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The internationalisation of EME currency trading[1]

The participation of non-residents in foreign exchange (FX) markets for emerging market economy (EME) currencies has increased to the point where these markets are almost as internationalised as those for advanced economy (AE) currencies. Nevertheless, the overall volume of trading in many EME currencies relative to economic activity remains much less than that in AE currencies. This reflects EMEs' smaller domestic investor base and lower degree of international financial integration.

JEL classification: F31, F36, G15.

In foreign exchange (FX) markets, the composition of trading in many emerging market economy (EME) currencies has largely converged with that in advanced economy (AE) currencies along one important dimension: the participation of non-residents. Until the late 2000s, trading with non-residents accounted for a much smaller share of FX activity in EME currencies than in AE currencies. This share has since progressively increased. By 2022, FX trading in all but a handful of EME currencies was overwhelmingly with counterparties abroad (Graph 1). In other words, the trading of EME currencies had become almost as internationalised as that of AE currencies.

Internationalisation is not the only dimension along which the composition of EME currency trading has become similar to that of AE currency trading. The importance of derivatives and the participation of a diverse range of financial customers have also largely converged. Indeed, from the perspective of the structure of FX markets, the currencies of a few countries categorised by the BIS as EMEs now closely resemble AE currencies.[2]

2   The BIS categorises the following 11 economies as AEs: Australia, Canada, Denmark, the euro area, Japan, New Zealand, Norway, Sweden, Switzerland, the United Kingdom and the United States. All other economies are categorised as either EMEs or developing economies. These groupings are intended solely for analytical convenience and do not represent an assessment of the stage reached by a particular country in the development process.
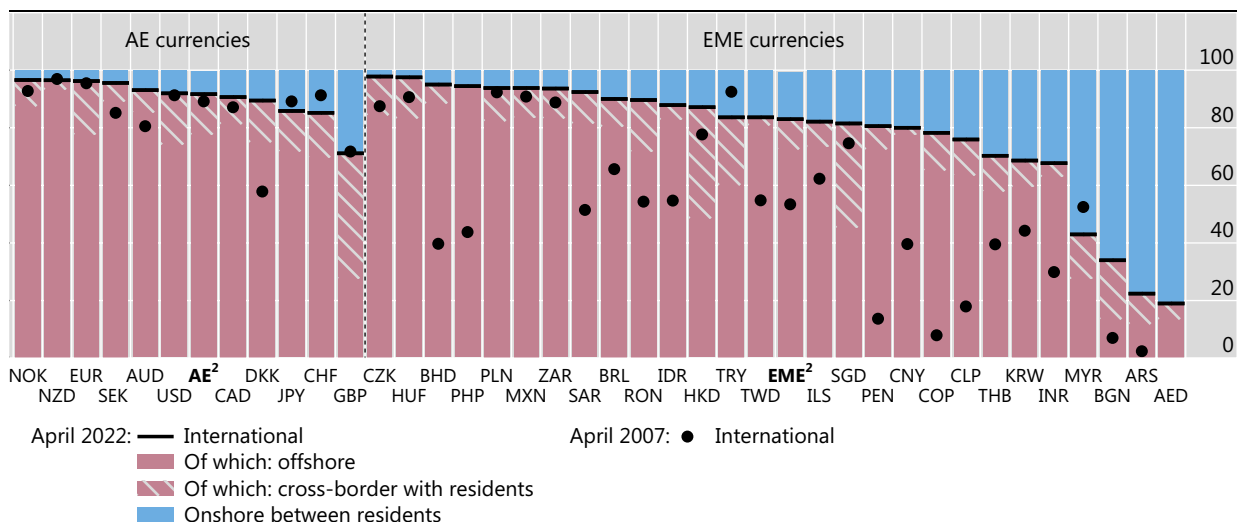
On the back of these trends, EME currencies' turnover almost tripled relative to GDP between 2007 and 2022. This growth was facilitated by increased portfolio investment and financial deepening. Despite this growth, the volume of FX trading in many, albeit not all, EME currencies remained low when benchmarked against underlying economic activity. EMEs' smaller domestic investor base and their lesser degree of international financial integration are important reasons why their FX trading remained relatively low.

The rest of this feature is structured as follows. The next section traces the rising internationalisation of EME currencies and its link to the growth of overall FX activity, drawing on the BIS Triennial Central Bank Survey of FX and over-the-counter (OTC) derivatives markets.[3] The feature then identifies the key factors behind these trends as well as the main drivers of FX turnover. The following section compares the structure of trading in EME and AE currencies. The concluding section highlights policy challenges arising from currency internationalisation. A box reviews FX trading in the Chinese renminbi (CNY), and another assesses the drivers of FX trading.

FX trading is mostly with non-residents outside the currency-issuing country[1]

In per cent of FX turnover   Graph 1

April 2022: —— International   April 2007: ● International
        ▨ Of which: offshore
        ▨ Of which: cross-border with residents
        ▦ Onshore between residents

[1] See technical annex for details.   [2] Median of AE/EME currencies.

Sources: BIS Triennial Central Bank Survey; authors' calculations.

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[3]   The Triennial Survey captures FX turnover in spot and OTC derivatives markets during the month of April. More than 1,200 banks and other dealers in 52 countries participated in the 2022 Survey. For details, see the BIS website, www.bis.org/stats_triennial_surveys/index.htm.

Trend towards currency internationalisation

Currency internationalisation refers to the use of a currency outside its country of issue. There are gradations of use, starting with the exchange of one currency against another for trade in goods and services and extending to the denomination of financial contracts in a currency foreign to the contracting parties (Kenen (2012)). Our focus is on the buying and selling of currencies by non-residents of the currency-issuing country, which are prerequisites for other international uses.

The internationalisation of FX trading can take two forms: transactions in foreign markets without the involvement of the issuing country's residents, referred to as offshore trades; and transactions between non-residents and residents of the issuing country, which we refer to as cross-border trades with residents.[4] The counterpart to these two forms of international trading is transactions between residents in their domestic market, referred to as onshore trades between residents.

AE currencies are all highly internationalised. Offshore trading accounts for the largest share of their FX turnover (Graph 1). Such trading is concentrated in a few major financial centres, foremost the United Kingdom followed by the United States, Singapore and Hong Kong SAR (BIS (2022a)). Cross-border trades with residents typically account for less than 10% of turnover. Among AE currencies, onshore trades between residents of the currency-issuing country are sizeable only for pound sterling (GBP), owing to London's pre-eminent place in the global FX market.

Among EME currencies, internationalisation has increased rapidly since the 2000s. For the median EME currency, the international share of trading rose from 53% in April 2007 to 83% in April 2022 (Graph 1). Offshore trading accounted for all of this increase; cross-border trading with residents of the issuing country actually declined as a share of overall trading. Onshore trades between residents remained large only for a few EME currencies, including Malaysian ringgit (MYR) and Argentine peso (ARS).

