



Exchange rates and the transmission of global liquidity

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It is a pleasure to be in Seoul and to address such a distinguished audience. It is almost exactly five years ago that I was here as part of the organising team for the G20 Leaders' Summit. None of us got much sleep during the communiqué drafting session, but we were energised by the prospect of agreements on international safety nets and plans for future work on macroprudential policies. It seems that the wheel has turned full circle, as many of us will travel from here to the first meeting under China's presidency of the G20, where some of the same issues will be discussed.

Today, I would like to share some thoughts on exchange rates and economic activity, a topic that crops up perennially around the G20 table.

Let me introduce the issue by posing a question to you: What is the macroeconomic impact of currency depreciation? Is it expansionary or contractionary?

The traditional argument, in the spirit of the Mundell-Fleming model, is that currency depreciation is expansionary, as a depreciation is associated with an increase in net exports and hence with an expansion in output, other things being equal. This is why exchange rates figure so prominently on the G20 agenda, as they determine the allocation of global spending.² Nevertheless, when we look at the current conjuncture, the deep depreciations of some emerging market currencies have not been associated with much of an expansion. On the contrary, it appears, on the surface at least, that the emerging market economies (EMEs) that have seen the sharpest depreciations are those that have recorded the steepest slowdown in growth. While we have to be careful about causation here, we should give more thought to elements that may be neglected in the traditional models.

The missing element in the explanation may be the financial channel of exchange rate changes, which seems a curious gap given how prominently this channel has figured in the discussions of credit booms and financial vulnerability in EMEs.³ In this literature, a currency *appreciation* goes hand in hand with rapid credit growth and buoyant economic activity on the back of more permissive financial conditions. The boom may be accompanied by a build-up of financial vulnerabilities. These links were

¹ I am grateful to Stefan Avdjiev, Claudio Borio, Dietrich Domanski, Jonathan Kearns, Catherine Koch, Bob McCauley, Ramon Moreno and Christian Upper for their comments, and to Alan Villegas for capable research assistance. The views expressed here are my own, not necessarily those of the Bank for International Settlements.

² The recent speech by Benoît Cœuré takes a welcome fresh look at the issues surrounding international policy discussions; see B Cœuré "Paradigm lost: Rethinking international adjustments", European Central Bank speech, November 2015.

³ See G Kaminsky and C Reinhart, "The twin crises: the causes of banking and balance-of-payments problems", *American Economic Review*, vol 89(3), June 1999, pp 473–500; and C Reinhart and V Reinhart, "Capital flow bonanzas: an encompassing view of the past and present", *NBER Macroeconomics Annual*, University of Chicago Press, April 2009, pp 9–62.

highlighted in Borio and Lowe (2002)⁴. More recently, in a study of both advanced and emerging economies from 1973 to 2010, Gourinchas and Obstfeld (2012)⁵ find that a combination of a rapid increase in leverage and a sharp real appreciation of the currency is perhaps the most reliable indicator of subsequent financial vulnerability.

Risk-taking channel of currency appreciation

I will draw my remarks from some recent work with my BIS colleagues Boris Hofmann and Ilhyock Shim⁶ on the risk-taking channel of currency appreciation which addresses the connection between exchange rates and leverage. In that work, we ask how currency appreciation is associated with greater risk-taking by both borrowers and lenders. Tellingly, the relevant exchange rate for the risk-taking channel is that with the international funding currency – almost invariably the US dollar, but also increasingly the euro – rather than the trade-weighted effective exchange rate. This is because the risk-taking channel has to do with leverage and risk-taking, in contrast to the net exports channel, which revolves around trade and the effective exchange rate. The wedge between the two provides a window for a reconciliation of the risk-taking channel with the net exports channel, and permits an empirical investigation that disentangles the two channels.

The risk-taking channel operates whenever a currency appreciation elicits valuation changes on borrower balance sheets. For instance, if the borrower has local currency assets but has borrowed in dollars, then 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 dollar cash flows, as in the case of oil firms; a stronger dollar tends to go together with weaker commodity prices. 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.

Risk-taking has both a price and a quantity dimension. Let me address each in turn, beginning with the quantity dimension.

⁴ C Borio and P Lowe “Assessing the risk of banking crises” *BIS Quarterly Review*, December 2002.

