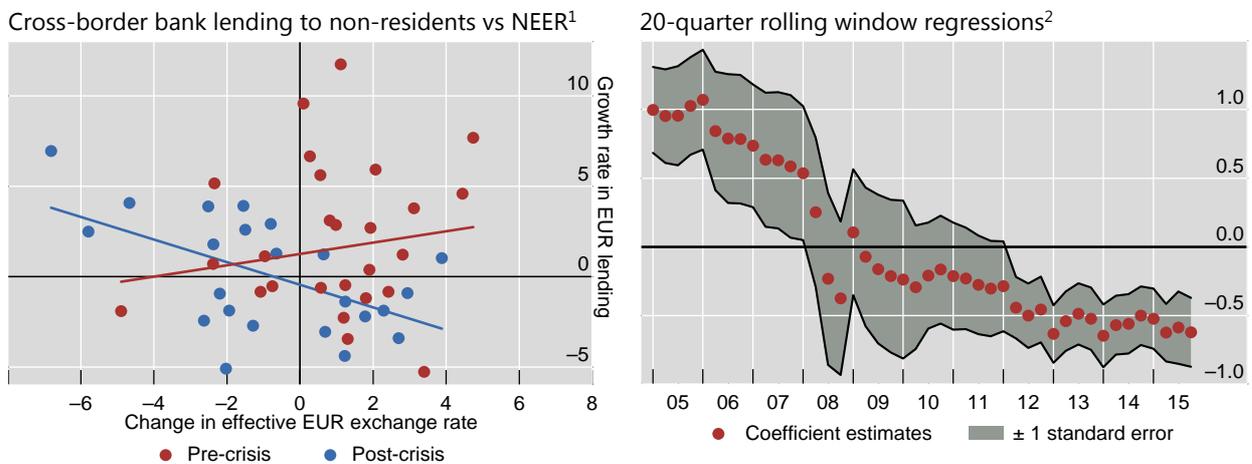
The right hand panel of Graph 8 shows the coefficients of rolling regressions with a 20 quarter sample window. What is notable is that the coefficient has become more negative in the recent post-crisis period. Before the 2008 crisis, the coefficient hovered around -0.2 to -0.3 , but after the crisis, the coefficient has been around -0.5 . In other words, a one percent appreciation of the dollar in terms of the nominal effective exchange rate (NEER) is associated with a 0.5 percentage point decline in the quarterly growth rate of dollar cross-border credit. In this sense, the value of the dollar is a key barometer of global dollar credit conditions.

We saw earlier in Graphs 2 and 3 how the deviation from covered interest parity tracked closely the value of the US dollar. We now have a way of making sense of this. The breakdown of covered interest parity is a symptom of tighter dollar credit conditions putting a squeeze on accumulated dollar liabilities built up during the previous period of easy dollar credit. During the period of dollar weakness, global banks were able to supply hedging services to institutional investors at reasonable cost, as cross-border dollar credit was growing strongly and easily obtained. However, as the dollar strengthens, the banking sector finds it more challenging to roll over the dollar credit previously supplied.

One way to summarise the finding is that there is a “triangle” that links a stronger dollar, more subdued dollar cross-border flows, and a widening of the cross-currency basis against the dollar. This is the main theme explored in my recent research in collaboration with Wenxin Du of the Federal Reserve Board and my BIS colleagues Stefan Avdjiev and Catherine Koch.¹⁰ The pre-eminent role of the US dollar as the global funding currency means that US monetary policy has an especially important place in the determination of global financial conditions.

Euro-denominated cross-border bank lending and the euro exchange rate

Graph 9



¹ Plot of quarterly growth rate of cross-border bank lending in euros on quarterly changes in the euro nominal effective exchange rate (NEER) for Q1 2003–Q3 2015. Lending refers to loans by BIS reporting banks to all (bank and non-bank) borrowers outside the euro area. The red line is a fitted regression line for Q1 2003–Q4 2008; the blue line is a fitted regression line for Q1 2009–Q3 2015. Positive changes indicate an appreciation of the euro. ² Rolling regression coefficient for 20-quarter window.

Sources: BIS locational banking statistics; BIS effective exchange rate indices; BIS calculations.

The euro, after a slow start, is showing signs of joining the dollar as an international funding currency. Borrowers outside the euro area are growing their euro liabilities, taking advantage of very low long-term interest rates, just as borrowers outside the United States have been borrowing in US dollars

¹⁰ Avdjiev, Du, Koch and Shin (2016).



for some time. To be sure, the sums are still small for the euro. The stock of euro-denominated debt of non-banks outside the euro area is only around a quarter of the equivalent US dollar amount. But the trajectory is steep. US companies have been particularly active in borrowing in euros. This type of borrowing is common enough to have its own name. It's called "reverse yankee" borrowing.