Owing to this expansion of offshore trading, the growth of turnover in EME currencies has greatly outpaced that in AE currencies since the mid-2000s, resulting in a near-tripling of their share of global trading (Graph 2, panel A). The CNY saw especially fast growth (see Box A). Moreover, EME currency trading rose faster than economic activity. Between April 2007 and April 2022, daily FX trading increased from less than 3% of the median EME's annual GDP to over 6% (panel B).
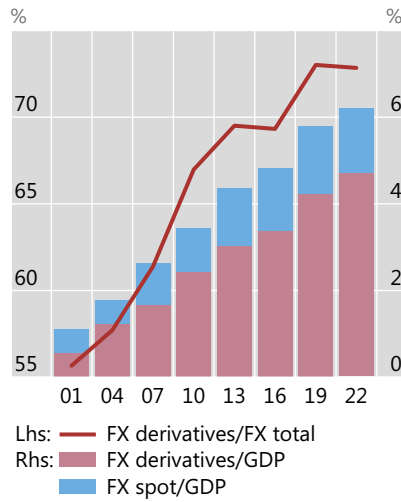
Internationalisation helped to propel overall FX turnover by facilitating diversification and innovation. Non-residents often have different preferences and constraints than residents. Their participation thus broadens opportunities for hedging and positioning by making it easier to find counterparties willing and able to take the other side of a trade. This in turn makes it more attractive for dealers to make markets, lowering transactions costs and, in the process whereby liquidity

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[4]   Data from the Triennial Survey overestimate offshore trading and underestimate cross-border trading with residents. Dealers who contribute to the Survey differentiate between transactions with residents and non-residents but do not report the geographic details that would be necessary to determine whether the customer resides in the currency-issuing country. Consequently, offshore trades include cross-border trades between dealers abroad and customers onshore. Estimates of international trading, which sum offshore trading and cross-border trading with residents, are unaffected by this potential misclassification.
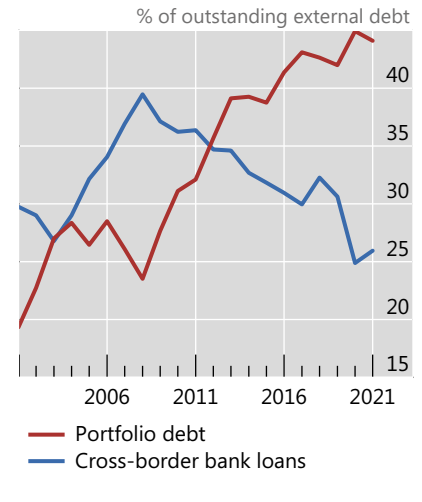
Growth of EME currency trading[1]

Graph 2

A. EME currencies' share of global FX turnover increased
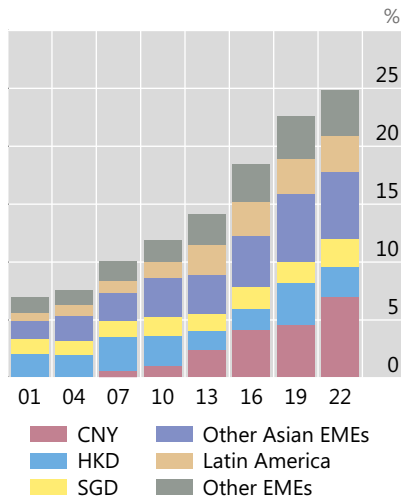
B. Led by derivatives, FX turnover rose as a share of EMEs' GDP[2]...

C. ... on the back of a shift towards portfolio investment[2]

Panel A legend:
- CNY
- HKD
- SGD
- Other Asian EMEs
- Latin America
- Other EMEs

Panel B legend:
- Lhs: FX derivatives/FX total
- Rhs: FX derivatives/GDP
- FX spot/GDP

Panel C legend:
- Portfolio debt
- Cross-border bank loans

[1] See technical annex for details.   [2] Median of EME currencies.

Sources: IMF, *Balance of Payments Statistics*; IMF, *World Economic Outlook*; national data; BIS Triennial Central Bank Survey; authors' calculations.

begets liquidity, further boosting trading. Furthermore, non-residents often spearhead innovations that help to deepen markets. For example, the electronification of FX trading has boosted trading in major financial centres, especially London (Schrimpf and Sushko (2019)).

Accordingly, the internationalisation of EME currencies went hand in hand with a rise in the share of trading with a diverse range of financial customers, such as smaller (non-dealer) banks, institutional investors, hedge funds and proprietary trading firms. Such customers' collective share rose from about 30% of trading in the median EME currency in April 2007 to almost 50% in April 2022.

Financial customers tend to trade more heavily in derivatives markets than spot markets. Their rising prominence has thus boosted derivatives trading more than spot trading. For the median EME currency, derivatives trading rose from 61% of total FX turnover in April 2007 to 73% in April 2022 (Graph 2, panel B).

Renminbi turnover offshore surges

Among the 39 currencies covered in the BIS Triennial Survey, the Chinese yuan (CNY) saw the fastest growth in FX trading between April 2019 and April 2022. CNY trading rose by over 70% after adjusting for exchange rate movements, to $526 billion per day. This rapid growth elevated the CNY to the fifth most traded currency in the world. Even so, CNY turnover remained low relative to the size of China's economy: 3% of annual GDP, compared with 30% of GDP for USD and 6% for the median EME currency.

Increased CNY turnover largely reflected more active trading between counterparties outside mainland China. Such international turnover doubled between April 2019 and April 2022, to about 80% of all CNY trading (Graph A1, panel A). Hong Kong SAR remained the pre-eminent hub for trading CNY, but it lost market share to Singapore, the United Kingdom and the United Sates.
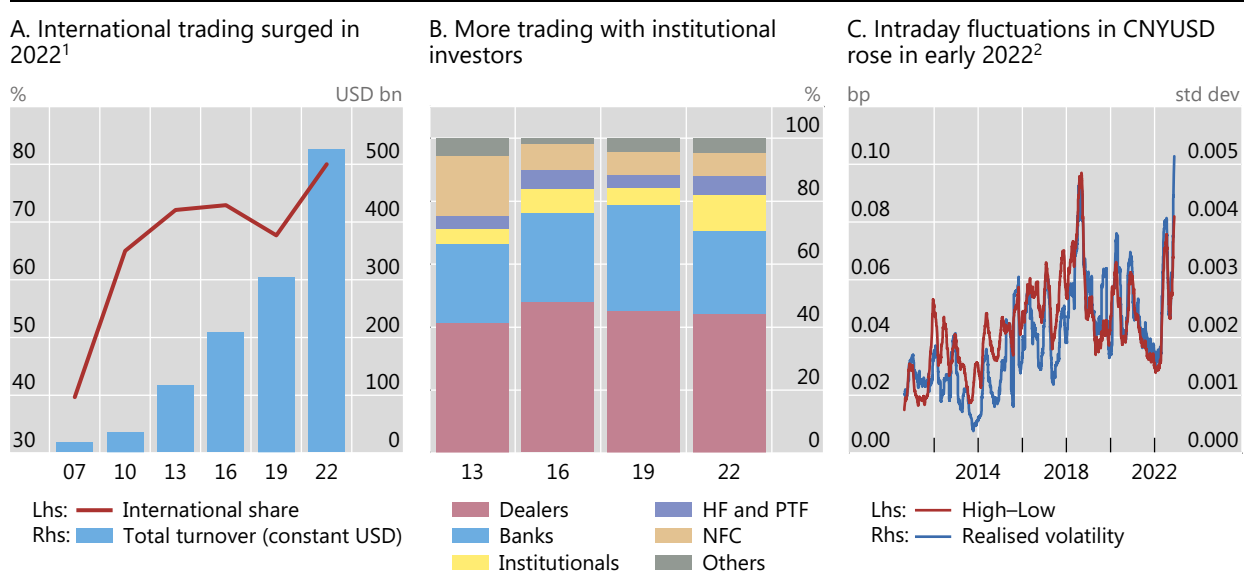
CNY trading onshore with residents of the mainland increased by only 4%, despite the Chinese government's continued efforts to open up domestic financial markets to foreign participants. The subdued growth of onshore trading was probably due to a city-wide lockdown in Shanghai between March and May 2022. Given the slowdown in international trade during the period and the city's status as China's main financial centre, the lockdown is likely to have weakened onshore trading in April, when the Triennial Survey was conducted.

