The dollar-based financial system through the window of the FX swaps market

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The international role of the dollar is often discussed in the context of the current accounts of both advanced and emerging market economies and their accumulation of reserve assets. Several contributions in this volume reflect this focus on the current account. However, it is better to view the dollar's outsize importance in global affairs as deriving more from its pre-eminent role as the *funding currency* of choice in global capital markets for banks and non-bank financial intermediaries (NBFIs), and the pivotal role of central bank dollar swap lines as a liquidity backstop in keeping the global financial system on an even keel (Avdjiev et al (2016)).

The markets for FX swaps and forwards provide a window on this global role of the dollar as the main funding currency for both banks and non-banks. FX swap and forward positions are very large in gross terms, as I will describe below, but they do not always map neatly to current account balances. Most of the time, FX swaps are out of sight and out of mind. However, from time to time, they are thrust into the limelight during periods of dollar funding stresses, most recently in the early phase of the Covid shock in March 2020, and most dramatically during the 2007–09 Great Financial Crisis. Piecing together the size and the structure of FX swaps and the resulting ongoing dollar repayment obligations reveals that the vulnerabilities to dollar funding stresses are larger in advanced economies than in emerging market economies.

Dollar dominance in FX swaps and forwards

At its most basic, an FX swap is an arrangement whereby two parties exchange currencies at the spot rate today (spot leg) and agree to unwind that transaction at a pre-agreed exchange rate at some pre-agreed time (forward leg). Once the spot leg transaction is complete, only the forward leg remains. Unlike most other derivatives, FX swaps require payment of the full principal amount at maturity, and thus have debt-like attributes. Yet, unlike other forms of collateralised borrowing

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(such as repo), the prevailing accounting convention does not record the obligations from FX swaps as debt on the balance sheet.

The textbook use case for FX swaps/forwards is for hedging currency exposures. For example, exporters and importers often use forwards to hedge their international trade-related accounts payables/receivables. An exporter with expected dollar receipts may sell dollars forward to lock in the local currency value of the export proceeds. Such hedging would allow the exporter to hedge the costs associated with the domestic wage bill or other investment costs locally.

However, much more important than these "real economy" uses is the hedging by non-bank financial firms (eg pension funds and insurance companies) that manage the exchange rate risk associated with their asset portfolio. Take the case of a life insurer or pension fund who has obligations to policy holders or beneficiaries in euros, yen, sterling or Swiss francs. While these obligations are in domestic currency, the life insurer or pension fund typically holds a globally diversified portfolio, much of it comprising dollar assets. To hedge the currency risk, the life insurer or pension fund can enter an FX swap with a global bank, in effect *borrowing* dollars while pledging domestic currency as collateral.

The amounts involved in such hedging transactions are very large (see, for instance, Borio et al (2022)). The outstanding obligations to pay US dollars in FX swaps/forwards, mostly very short term, amount to more than $80 trillion. This sum exceeds the stocks of dollar Treasury securities, repo and commercial paper combined. Such are the outstanding stocks. In terms of flows, the latest BIS Triennial survey found that the churn of deals approached $5 trillion per day in 2022, accounting for two thirds of daily global FX turnover.

Graph 1 draws on the BIS Triennial Survey to illustrate the average daily global turnover in foreign exchange, with breakdowns by instrument, currency, maturity, sector and location of transactions.[2] For the stocks, the BIS OTC derivatives statistics track global outstanding amounts for FX swaps/forwards semiannually, with detail by currency and sector.[3]

As shown in Graph 1, average daily FX turnover scaled by world GDP (dashed black line) has consistently trended upwards for roughly two decades. To give sense of the rough magnitudes, note that in 2022 the equivalent of world GDP was being turned over every 14 days or so. This is significantly faster than every 25 days in 2001. As argued below, this growth can be attributed to greater use of FX swaps by non-bank financial firms.