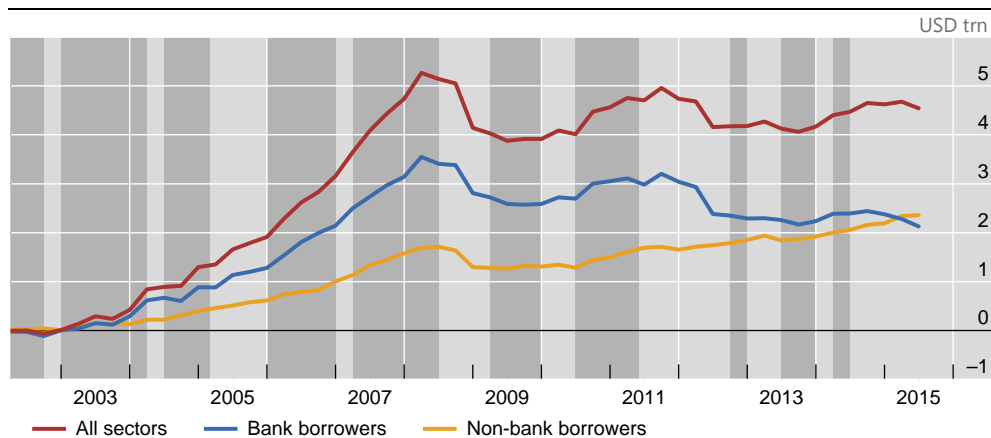
⁵ P-O Gourinchas and M Obstfeld (2012): “Stories of the twentieth century for the twenty-first”, *American Economic Journal: Macroeconomics*, vol 4(1), 2012, pp 226–65.

⁶ B Hofmann, I Shim and H S Shin, “Sovereign yields and the risk-taking channel of currency appreciation”, *BIS Working Papers*, forthcoming. In turn, this work develops the arguments in V Bruno and H S Shin, “Cross-border banking and global liquidity”, *Review of Economic Studies*, vol 82 (2), 2015, pp 535–64. The term “risk-taking channel” was coined by Claudio Borio and Haibin Zhu “Capital regulation, risk-taking and monetary policy: A missing link in the transmission mechanism?”, *Journal of Financial Stability*, 2011



Cumulative flows in USD-denominated cross-border loans outside the United States¹

Graph 1



¹ The dark shaded areas indicate depreciation of the effective US dollar exchange rate.

Sources: S Avdjiev, C Koch and H S Shin "Exchange rates and foreign borrowing in international currencies" (2015, in progress); BIS effective exchange rate statistics; BIS locational banking statistics by residence.

Graph 1 provides a glimpse at the risk-taking channel at work, as revealed in cross-border banking flows. It plots the cumulative flows of cross-border lending denominated in US dollars to borrowers outside the United States using quarterly data from the BIS locational banking statistics. The dark shaded areas indicate quarters when the US dollar depreciated in effective terms.

We see that the dark shaded bars are associated with steeper growth in cross-border lending in US dollars. As a rule of thumb, a simple-minded regression analysis (not shown here) shows that a 1% depreciation of the US dollar is associated with a 0.5 percentage point increase in the quarterly growth rate of the US dollar-denominated cross-border lending outside the United States. In annual terms, this translates into roughly 2 percentage points. This puts the impact of the recent dollar strength in context. A 1% appreciation of the US dollar is associated with an approximately 2 percentage point decrease in the annual growth rate of US dollar-denominated cross-border lending outside the United States. Notice in Graph 1 how the most recent period is not shaded dark grey, indicating that the dollar has been appreciating. We indeed see that the blue line for the cross-border bank lending to other banks has turned down, as has the total.

Knock-on effects on fiscal positions

There are knock-on effects from the risk-taking channel on the government's fiscal position too. When credit supply expands, so does the set of corporate investment projects that are financed. This raises economic activity and improves the fiscal position of the government. If the corporate borrowing in dollars takes place 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.

In a period when the US dollar is weak, the risk-taking channel operates across the set of EMEs, and a diversified investor in EME local currency sovereign bonds sees reductions in tail risks, allowing greater portfolio positions for any given exposure limit. In this way, a weaker dollar goes hand in hand with portfolio flows into local currency EME sovereign bonds. However, when the dollar strengthens, these same relationships go into reverse and conspire to tighten financial conditions. Borrowers' balance sheets look weaker. Their creditworthiness declines. Creditors' capacity to extend credit declines for any exposure limit, and credit supply tightens, serving to dampen economic activity and the government fiscal position. The deteriorating fiscal position increases tail risks for a diversified investor in sovereign bonds, a situation

which is met by reductions in overall portfolio positions in EME sovereign bonds. In this way, a stronger dollar coincides with portfolio outflows from EME local currency sovereign bonds.