CNY growth was led by trading in options and with institutional investors, hedge funds and other non-bank financial customers. The shares of options in total turnover about doubled between 2019 and 2022, to 10%, as did the share of non-bank financial customers, to 18% (Graph A1, panel B).

Rising portfolio investment contributed to the growth of CNY trading. Cumulative inflows into local bond and equity markets rose strongly over several years through early 2022, when China subsequently saw outflows. In addition, the instrument and counterparty composition of trading suggests that heightened volatility contributed to the expansion of CNY trading in April 2022. The volatility of the CNYUSD exchange rate was high in April 2022, comparable with levels seen in late 2018 when China-US trade frictions escalated (panel C). Higher volatility typically leads to more active trading as hedging and speculation increase (Drehmann and Sushko (2022)). The impact is often more pronounced in options because their payoff is directly related to volatility.

Rising volume and diversity of trading in Chinese renminbi   Graph A1

A. International trading surged in 2022[1]

B. More trading with institutional investors

C. Intraday fluctuations in CNYUSD rose in early 2022[2]

Lhs: ── International share
Rhs: ── Total turnover (constant USD)

Dealers · HF and PTF
Banks · NFC
Institutionals · Others

Lhs: ── High–Low
Rhs: ── Realised volatility

HF = hedge funds; NFC = non-financial corporations; PTF = proprietary trading firms.

[1] Constant exchange rates; April of each year.   [2] Computed over a rolling 65-day window.

Sources: Bloomberg; BIS Triennial Central Bank Survey; authors' calculations.

Financial deepening boosts FX turnover

Notably, the rise in EME currencies' internationalisation and the growth of their overall FX trading were not precipitated by a significant easing of FX or capital controls. Instead, they were spurred by the changing composition of foreign investment and the deepening of local financial markets.

Many EMEs retain FX and capital controls. Indeed, since the Great Financial Crisis (GFC) of 2007–09, restrictions on capital movements in the median EME have not changed much (Graph 3, panel A). A number of EMEs, particularly in Asia, require FX transactions to be backed by underlying trade in goods and services or investments.

These controls hinder market liquidity by causing FX trading to fragment between onshore and offshore markets. Non-residents typically choose to trade offshore, beyond the reach of FX controls, rather than participate in the onshore market. Overall turnover is lower as a result. To be sure, there are many economies where FX turnover is subdued relative to GDP even though capital restrictions are low (Graph 3, panel B).[5] That said, where capital restrictions are high, FX turnover is invariably low.

Fragmentation between onshore and offshore markets is most noticeable in FX swaps and forwards. FX swaps require the exchange of principal and are thus inhibited by restrictions on their deliverability abroad. For deliverable currencies, FX swaps account for the largest share of derivatives trading (Graph 3, panel C). They are used by residents and non-residents alike to fund and hedge foreign investments (Borio et
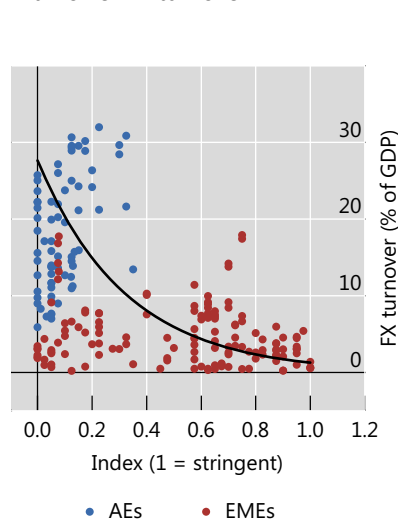
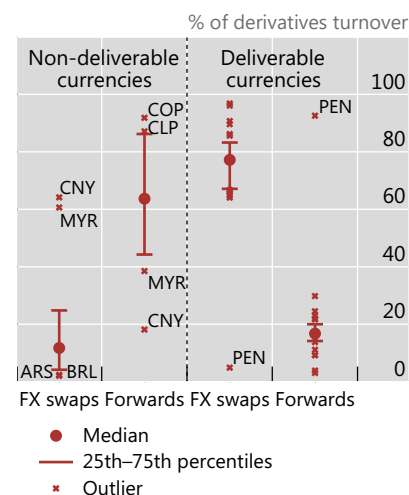Controls lead to the fragmentation of FX trading[1]   Graph 3

A. International share of FX turnover rose despite no easing in EMEs' capital controls[2]
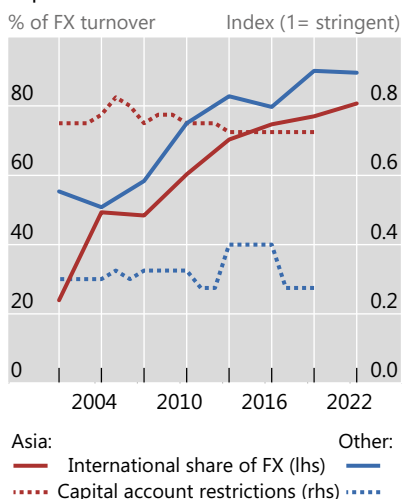
B. Capital controls were associated with lower FX turnover

C. For currencies with FX controls derivatives trading concentrated in forwards

Asia:
— International share of FX (lhs)
····· Capital account restrictions (rhs)

Other:
—
·····

• AEs • EMEs

• Median
— 25th–75th percentiles
✗ Outlier

[1] See technical annex for details.   [2] Median of Asian EMEs/Other EMEs.

Sources: Fernández et al (2016); IMF, *World Economic Outlook*; BIS Triennial Central Bank Survey; authors' calculations.