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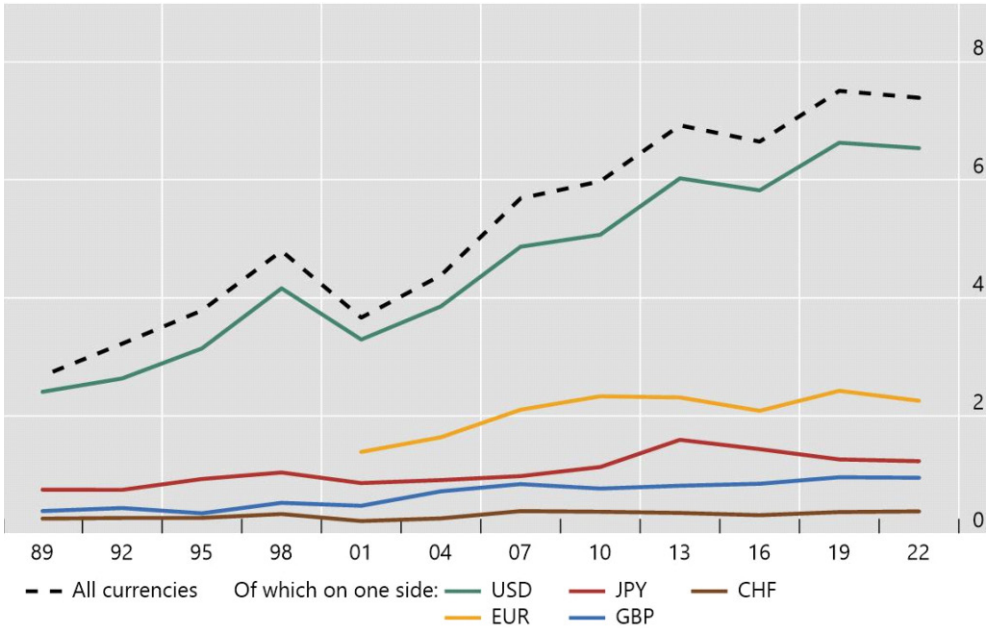
[2] The BIS Triennial Central Bank Survey is the most comprehensive source of information on the size and structure of global over-the-counter (OTC) FX markets. The Triennial Survey is coordinated by the BIS, in cooperation with central banks and other reporting authorities in more than 50 jurisdictions. The Survey takes place in April every three years (since 1986), the most recent being in April 2022 (results published in November 2022). The Survey covers the average daily turnover at more than 1,200 banks and other dealers.

[3] FX swaps and outright forwards cannot be distinguished in BIS stocks data. Currency swaps are FX swaps with a maturity longer than one year in which coupons are also exchanged. Ideally, we would exclude from our analysis non-deliverable forwards (NDFs), which entail just a fractional payment, but they are not identified individually in the stocks data. However, turnover data show that NDFs account for less than 10% of the average daily turnover of FX swaps, forwards and currency swaps

Turnover of FX spot, swaps and forwards,[1] scaled by world GDP

In percent Graph 1



[1] Average daily turnover in the month of April.

Sources: IMF, BIS Triennial Survey.

Dollar dominance is clearly evident in Graph 1, which aggregates turnover in forward, swap and spot transactions. FX contracts with the US dollar on one side (green line) have grown in tandem with the global total. By contrast, turnover with the euro, yen, sterling or Swiss franc on one side has barely kept pace with underlying economic activity as measured by global GDP.

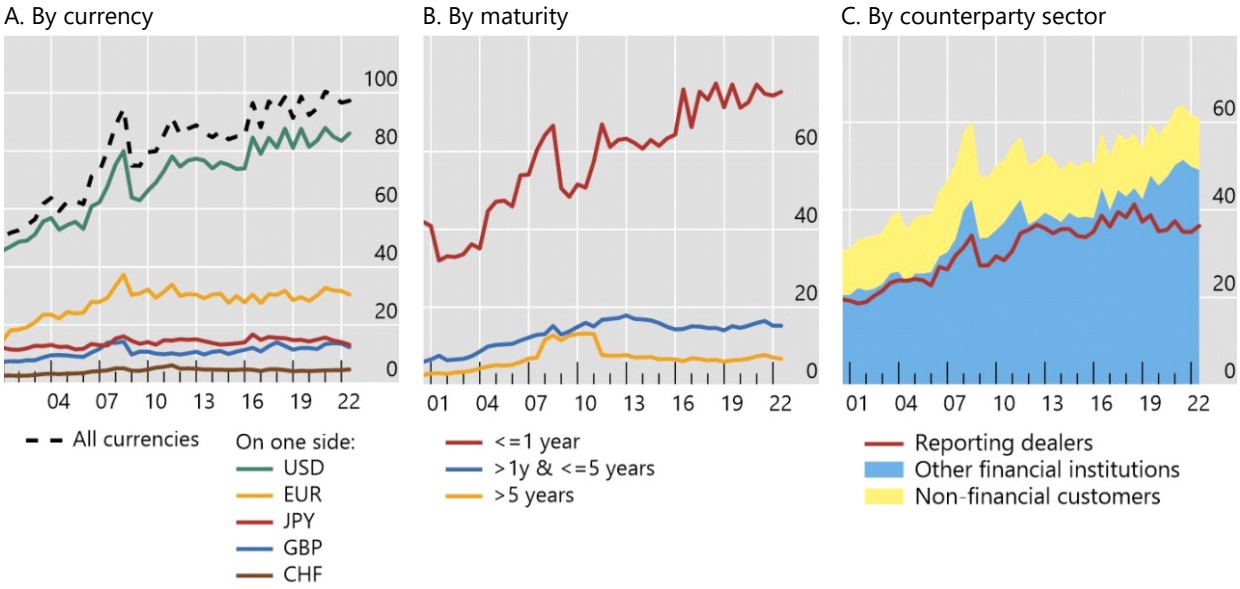
Turning to outstanding stocks, it is useful to focus squarely on FX swaps/forwards. Markets for these instruments are periodically subject to funding squeezes. Swaps and forwards are typically short term and have debt-like attributes as explained below. They are key to understanding the financial factors that determine the fluctuations in risk premiums (eg Avdjiev et al (2016), Shin (2016), Obstfeld and Zhou (2022) and the chapters by Rey, Blanchard, Kalemli-Özcan and Velasco in this volume. As shown in Graph 2.A, FX swaps/forwards with the US dollar on one side (green line) have grown to more than 80% of world GDP. By contrast, and in line with the flows in Graph 1, FX swaps/forwards with the euro, yen, Swiss franc or sterling on one side have been stable.