Graph 9 shows that the risk-taking channel for the euro is starting to show the tell-tale negative relationship between a weaker currency value and expanding cross-border lending in that currency; it was not there before the crisis, but has emerged since the crisis. The coefficient of the rolling regression is now negative. At around -0.7 , the coefficient is even larger in absolute terms than for the dollar. For the Japanese yen, Avdjiev, Koch and Shin (2016) find that its role as an international funding currency has waxed and waned over the past couple of decades, but the tell-tale signs of the risk-taking channel have reappeared in recent years with monetary easing in Japan.

As the euro and yen join the dollar in the ranks of international funding currencies, we are left with a dilemma. With each successive wave of monetary easing since the financial crisis, greater demands are being made on international capital markets. One important task that remains is to investigate how much of the observed market anomalies can be attributed to exchange rate pressures and changing market dynamics wrought by monetary spillovers. Spillovers and "spillbacks" have been an important theme in international finance,¹¹ and it looks to stay that way for the time being.

Macro implications of the risk-taking channel

The risk-taking channel has macro implications, too, and may explain why currency appreciation in emerging markets may sometimes be expansionary, rather than contractionary.

Exchange rate fluctuations influence the economy through both real and financial channels. The real effects through the net exports channel are well-known and are standard in open economy macro models such as the textbook Mundell-Fleming model. However, exchange rate fluctuations influence the economy through a financial amplification channel, as well as through net exports.

The financial channel of exchange rates operates when currency appreciation elicits valuation changes on borrower balance sheets. For instance, if the borrower has local currency assets but has borrowed in dollars, there is a naked currency mismatch. Even if the assets generate dollar cash flows, there may be an empirical association between a stronger dollar and weaker cash flows, as in the case of oil firms. For whatever reason, when there is the potential for valuation mismatches arising from exchange rate effects, a weaker dollar flatters the balance sheet of dollar borrowers whose liabilities fall relative to assets. From the standpoint of creditors, the stronger credit position of the borrowers creates spare capacity for credit extension even with a fixed exposure limit, for instance through a Value-at-Risk (VaR) constraint. The spare lending capacity is filled through an expansion in the supply of dollar credit (see Bruno and Shin (2015a, b)).

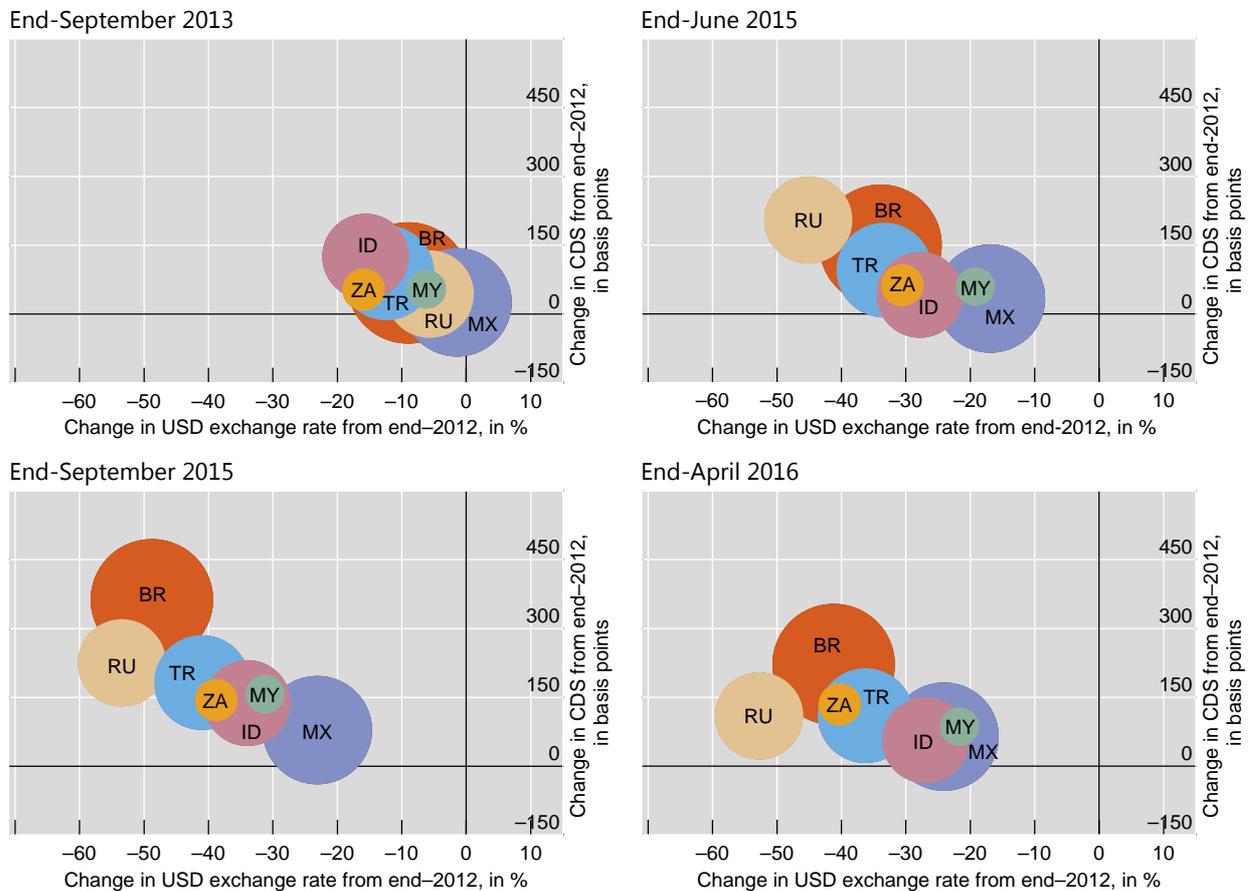
There are knock-on effects of the risk-taking channel on the government's fiscal position, too. When credit supply expands, so does the set of investment projects, raising economic activity and improving the fiscal position (Turner (2014), Chui et al (2016)). If corporate dollar borrowing is done through state-owned enterprises (as is the case for the oil and gas sector in many EMEs), then the fiscal impact may be even more direct through the dividends that are paid into government coffers.