[5]   FX controls govern the buying and selling of the local currency, whereas capital controls regulate cross-border transactions in financial assets and liabilities. They tend to be liberalised together and thus capital controls can be seen as a proxy for FX controls. However, it is not uncommon for countries to remove all FX controls but maintain some restrictions on inward or outward investment.

al (2022). By contrast, for currencies with FX controls, FX swaps account for a very small share of derivatives trading and are predominantly traded onshore between residents. Instead, derivatives trading is concentrated in forwards, especially non-deliverable forwards (NDFs) traded offshore. NDFs do not require an exchange of currencies; they settle in the same currency, typically in US dollars. For a few currencies, FX controls permit limited deliverability outside the issuing country, which boosts their FX swap and overall trading. For example, this is the case for CNY, which can be cleared and settled in Hong Kong SAR and a few other major financial centres in the so-called CNH market.
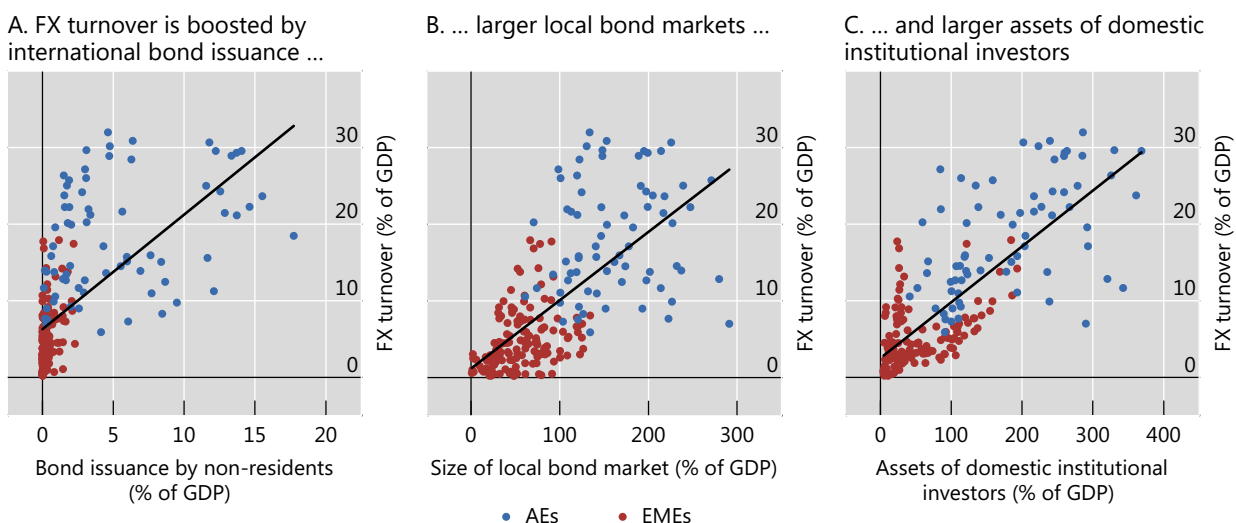
Rather than an easing of controls, what stimulated the trading of EME currencies, especially with non-residents, was a rise in portfolio flows. Following the GFC, the composition of debt inflows to EMEs shifted from bank lending to portfolio investment (Shin (2013); Graph 2, panel C). This shift generated demand for exchanging currencies and hedging FX risk. Whereas international loans were denominated mainly in US dollars and usually hedged at the time of borrowing if at all, foreign institutional investors, such as investment funds, often invested in bonds and other securities denominated in EME currencies and actively managed their FX exposures (CGFS (2021)). Furthermore, whereas loans were associated with infrequent payments, bonds and equities traded in secondary markets, generating frequent payments. Alongside inflows, portfolio outflows from EMEs increased too, in particular outward investment by domestic institutional investors, mainly pension funds and insurance companies (McGuire et al (2021)).

The relationship between portfolio flows and FX trading is evident in the issuance of international bonds. Foreign borrowers often swap the proceeds into another currency. Consequently, the larger such issuance, the higher is the ratio of FX turnover to GDP (Graph 4, panel A). International issuance of bonds denominated in Brazilian real (BRL), CNY, Turkish lira (TRY) and a few other EME currencies increased during the 2010s, which helped to boost FX trading in these currencies.

More generally, FX turnover was supported by financial deepening. The larger the stock of tradable debt and the more diverse the investor base, the more

Financial deepening drives differences in FX turnover[1]

Graph 4

A. FX turnover is boosted by international bond issuance ...

B. ... larger local bond markets ...

C. ... and larger assets of domestic institutional investors

- AEs
- EMEs

[1] See technical annex for details.

Sources: IMF, *World Economic Outlook*; World Bank, *Global Financial Development Database*; BIS debt securities statistics; BIS Triennial Central Bank Survey; authors' calculations.

developed tends to be the ecosystem for trading debt and hedging the associated risks. Accordingly, FX turnover is positively correlated with the size of the domestic bond market (Graph 4, panel B) as well as the assets of domestic institutional investors (panel C). Regression analysis confirms the significant contribution of domestic investors to FX turnover, even after controlling for other factors (see Box B).

Trading volumes in EME currencies remain low

Despite the decade-long trend towards internationalisation and its role in propelling overall growth, the volume of FX trading relative to economic activity remained low for many EME currencies, much lower than for the typical AE currency. Daily FX turnover in April 2022 for the median EME currency was roughly 6% of annual GDP, well below the 26% for AEs (Graph 5). Aside from the Hong Kong dollar (HKD) and the Singapore dollar (SGD), the only EME currencies that came close to the median for AE currencies were the South African rand (ZAR) and the Hungarian forint (HUF).

The relatively low volume of FX trading partly reflects the modest size of financial markets in EMEs. In particular, the heft of domestic institutional investors is much smaller in EMEs. Assets held by institutional investors equalled about 38% of GDP in the median EME at end-2021, compared with 151% in the median AE (Graph 6, panel A).

The juxtaposition of greater currency internationalisation but low FX trading relative to economic activity also highlights the lesser degree of overall international financial integration in many EMEs. Countries with larger external positions – common proxies for financial integration – tend to have larger FX trading in their currencies (Graph 6, panel B). In particular, external debt tends to give rise to FX hedging demand (see Box B). The gross external debt position – outstanding external assets and liabilities that take the form of debt – of the median EME rose from 17% of GDP in 2007 to 28% in 2021 (panel C). Yet, it was still much smaller than the external debt position of the median AE, which was 98% of GDP in 2021.

For most EME currencies FX trading is low compared with GDP[1]