The scale of the US dollar (green lines) relative to other currencies in Graphs 1 and 2.A reflects its status as the global funding currency of choice. But what is the reason for the *rise* in the green lines in these graphs? The answer is revealing, and highlights the network effects that arise from the mutually reinforcing choices of financial and non-financial firms in their funding and hedging choices. Consider first the choices faced by importers and exporters on the real side of the economy. In both advanced economies and emerging markets, corporate borrowers that borrow internationally tend to borrow in US dollars (Maggiori et al (2020)). For example, firms that

purchase inputs denominated in dollars need working capital in dollars, and thus borrow dollars short term from banks. Dollar-denominated trade, in effect, creates dollar-denominated debt. As another example, consider an exporter of oil or other commodities invoiced in dollars who wants to make a long-term capital investment. Given regular dollar revenue streams, such an exporter may find it prudent to borrow long-term in dollars, thereby eliminating currency risk. Again, trade invoicing begets dollar debt.

FX swaps, FX forwards and currency swaps outstanding, scaled by world GDP

In per cent of world GDP Graph 2



Sources: IMF, BIS OTC derivatives statistics.

From a capital markets viewpoint, trade invoicing in dollars produces a preponderance of dollar debt that investors are invited to finance. The size and depth of dollar capital markets create thick market externalities that attract both investors and issuers. The more investors enter the market, the more issuers they attract, and vice versa. Long term investors such as pension funds and life insurance companies have long-term obligations to their policyholders and thus demand long-term assets to match duration for asset-liability management. But, for those investors who operate outside the United States, there are often not enough securities, or not enough diversity of securities, in their home markets to fill up their very large balance sheets. Such investors typically have a globally diversified portfolio. Dollar-denominated securities are a very important part of the asset portfolio. As these long-term investors' obligations to policyholders and beneficiaries are generally in their local currency, many of them hedge the currency risk using FX swaps.[4] This is where global banks enter the story, as they are the counterparties to these

[4] The degree to which currency risk is hedged depends on the type of asset and the type of investor. Equity portfolios are generally more volatile and have less predictable cash flows than fixed income portfolios, and thus are hedged to a lesser

investors who wish to hedge by borrowing dollars. The banks (mostly non-US banks) for their part, will source dollars in wholesale dollar funding markets. For this reason, the global banking system itself runs on dollars.

Graph 2.C gives a sense of the relative importance of the real and financial sector pieces of the FX swap market. On the real side, world trade grew very rapidly until roughly the Great Financial Crisis but has since flatlined. The real-world use of FX swaps/forwards by non-financial users, mainly importers and exporters to hedge accounts receivables/payables, has in turn kept pace, and hence we see the stable yellow shaded area in Graph 2.C. Moreover, the amounts involved are rather small relative to use of these instruments by the financial sector. Within the financial sector, "other financial institutions" (blue-shaded area), our proxy for non-bank financial intermediaries (NBFIs), have emerged as the dominant players.[5,6] This in part reflects the growth in outward portfolio investment by pension funds, insurance companies and asset managers in countries with ageing populations. McGuire et al (2021), for example, document a sharp rise in such investment and demand for FX hedging services by NBFIs in six Asian economies.