¹¹ This theme has been tackled by Caruana (2012), Rajan (2014), Rey (2015) and Borio (2016).

Illustrating the risk-taking channel for EMEs

Bilateral USD exchange rate and five-year sovereign CDS, change from end-2012

Graph 10



BR = Brazil; ID = Indonesia; MX = Mexico; MY = Malaysia; RU = Russia; TR = Turkey; ZA = South Africa. The size of the bubbles indicates the size of US dollar-denominated credit to non-banks in the respective economies in Q4 2015.

Sources: Avdjiev et al (2015); Datastream; Markit; national data; BIS; BIS calculations.

Graph 10 shows how sovereign CDS spreads for a group of EMEs have moved with shifts in the bilateral exchange rate against the US dollar. The horizontal axis in each panel is the percentage change in the bilateral exchange rate against the US dollar from the end of 2012. The vertical axis gives the change in the local currency five-year sovereign CDS spread. The size of the bubbles indicates the total dollar-denominated debt owed by nonbanks in the country.

We see from Graph 10 that there is both a time series and cross-section relationship between the CDS spread and the bilateral dollar exchange rate. In the cross-section, the bubbles line up along a downward-sloping line, indicating that those countries that have depreciated more against the US dollar tend to have CDS spreads that are higher. Over time, as the US dollar appreciates, the bubbles migrate toward the north-west; in other words, as the domestic currency weakens against the US dollar, EME sovereign CDS spreads have tended to rise.

Interestingly, these results go away when we consider instead the trade-weighted effective exchange rate that is unrelated to the US dollar (Hofmann et al (2016)). When we consider the component of the effective exchange rate that is unrelated to the US dollar, there is no evidence that a currency appreciation is associated with loosening of financial conditions. Indeed, we actually find the opposite



result for some measures of financial conditions. Again, the takeaway is that dollar strength is key for financial conditions in emerging markets.

Beyond the current account

Capital flows are traditionally viewed as the financial counterpart to savings and investment decisions, and exchange rates are the automatic stabilisers. In textbook models, a current account deficit can be remedied when the exchange rate depreciates, raising net exports and closing the current account gap.

Let's go back to 2002. Graph 4 seen earlier showed a snapshot of the cross-border banking claims denominated in US dollars around the world. Even then, there was quite an active two-way flow between Europe and the United States. The two-way flow resulted from the "round-tripping" of dollars intermediated by the large European banks which raised wholesale funds by using their US branches to borrow from US money market funds, ship the funds back to headquarters and then recycle the proceeds back to the United States by purchasing securities built on mortgages of US households. A large chunk of US subprime mortgages were financed this way. In 2002, the arrow from the United States to Europe was \$462 billion. This grew to \$1.54 trillion by 2007. The return leg of the round-tripping went from \$856 billion in 2002 to over \$2 trillion in 2007.