In per cent, log$_{10}$ scale with axis labels in natural units   Graph 5
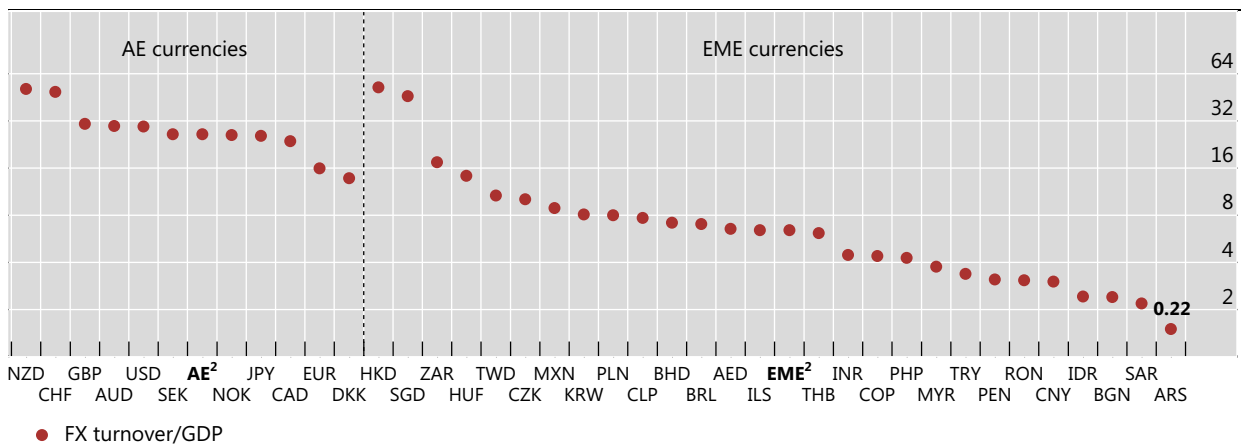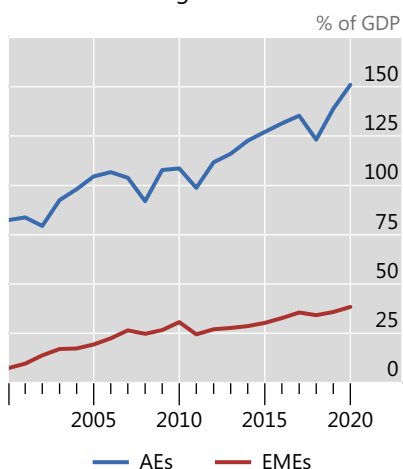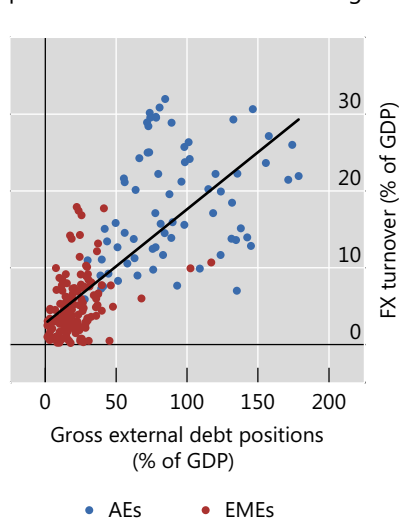

● FX turnover/GDP

[1] See technical annex for details.   [2] Median of AE/EME currencies.

Sources: IMF, *World Economic Outlook*; BIS Triennial Central Bank Survey; authors' calculations.
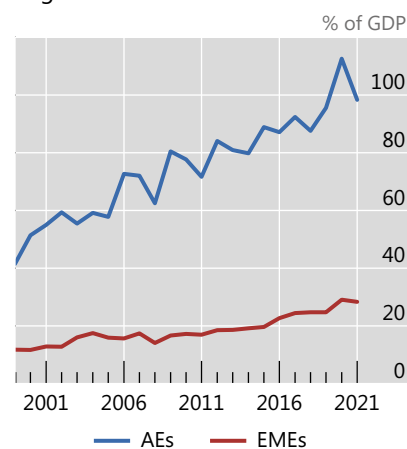
Low FX turnover reflects small markets and less international integration[1]   Graph 6

A. Assets of domestic institutional investors are larger in AEs[2]

% of GDP

| | 2005 | 2010 | 2015 | 2020 |

—— AEs   —— EMEs

B. Higher gross external debt positions lead to more FX trading

FX turnover (% of GDP)

Gross external debt positions
(% of GDP)

• AEs   • EMEs

C. Gross external debt positions are larger in AEs[2]

% of GDP

| 2001 | 2006 | 2011 | 2016 | 2021 |

—— AEs   —— EMEs

[1] See technical annex for details.   [2] Median of AEs/EMEs.

Sources: Lane and Milesi-Ferretti (2018); IMF, *World Economic Outlook*; World Bank, *Global Financial Development Database;* BIS Triennial Central Bank Survey; authors' calculations.

Evolving market structure for EME currency trading

Notwithstanding large differences between AE and EME currencies regarding the volume of FX trading, the structure of their trading is becoming increasingly similar. Besides the international share discussed above (Graph 7, panel A), the instrument and counterparty composition of FX turnover in EME currencies also increasingly resembles that of AE currencies. That said, there is still a higher degree of heterogeneity among EME currencies than in AE currencies, as indicated by the wide dispersion around the median shown in Graph 7.

FX derivatives markets in EME currencies have gained depth over time, and as a result spot trading now accounts for a similar share of total FX turnover in EME and AE currencies (Graph 7, panel B). In EME derivatives markets, FX forwards and futures have lost market share as FX swaps trading has expanded (panel C). While forwards and futures now account for similar shares of the median EME and AE currencies, the range is much larger for EME currencies because of the importance of NDFs for some.

Another dimension along which FX trading in EME and AE currencies has converged is the prominence of financial customers, in particular institutional investors and other non-bank financial institutions. During the 2010s, the share of these financial customers rose steadily for AE and EME currencies, but the share of AE currencies was persistently higher (Graph 7, panel D). In 2022, financial customers retreated from FX trading, with AE currencies experiencing a relatively larger decline