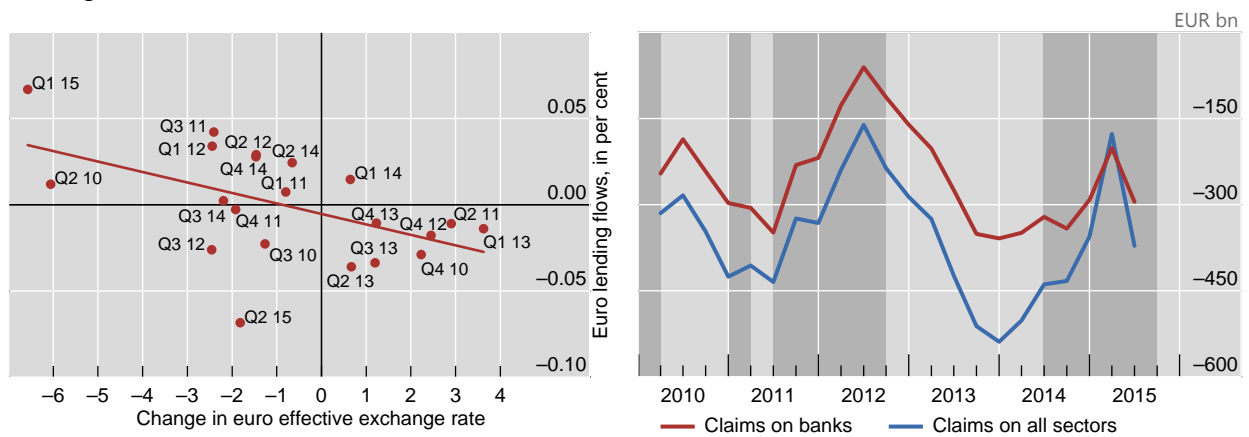
Although the US dollar is undoubtedly the most important international funding currency, the risk-taking channel is not just about the dollar. As the just released December 2015 *BIS Quarterly Review* notes, the euro seems to be taking on the attributes of an international funding currency, just like the dollar. Cross-border bank lending in euros to borrowers outside the euro area shows the telltale pattern of a depreciating euro going hand in hand with greater euro-denominated lending to borrowers outside the euro area, as shown in Graph 2, taken from that *Quarterly Review*.

Cross-border bank claims in euros on borrowers outside the euro area

Graph 2

Percentage changes in cross-border claims in euros outside the euro area vs changes in euro effective exchange rate¹

Cumulative flows²



¹ The line is a fitted regression line. Positive changes in FX rate denote euro appreciation; percentage changes are break-adjusted and refer to cross-border claims on all sectors. ² The dark shaded areas indicate depreciation of the effective euro exchange rate; flows break-adjusted.

Sources: BIS effective exchange rate statistics; BIS locational banking statistics by residence.

Pricing consequences of the risk-taking channel

I said earlier that risk-taking has both a price and a quantity dimension. Let me now turn to the price dimension. In terms of price, greater risk-taking is associated with a compression of spreads.

Take the example of EME sovereign credit default swap (CDS) spreads. The bubbles in Graph 3 show how sovereign CDS spreads for a group of EMEs have moved with shifts in the bilateral exchange rate against the US dollar since the end of 2012. 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 five-year sovereign CDS spread. The size of the bubbles indicates the total dollar-denominated debt owed by non-banks in the country.

We see from Graph 3 that there is both a time-series and a 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 towards the top left hand corner; in other words, as the domestic currency weakens against the US dollar, EME sovereign CDS spreads have tended to rise.