An economic asymmetry in FX swap markets

FX swaps have attributes of collateralised borrowing where a currency is used as collateral instead of securities. Unlike repo and other forms of collateralised borrowing, however, the payment obligations are not recorded on the balance sheet as debt.

Contractually, an FX swap is symmetric: two parties exchange two currencies and reverse the transaction at a later agreed date. During the life of the contract, each party has a symmetric debt obligation to the other. At the macro level, however, the dominance of the dollar in the FX swap market gives rise to an *economic asymmetry* in the following sense. At times when there is a dollar shortage, the borrowers of dollars in the FX swap market must join the scramble for dollar funding. This is so even if they receive euros, yen, sterling or Swiss francs in return. Their payment obligation is in dollars, and so they must source dollars somehow. Typically, a long-term investor who has borrowed in dollars in the swap market has bought long-term dollar assets, such as long-dated treasuries, agency securities or dollar corporate bonds. However, not all of them can be sold immediately to repay dollars. In this respect, the dollar borrowers in the swap market face a maturity mismatch between short-term dollar payment obligations which are due immediately and long-term dollar assets that are illiquid.

The asymmetry between the dollar and other currencies is most evident during periods of market stress. FX swaps and forwards require the payment of the full principal amount at maturity. Since

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extent. Across investor types, those that are more tightly regulated, like insurance companies, tend to have more conservative exposures than other types, such as pension funds and asset managers. See McGuire et al (2021) for a discussion.

[5] In the BIS derivatives statistics, The counterparty group "other financial institutions" comprises mainly non-bank financial institutions such as pension funds, insurance companies and hedge funds, but also includes non-reporting banks.

[6] In Graph 2.C, the reporting dealers' portion (red line) is included for completeness; it captures activity associated with the banking sector that actually makes markets in these instruments.

they are typically short term, they need to be rolled over frequently.[7] These attributes make FX swap markets vulnerable to funding squeezes, as was evident during the Great Financial Crisis (GFC) and again in March 2020 when the Covid-19 pandemic wrought havoc. During these episodes, market participants scrambled to roll over dollar hedges just as dealer banks pulled back.

The economic asymmetry in FX swap markets shows up in the pricing of FX swaps. The interest rate on dollar borrowing implied by the forward exchange rate tends to diverge systematically from the interest rate in dollar money markets, in violation of covered interest parity (CIP). For much of the period after the GFC, market participants paid more to borrow dollars in the FX swap market than in the dollar money market. This premium on dollar funding in FX swaps has fluctuated substantially depending on financial conditions. It is one more example of the fluctuations in risk premiums highlighted by many contributors in this volume.

The dollar payment obligations associated with FX swaps/forwards are not measured well, presenting challenges for monitoring and mitigation. BIS statistics capture overall outstanding amounts but lack more detailed information on how the dollar payment obligations are distributed across countries and sectors. Estimates based on assumptions detailed in Borio et al (2017, 2022) put the dollar debt from FX swaps/forwards of non-banks outside the United States at around $25 trillion in mid-2022, double their $13 trillion in on-balance sheet dollar debt. The estimate for non-US banks is about $35 trillion, more than double the estimated $15 trillion in on-balance sheet dollar debt.