that brought financial customers' share of AE currency trading down to that of EME currencies.[6]
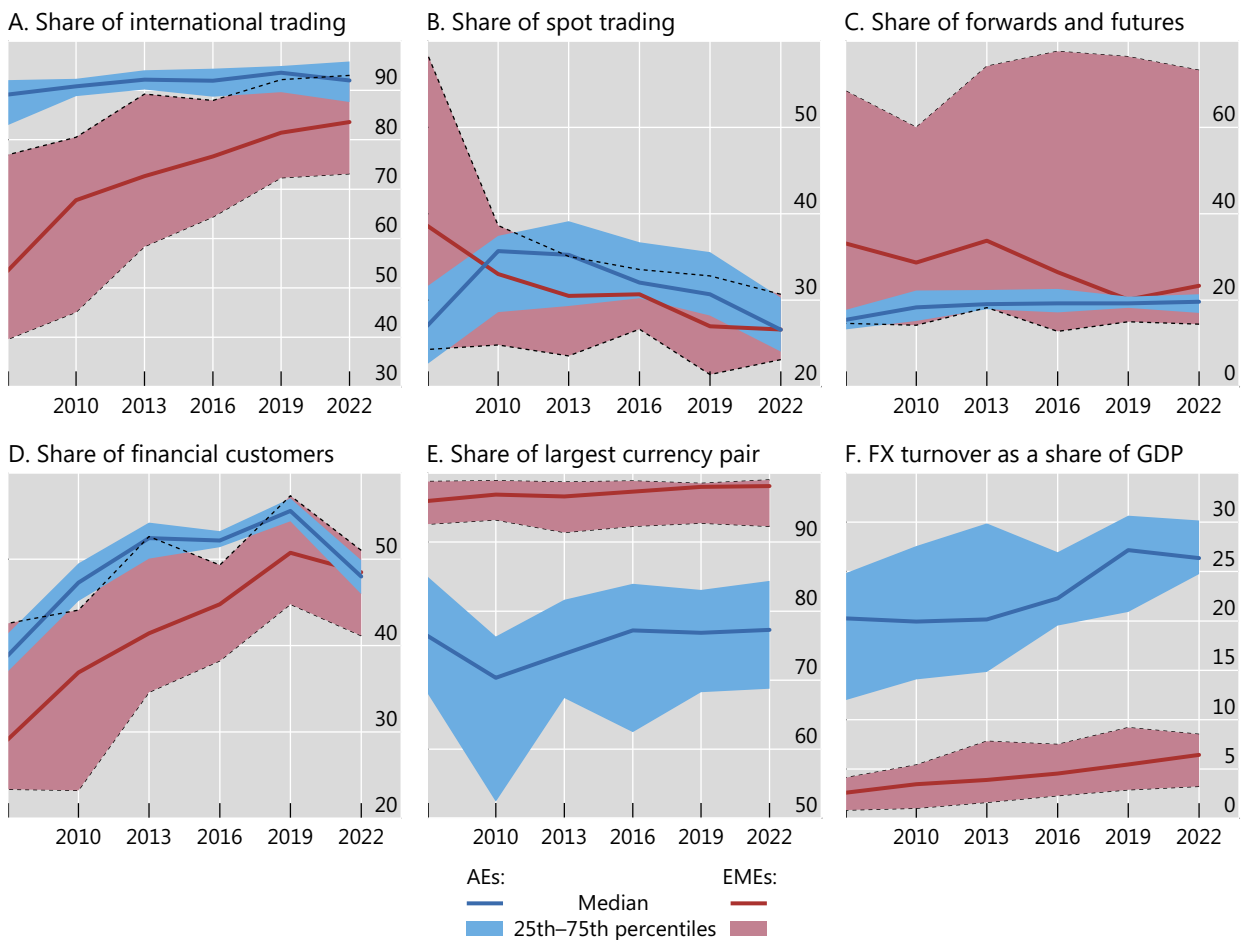
That said, there remain notable differences between EME and AE currency trading along several dimensions. The most important is trading volumes relative to GDP, as discussed above (Graph 7, panel F). Another is the diversity of currencies against which they trade. While EME currencies trade predominantly against either US dollar (USD) or euro (EUR), AE currencies generally trade against a broader set of currencies. Consequently, the largest currency pair accounts for 99% of trading in the median EME currency, but only 77% in the median AE one (panel E).

To assess the extent to which the market structure for EME currency trading has converged with that for AE currencies, we use cluster analysis to group currencies that have similar trading characteristics. Market structure is characterised by the six variables shown in Graph 7: international and spot shares of FX trading, share of

Structure of FX markets: comparison of AE and EME currencies[1]

In per cent   Graph 7

A. Share of international trading

B. Share of spot trading

C. Share of forwards and futures

D. Share of financial customers

E. Share of largest currency pair

F. FX turnover as a share of GDP

AEs: EMEs:
Median
25th–75th percentiles

[1] See technical annex for details.

Sources: IMF, *World Economic Outlook*; BIS Triennial Central Bank Survey; authors' calculations.

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[6]   More generally, in 2022 trading by dealers with customers stagnated owing largely to a slowdown in international investment activity. At the same time, inter-dealer trading increased because of higher volatility (Drehmann and Sushko (2022)).

derivatives trading in forwards and futures, importance of financial customers, diversity of currency pairs, and FX turnover scaled by GDP.

The analysis results in two broad clusters, one of which consists exclusively of EME currencies (Table 1, cluster 1) and the other a mix of AE and EME currencies (cluster 2). Within cluster 1, there is a subcluster (1A) comprising currencies that have a high share of trading in forwards and futures. All but one of these currencies have FX controls, which boost the trading of NDFs. Even though PEN is deliverable, it stands out for having more active trading in NDFs than FX swaps (Graph 3C). There is a small subcluster of EME currencies (1B) comprising ARS and the Bulgarian lev (BGN), where onshore transactions between residents and spot trading dominate. Unlike ARS, BGN is not subject to FX or capital controls. Yet, its FX market is like that of ARS because Bulgarian residents seem to trade FX derivatives denominated in EUR rather than BGN, perhaps because of the currency board linking BGN to EUR.

Within cluster 2, there is a subcluster (2A) comprising only EME currencies, namely the Bahraini dinar (BHD), Romanian leu (RON) and Saudi riyal (SAR). This subcluster is closer to AE currencies than to the other EME subclusters because its constituent currencies have high international activity, limited spot trading and a low share of forwards and futures in derivatives trading.

A number of EME currencies cluster with AE currencies. FX trading in HKD and SGD resembles that in GBP, the New Zealand dollar (NZD) and the Swiss franc (CHF). This is mainly because their turnover is exceptionally large vis-à-vis their GDP. Several currencies of European EMEs, such as the Czech koruna (CZK), HUF and Polish zloty (PLN), are much closer to the currencies of European AEs than to other EME currencies (subcluster 2C). EUR and USD are also in this subcluster. They stand out from other AE currencies mainly because they trade against more than one currency.

Five EME currencies are in the same subcluster (2D) as the Australian dollar (AUD), Canadian dollar (CAD) and Japanese yen (JPY). The similarity of ZAR to AUD,

Structure of FX trading in some EME currencies resembles that in AE currencies[1]   Table 1

Cluster by hierarchy		AE currencies	EME currencies			Key characteristics that differentiate clusters
			Asian currencies	Latin American currencies	Other EME currencies	
1	1A		IDR, INR, KRW, MYR, PHP, THB, TWD	BRL, CLP, COP, PEN		High share of forwards and futures
	1B			ARS	BGN	High share of spot trading Low share of international trading
2	2A				BHD, RON, SAR	Low share of forwards and futures
	2B	CHF, GBP, NZD	HKD, SGD			High ratio of FX turnover to GDP
	2C	DKK, EUR, NOK, SEK, USD			CZK, HUF, PLN	Low share of largest currency pair
	2D	AUD, CAD, JPY	CNY	MXN	ILS, TRY, ZAR	Close to the median for all characteristics

[1] Based on an agglomerative hierarchical clustering algorithm using Ward's method, which at each stage combines the two clusters with the smallest increase in the overall sum of squares. In other words, the process attempts to generate clusters to minimise the total within-cluster variance (sum of currencies squared Euclidean distance to the cluster mean). We chose the optimal number of clusters based on the hierarchical structure of the dendrogram.

Sources: IMF, *World Economic Outlook*; BIS Triennial Central Bank Survey; authors' calculations.

CAD and JPY is not surprising considering its high volume of trading and sophisticated derivatives markets. The Israeli shekel (ILS), Mexican peso (MXN) and Turkish lira (TRY) have much lower ratios of FX turnover to GDP than AUD, CAD and JPY, but their trading structure is similar in terms of location, instruments and counterparties. The CNY is a surprising addition to this subcluster, given that it is subject to much stricter FX and capital controls than other constituent currencies. By stimulating the development of the offshore CNH market, the partial deliverability of CNY has seemingly resulted in a market structure similar to that of deliverable currencies.