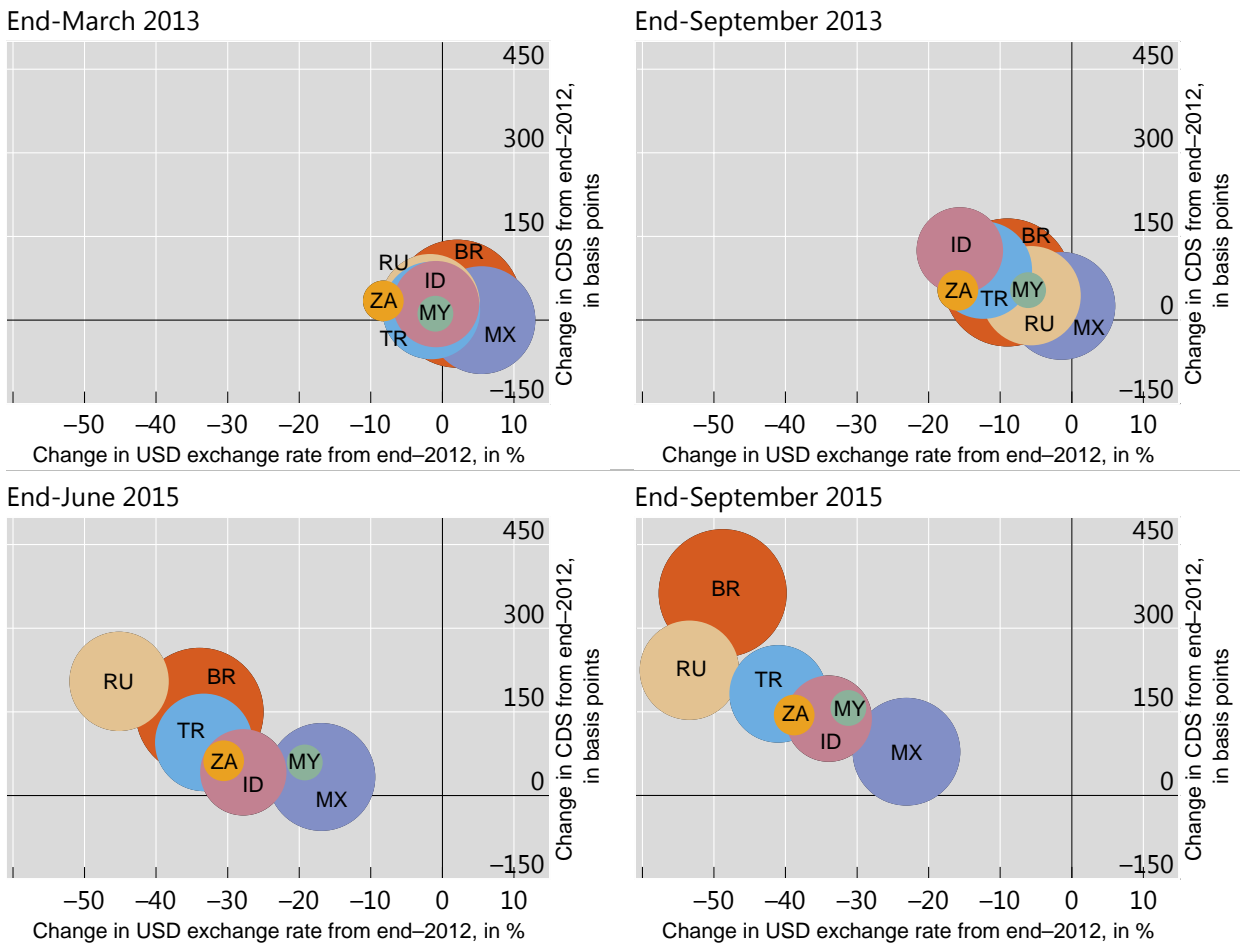


Interestingly, these results go away when we consider instead the trade-weighted effective exchange rate that is orthogonal to the US dollar.⁷ When we consider that part of the effective exchange rate that is orthogonal, or unrelated, to the US dollar, there is no evidence that a currency appreciation is associated with loosening of financial conditions. Indeed, we actually find the opposite result for some measures of financial conditions. Thus, one immediate lesson from our empirical investigation is that the risk-taking channel operates through the bilateral exchange rate against the US dollar, not through the trade-weighted effective exchange rate.

Illustrating the risk-taking channel

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

Graph 3



BR = Brazil; ID = Indonesia; MX = Mexico; MY = Malaysia; RU = Russia; TR = Turkey; ZA = South Africa. The size of the bubbles indicates the size of dollar debt in Q4 2014.

Sources: S Avdjiev, R McCauley and H S Shin, "Breaking free of the triple coincidence in international finance", *BIS Working Papers*, no 524, October 2015; Markit; national data; BIS.

A similar set of results hold for returns on EME sovereign bonds. Graph 4 depicts returns in dollar and local currency terms on emerging market sovereign bonds.⁸ The blue scatter is the local currency

⁷ Hofmann et al (2015), op cit.

⁸ See Hofmann et al (2015), op cit, for details of data source and construction of the scatter chart.