The outflows to Europe were matched by the inflows from Europe, and so the net flows were small compared to the gross flows. The current account between Europe and the United States remained broadly in balance, even though the gross capital flows from Europe into the United States grew enormously. Lending standards, though, are about the size of the balance sheet. So, gross flows are what counts for lending standards. Gross flows surged, easing lending standards and fuelling the rapid increase in credit to subprime borrowers. Borio and Disyatat (2011, 2015) give a detailed account of why current account reasoning led some commentators astray. My discussant Maury Obstfeld was one of the first to highlight the importance of gross flows (Obstfeld (2010, 2012)).

Why did policymakers miss the surge in subprime funding coming from Europe? For once, we cannot blame the lack of data. Graph 4 was constructed from the BIS locational banking statistics, but the BIS simply aggregates the data supplied by central banks. In fact, the cross-border position data between Europe and the United States actually comes from the central banks in those respective jurisdictions.

If it's not the lack of data, then why did we miss this? I suspect that the blind spot is due to our accounting conventions in international finance. When we do international finance, we often buy into the "triple coincidence" where the GDP area, decision-making unit and currency area are one and the same (Avdjiev, McCauley and Shin (2015)). Textbooks therefore start with the assumption that each GDP area has its own currency and the use of that currency is largely confined to that economic area. The Mundell-Fleming model is a classic example of the triple coincidence, but even in sophisticated macroeconomic models, the triple coincidence is rarely questioned. Currency appreciation or depreciation then acts on the economy through changes in net exports.

One reason why I suspect that triple coincidence reasoning led us astray comes from another common error that economists were making before the crisis. As the US current account deficit grew to historically large levels, triple coincidence reasoning would point to a depreciation of the dollar. Many commentators wondered aloud whether there would be "sudden stop" in the capital flows to the United States, just as in emerging market crises (Summers (2004), Edwards (2005), Obstfeld and Rogoff (2005), Roubini and Setser (2005), Krugman (2007)).

In the event, the US dollar appreciated sharply with the onset of the global financial crisis. The dollar's surge was associated with a deleveraging of financial market participants outside the United States that had used short-term dollar funding to invest in risky long-term dollar assets, with the European banks



mentioned above being the most prominent example. As the crisis erupted, these financial institutions found themselves short the dollar and overleveraged, and sought to reduce their dollar liabilities, bidding up the value of the dollar in the process.

Looking back and looking ahead

The strengthening of the dollar since mid-2014 brings us back full circle to mechanisms at play today. But the protagonists have changed in the meanwhile. The dollar borrowers are not European banks, but emerging market corporates. And the borrowing is done through corporate bonds, rather than wholesale bank funding.

The stock of US dollar-denominated debt of non-banks outside the United States currently stands at \$9.7 trillion. Of this, the US dollar-denominated debt of non-banks in EMEs stands at \$3.3 trillion. This overhang of US dollar-denominated debt has been weighing on macroeconomic conditions in emerging market economies since the dollar started to strengthen in 2014.

To be sure, there are some mitigating factors. For one thing, much of the recent increase in dollar debt in EMEs has been in the form of debt securities issued by emerging market corporates. These debt securities have long maturities. In addition, many emerging economies hold substantial foreign exchange reserves, in contrast to their situation in past crises. Demirguc-Kunt and Detragiache (1998) is a classic reference on the determinants of banking crises, and many of the factors identified there do not show up currently.

Nevertheless, there is no room for complacency. First, even if the bonds have long maturities, there are other repercussions on the economy if US dollar-denominated borrowing begins to unwind. Non-financial firms are deeply embedded in the economy, and their financial activities spill over into the rest of the economy. Bruno and Shin (2015c) find that dollar borrowing by emerging market corporates has had the attributes of a "carry trade" where, for every dollar raised through a bond issue, around a quarter ends up as cash on the firm's balance sheet. Here, cash could mean a domestic currency bank deposit or a claim on the shadow banking system, or indeed a financial instrument issued by another firm. So, dollar borrowing will spill over into the rest of the economy in the form of easier credit conditions. When the dollar borrowing is reversed, these easier domestic financial conditions will be reversed, too.

Furthermore, even if a country has large foreign exchange reserves, the corporate sector itself may find itself short of financial resources and may cut investment and curtail operations, resulting in a slowdown of growth. So, even a central bank that holds a large stock of foreign exchange reserves may find it difficult to head off a slowing real economy when global financial conditions tighten. Arguably, such a slowdown is part of what we are seeing right now in emerging market economies.

All this goes to show that international financial developments have to be placed in the broader context of past and anticipated central bank actions. We will undoubtedly have more opportunities to discuss these issues in policy circles in the months ahead.



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