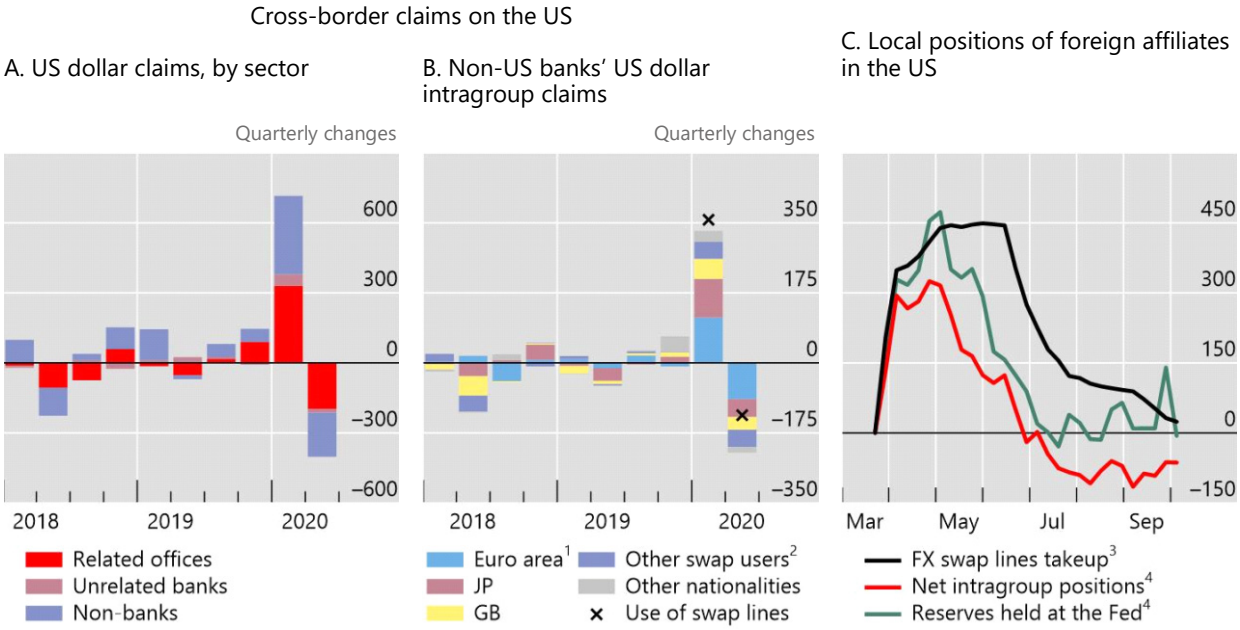
This lack of information about the geography of dollar debt from FX swaps/forwards poses challenges to the implementation of policies to cushion shocks. To restore market functioning during the GFC, and again in March 2020, central bank swap lines between the Federal Reserve and major central banks around the world channelled dollars to central banks around the world, which on-lent to private financial institutions in the jurisdictions that were scrambling for dollars.

[7] Almost four fifths of outstanding amounts at end-June 2022 in Graph 2.B matured in less than one year. Data from the April 2022 Triennial Survey show not only that instruments maturing within a week accounted for some 70% of FX swaps turnover, but also that those maturing overnight accounted for more than 30%.

Cross-border banking flows and central bank swap lines

In billions of US dollars

Graph 3



[1] Banks headquartered in any of the 13 BIS reporting euro area countries. [2] Comprises AU, CH, DK, KR, MX, NO and SG (KR and MX started to use their swap lines in Q2 2020). [3] Central bank liquidity swaps outstanding. [4] Cumulative weekly changes since 18 March 2020 at foreign branches and agencies in the United States

Source: Aldasoro et al (2020).

To the extent that the dollar shortages result from funding transactions of the largest non-US financial firms, the debt-like obligations are an advanced economy (AE) story. Central bank swap lines take on great significance for maintaining the orderly functioning of global capital markets. Through central bank swap lines, central banks can obtain dollar liquidity from the Federal Reserve to meet underlying demand from banks and non-banks in their jurisdictions, who pledge domestic currency as collateral.

In March 2020, the Federal Reserve used its network of swap lines with 14 central banks to channel dollar liquidity globally, significantly easing global dollar funding conditions. Tapping the swap lines generated a sharp increase in global cross-border banking flows, particularly in cross-border claims on banks located in the United States (Graphs 3.A and 3.B). This rise was less a reflection of the increased external funding needs of banks specifically located in the United States, and more the result of a sudden increase in global demand for dollar liquidity – symptomatic of a system under stress. In effect, the Fed provided a "grand dollar overdraft" to backstop the global dollar financial system (see Aldasoro et al (2021)).

These exceptional movements reflect how banks manage liquidity across borders through their global network of branches and subsidiaries. By end-March 2020, a total of $358 billion had been drawn, most prominently by banks in the euro area, Japan and the United Kingdom. The overall

rise in these banks' dollar-denominated intragroup claims correlates with the uptake at their central banks' dollar auctions. The use of the swap lines serves to illustrate the mechanics of cross-border capital flows as well as the "elastic" nature of the global banking system that comprises both central and commercial banks.

There are three main lessons that come from an examination of the FX swap market. First, while attention has often been focused on the current account, the bigger issue for global financial conditions stems from the large gross flows associated with the role of the dollar as the funding currency of choice in capital markets. Second, while dollar shortages often focus on emerging market economies, the protagonists in dollar funding scrambles are advanced economy financial firms. Third, central bank dollar swap lines are the essential backstop that keeps the global financial system on an even keel.

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