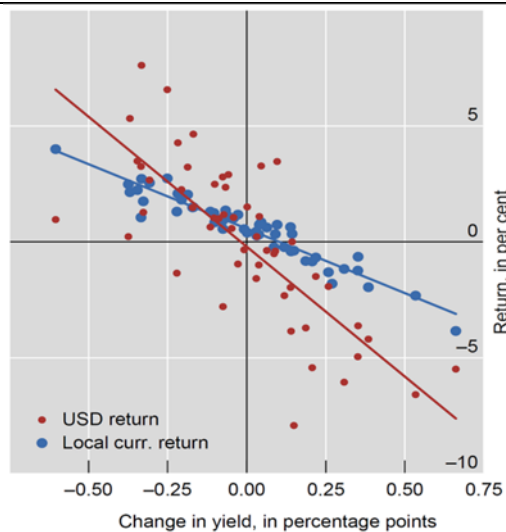


return (in per cent) against the domestic bond yield change (in percentage points), while the red scatter is the US dollar-denominated return against the yield change.

As you can see, the scatter plots reveal a negative relationship between EME currency appreciation against the US dollar and domestic interest rates. In Graph 4, the slope for the red line for red dots is steeper than that for the blue line for blue dots. The right-hand half of the scatter plot corresponds to the region where domestic currency sovereign bond yields have risen – that is, where domestic financial conditions are tighter, associated with higher interest rates. In these countries, the red line is below the blue line, which is to say that dollar returns tend to be lower than local currency returns, implying that the local currency is depreciating against the dollar. In short, when domestic interest rates rise, the domestic currency tends to depreciate.⁹

Dollar and local currency returns on an emerging market sovereign bond fund¹

Graph 4



¹ This chart shows monthly returns on an emerging market sovereign bond fund between January 2011 and July 2015. The blue scatter is the local currency return (in per cent) against the domestic bond yield change (in percentage points). The red scatter is the US dollar return against the yield change. See Hofmann et al (forthcoming) for details.

Sources: B Hofmann, I Shim and H S Shin, “Sovereign yields and the risk-taking channel of currency appreciation”, *BIS Working Papers*, forthcoming; Bloomberg; EPFR.

Conversely, the left-hand half of the scatter panel corresponds to the situation where domestic interest rates have fallen, and so represents more permissive domestic financial conditions. There, we see that the blue line lies below the red line, implying that the domestic currency tends to appreciate against the dollar.

The relationship between exchange rates and financial conditions in Graph 4 shows how broader domestic monetary conditions fluctuate in unison with the exchange rate. Specifically, dollar returns are

⁹ This result lines up with the finding that in EMEs, a positive shock to short interest rates leads to a depreciation, in contrast to advanced economies where a positive interest rate shock leads to an appreciation. For the former, see E Kohlscheen “Impact of monetary policy on the exchange rate: puzzling evidence from three emerging economies” Central Bank of Brazil working paper, 2011, <http://www.bcb.gov.br/pec/wps/ingl/wps259.pdf>. For the latter, see J Kearns and P Manners “The Impact of Monetary Policy on the Exchange Rate: A Study Using Intraday Data”, *International Journal of Central Banking*, 2006 December, <http://www.ijcb.org/journal/ijcb06q4a6.pdf>.



higher when EME financial conditions tighten, while local currency returns are higher when EME financial conditions loosen. Currency appreciation and looser financial conditions therefore go hand in hand.

Some general lessons for EMEs

When an international currency depreciates, there is a tendency for foreign borrowers to borrow more in that currency.

The stock of US dollar-denominated debt of non-banks outside the United States stands at \$9.8 trillion. Of this, the US dollar-denominated debt of non-banks in EMEs stands at \$3.3 trillion, a figure which has doubled since 2007.¹⁰ This overhang of US dollar-denominated debt has been weighing on macroeconomic conditions in recent months.

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. The average maturity of international debt securities issued by EME borrowers this year has been well over 10 years. In addition, many emerging economies hold substantial foreign exchange reserves, in contrast to their situation in past crises.

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. A recent BIS working paper¹¹ finds 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. The September 2015 issue of the *BIS Quarterly Review* has a box on capital outflows from China that illustrates these themes.¹²

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. Thus 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. Exchange rate changes do not happen in a vacuum; they are part of broader shifts in global financial conditions and should be understood in this broader context. We will undoubtedly have more opportunities to discuss these issues in policy circles in the months ahead.

¹⁰ R McCauley, P McGuire, V Sushko, "Dollar credit to emerging market economies", *BIS Quarterly Review*, December 2015, pp 27-41.

¹¹ V Bruno and H S Shin, "Global dollar credit and carry trades: a firm-level analysis", *BIS Working Papers*, no 510, August 2015.

¹² R McCauley, "Capital flowed out of China through BIS reporting banks in Q1 2015", *BIS Quarterly Review*, September 2015, pp 28-29.