Conclusions

The structure of FX trading in many EME currencies increasingly resembles that in AE currencies, notably in terms of its internationalisation but also in terms of the range of instruments traded and the diversity of participants who trade them. This evolution in EME currencies' trading is a manifestation of broader trends that are blurring the distinction between AEs and EMEs. In particular, against the backdrop of better institutional frameworks and macroeconomic fundamentals in EMEs, investors have increasingly assessed EMEs on the basis of country-specific factors since the GFC, as they do for AEs (CGFS (2021)).

The trends towards currency internationalisation pose several challenges for EME policymakers. One is to improve their monitoring of FX trading abroad (BIS (2022b)). Offshore markets are often a locus for price discovery and volatility (Patel and Xia (2019)), yet information about them is not readily available. Central bank cooperation can help in this regard, such as through the Triennial Survey, and so too can tools for processing real-time financial data feeds, as prototyped in Project Rio by the BIS Innovation Hub.

Another policy challenge is to build on past success developing FX markets in a more challenging macroeconomic environment. For a decade after the GFC, a search for yield amidst abundant global liquidity boosted foreign investors' appetite for EME assets. That changed in 2022, when higher policy rates and mounting downside risks to economic growth led to a market-wide pullback in risk-taking. This retrenchment could cause liquidity conditions in EME currencies to deteriorate. Such a change might give urgency to further reforms to deepen FX markets, such as reducing obstacles to the integration of onshore and offshore markets.

The waning of foreign investors' appetite for EME assets puts the spotlight on the potential financial stability risks that greater international financial integration poses to EMEs. Policies that promote financial market deepening can help to reduce risks from international spillovers (CGFS (2019)). Key among these is the development of the local investor base. Local investors, particularly large institutional investors such as mutual and pension funds, play an important role in developing hedging markets and driving FX turnover. They should also help dampen volatility arising from the behaviour of non-resident investors (Carstens and Shin (2019)).

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Regression analysis of drivers of FX turnover

Many financial factors are closely correlated with FX turnover. To confirm which are the key drivers of differences in FX turnover across currencies and whether the correlations are meaningful, we estimate a multivariate regression that models FX turnover as a function of various proxies for trading and hedging demand. The regression results are largely consistent with the bivariate results of the plots as well as previous studies (Schrimpf and Sushko (2019), Upper and Valli (2016)). One novelty of our findings is that the assets of domestic institutional investors have a significant impact on FX turnover even after controlling for other drivers.

Our sample comprises 35 currencies – 11 from AEs and 24 from EMEs – and eight points in time, based on the Triennial Surveys from 2001 through 2022. FX turnover is measured as the sum of spot and derivatives trading in April of the given year, in OTC markets as well as on exchanges. While hedging demand is most closely related to derivatives activity, it can also give rise to spot trading – for example, a FX swap can be replicated with a spot and FX forward transaction – and so we focus on total turnover. To standardise variables across currencies, we scale turnover and other nominal variables by the GDP of the currency-issuing country.

One source of hedging demand is international trade, which we measure as the annual sum of exports and imports of goods and services. Another source is foreign currency borrowing. Resident borrowers might issue debt in a foreign currency and swap the proceeds to their local currency, while non-resident borrowers might do the opposite, issuing in resident investors' local currency and swapping to another currency. Indeed, such swap-covered borrowing accounts for a large share of foreign currency issuance (Munro and Wooldridge (2010)). Accordingly, we expect bond issuance by residents in foreign currency, as well as bond issuance by non-residents in investors' local currency, to be associated with higher FX turnover. The latter is likely to be more strongly associated with FX turnover than is the former because resident borrowers may have a natural hedge in the form of foreign currency revenues. Derivatives associated with such issuance tend to be one-off transactions, often with tenors equal to the maturity of the underlying bond, and so we proxy this by gross issuance over the six months prior to April of each Survey year.

More generally, FX turnover is expected to be positively influenced by international financial integration. A commonly used de facto measure of integration is external assets and liabilities (Lane and Milesi-Ferretti (2018)). Debt is more likely to be hedged than equity because the volatility of equity returns is much higher and open currency positions add volatility to bond portfolios without adding much return (Ramaswamy and Scott (2005)). Therefore, we focus on external assets and liabilities that take the form of debt.[1] An alternative de jure measure of financial integration is restrictions on cross-border movements of capital. The index compiled by Fernández et al (2016) increases in stringency from 0 to 1 and so it is expected to be negatively correlated with FX turnover.

Similarly, financial development is likely to give rise to more hedging and position-taking. Domestic institutional investors often have large and sophisticated hedging programmes to manage the currency risk associated with their foreign holdings. Thus, we expect FX turnover to be positively correlated with the size of assets managed by domestic mutual funds, pension funds, insurance companies and other institutional investors based in the currency-issuing country. Likewise, the larger the domestic bond market, the more developed the ecosystem for trading debt and hedging the associated risks tends to be.

Hedging demand and position-taking are also influenced by volatility (Drehmann and Sushko (2022)). Currencies that are fixed will tend to have lower FX turnover, and those that fluctuate a higher one. In the regression model, volatility is measured as the standard deviation of daily changes in the exchange rate against the USD over the three years prior to April of each Survey year. Turnover in higher-yielding currencies might also be boosted by carry trades, the attractiveness of which we measure using the carry-to-risk ratio. This ratio is calculated over the six-month period prior to each Survey as the difference between local currency and USD interest rates divided by the option-implied volatility of the exchange rate.

Finally, we include real GDP per capita to control for various structural characteristics that might be correlated with FX turnover or financial development in general, such as the strength of institutions and the rule of law. While higher income does not itself give rise to hedging demand, it has been shown to be associated with higher derivatives turnover (Mihaljek and Packer (2010), Upper and Valli (2016)). We also include a dummy to control for exceptionally high turnover in a few currencies, mainly the currencies of financial centres, the CHF, HKD and SGD, as well as NZD.

The regression analysis confirms the importance for FX turnover of financial variables. While trade has a positive impact on FX turnover, proxies for financial integration have a larger impact. An increase in residents' external debt liabilities by 10 percentage points of GDP increases FX turnover by 1.8 percentage points of GDP. An increase in residents' external debt assets by the same amount increases FX turnover by a smaller but still significant 1.3 percentage points. Local currency borrowing by non-resident issuers is also important: a 1 percentage point increase in issuance to GDP (which would be large compared with issuance of 0.4% of GDP in the median currency) boosts turnover by about 0.3 percentage points of GDP. The effect of capital account restrictions is not statistically significant in the full sample, but it does have a differential negative effect in EMEs when we allow its effect to vary in this country group relative to AEs – most of which have no restrictions.

Even after controlling for financial integration, some proxies for financial development are significant. An increase in domestic institutional investors' assets by 10 percentage points of GDP is associated with a 2 percentage point increase in FX turnover. However, the size of the bond market is not statistically significant. Volatility and the carry-to-risk ratio are also not statistically significant in our model.

Determinants of FX turnover[1]   Table B1

	Baseline	Adding FX volatility and carry trade
Total trade (exports plus imports, % GDP)	0.056***	0.061***
Residents' issuance of foreign currency bonds (% GDP)	−0.134	−0.118
Non-residents' issuance of local currency bonds (% GDP)	0.349*	0.331*
Residents' outstanding external debt assets (% GDP)	0.133***	0.132***
Residents' outstanding external debt liabilities (% GDP)	0.176***	0.180***
Capital account restrictions (from 0=none to 1=stringent)	0.044	0.043
Assets of domestic institutional investors (% GDP)	0.023***	0.021***
Size of the local bond market (% GDP)	0.000	−0.006
Exchange rate volatility		0.008
Carry-to-risk ratio		−0.016
GDP per capita, in constant 2021 US dollars (logs)	0.048*	0.066**
Financial centre dummy	0.289***	0.295***
Constant	−0.184*	−0.146
Overall R-squared	0.856	0.862
Observations	245	223
Currencies[2]	35	32

[1] Estimated as correlated random effects panel model via OLS using the pooled sample. To control for possible correlation between a given covariate and the panel intercept, the mean of each covariate across the sample is included for each currency. For an explanation of this estimation approach, see Wooldridge (2019). ***/**/* denotes statistical significance at the 1/5/10% level.   [2] AE currencies: AUD, CAD, CHF, DKK, EUR, GBP, JPY, NOK, NZD, SEK and USD. EME currencies: ARS, BGN, BRL, CLP, CNY, COP, CZK, HKD, HUF, IDR, ILS, INR, KRW, LTV, MXN, MYR, PEN, PHP, PLN, SAR, SGD, THB, TRY and ZAR.

Sources: Fernández et al (2016); Lane and Milesi-Ferretti (2018); IMF, *World Economic Outlook*; World Bank, *Global Financial Development Database*; Bloomberg; Datastream Refinitiv; JP Morgan Markets; national data; BIS debt securities statistics; BIS Triennial Central Bank Survey; authors' calculations.

① Our preferred measure is portfolio debt, but data are not available for all years and countries in our sample.

Technical annex

For definitions of ISO currency and country codes, see Abbreviations at the beginning of the *BIS Quarterly Review*, https://www.bis.org/publ/qtrpdf/r_qt2212/r_qt2212_abbreviations.pdf.

Graph 1: Average daily FX turnover in spot and derivatives markets (adjusted for local and cross-border inter-dealer double-counting, ie "net-net" basis), excluding exchange-traded derivatives. National aggregates adjusted for local inter-dealer double-counting, ie "net-gross" basis.

Graph 2.A: Other Asian EMEs = IDR, INR, KRW, MYR, PHP, THB and TWD. Latin America = ARS, BRL, CLP, COP, MXN and PEN. Other EMEs = AED, BGN, CZK, HUF, ILS, PLN, RON, SAR, TRY and ZAR. All years are based on a constant exchange rate (April 2022). Turnover is adjusted for local and cross-border inter-dealer double-counting, ie "net-net" basis.

Graph 2.B: Based on data for the 27 EMEs shown in Graph 1. Average daily turnover in April is scaled by annual GDP from the prior year and adjusted for local and cross-border inter-dealer double-counting, ie "net-net" basis.

Graph 2.C: Based on data for the EMEs shown in Graph 1, excluding AE and TW. Outstanding external debt is calculated as portfolio debt liabilities plus other debt liabilities. Cross-border loans include interbank deposits and deposits with own affiliates.

Graph 3.A: Capital account restrictions are based on data for the EMEs shown in Graph 1, excluding AE and TW. International share of FX turnover is based on data for the 27 EMEs shown in Graph 1.

Graph 3.B: Average daily FX turnover in spot and derivatives markets (adjusted for local and cross-border inter-dealer double-counting, ie "net-net" basis), including exchange-traded derivatives. The sample is based on data every three years from 2001 to 2022 (eight survey years) for AR, AU, BG, BR, CA, CL, CN, CO, CZ, DK, EA, GB, HU, ID, IL, IN, JP, KR, MX, MY, NO, PE, PH, PL, SA, SE, TH, TR, US and ZA. CH, HK, NZ and SG are excluded as outliers. For capital account restrictions, data for 2022 refer to 2019.

Graph 3.C: Non-deliverable currencies = ARS, BRL, CLP, CNY, COP, IDR, INR, KRW, MYR, PHP and TWD. Deliverable currencies = currencies shown in Graph 1 excluding the 11 non-deliverable currencies. Average daily FX turnover in derivatives markets (adjusted for local and cross-border inter-dealer double-counting, ie "net-net" basis), including exchange-traded derivatives. Forwards = FX forwards plus FX futures.

Graph 4: Average daily FX turnover in spot and derivatives markets (adjusted for local and cross-border inter-dealer double-counting, ie "net-net" basis), excluding exchange-traded derivatives. Based on data every three years from 2001 to 2022 (eight survey years) for AR, AU, BG, BR, CA, CL, CN, CO, CZ, DK, EA, GB, HU, ID, IL, IN, JP, KR, MX, MY, NO, PE, PH, PL, SA, SE, TH, TR, TW, US and ZA. CH, HK, NZ and SG are excluded as outliers. For bond issuance by non-residents, bond market size, assets of domestic institutional investors and GDP, data refer to the year before the survey year.

Graph 5: Average daily FX turnover in spot and derivatives markets in April 2022 (adjusted for local and cross-border inter-dealer double-counting, ie "net-net" basis), including exchange-traded derivatives. Turnover is scaled by annual GDP of the currency issuing country in 2021.

Graph 6.A: AEs = AU, CA, CH, DK, GB, JP, NO, NZ, SE, US plus euro area members (AT, BE, CY, EE, FI, FR, DE, GR, IE, IT, LV, LT, LU, MT, NL, PT, SK, SI and ES). EMEs = AE, AR, BH, BG, BR, CL, CN, CO, CZ, HK, HU, ID, IL, IN, KR, MX, MY, PE, PH, PL, RO, SA, SG, TH, TR, TW and ZA.

Graph 6.B: Average daily FX turnover in spot and derivatives markets (adjusted for local and cross-border inter-dealer double-counting, ie "net-net" basis), including exchange-traded derivatives. Based on data every three years from 2001 to 2022 (eight survey years) for AR, AU, BG, BR, CA, CL, CN, CO, CZ, DK, EA, GB, HU, ID, IL, IN, JP, KR, MX, MY, NO, PE, PH, PL, SA, SE, TH, TR, TW, US and ZA. CH, HK, NZ and SG are excluded as outliers. Gross external debt

positions are calculated as the sum of outstanding debt assets and debt liabilities and refer to the year before the survey year.

Graph 6.C: AEs = AU, CA, CH, DK, EA, GB, JP, NO, NZ, SE and US. EMEs = AE, AR, BH, BG, BR, CL, CN, CO, CZ, HK, HU, ID, IL, IN, KR, MX, MY, PE, PH, PL, RO, SA, SG, TH, TR, TW and ZA.

Graph 7: Based on data for the 11 AE currencies and 27 EME currencies shown in Graph 1.

Graphs 7.A, D–F: As a share of FX turnover in spot and derivatives markets, excluding exchange-traded derivatives.

Graph 7.B: As a share of FX turnover in spot and derivatives markets, including exchange-traded derivatives.

Graph 7.C: As a share of FX turnover in derivatives markets, including exchange-traded derivatives.