

FX Markets and FX Interventions: Insights from a Markets Committee Workshop

Insights from a Markets Committee Workshop on FX Markets and FX Interventions chaired by Jwahong Min (Bank of Korea)

The unprecedented monetary tightening and large terms of trade shocks tested FX markets in 2022. Many currencies depreciated significantly against the US dollar and FX volatility increased. Against this backdrop, the Markets Committee (MC) held a workshop on FX markets focusing on market structure and lessons learned from recent FX interventions.

This note summarises the main workshop takeaways. The first part summarises discussions with the private sector on FX market developments in 2022 and medium-term changes to the market structure. The second part summarises the lessons for FX interventions (FXIs) from the recent global tightening episode. The note incorporates a background survey completed by 20 central banks. 11 intervened (eight Asian, one European, and two Latin American), with just two from advanced economies.¹ Where possible, answers are compared to the survey conducted for the 2021 MC workshop on FX interventions.²

In addition to MC members, all EME members of the BIS Asian Consultative Council (ACC) and the Consultative Council for the Americas (CCA) were invited to participate as part of the broader MC outreach agenda. The central banks of Colombia, Peru, Philippines, and Thailand accepted the invitation.

Highlights: FX market structure and market developments in 2022

Liquidity continues to migrate from primary venues to other venues, which have become vital for price discovery in FX markets. CME-listed futures, especially for G7 currencies, have seen increasing volumes. FX volumes traded on secondary market venues and dark pools appear to have also increased. Central bank participants questioned the robustness of volumes of listed futures and volumes on other secondary venues during periods of heightened volatility. But views differed whether liquidity always returns to primary venues when volatility is high.

FX market resilience can be affected by the ratio of carry to volatility. While low carry (ie the interest rate differential against typically US Treasuries) to volatility does not cause market dysfunction on its own, it could increase the vulnerability of a currency to shocks, which was evident for some currencies in 2022.

¹ In addition, one central bank continued to roll FX swap positions rather than let them run off to avoid adverse signalling in volatile markets.

² The data reported for 2020 are based on the responses of 13 central banks that reported intervening. Respondents did not answer all questions in the survey due to confidentiality issues. Nine central banks intervened in both 2020 and 2022. For additional information on the 2021 workshop in FX markets, see Markets Committee (2022): "[FX Interventions- Insights from a Markets Committee Workshop](#)", May 2022.

Other emerging trends in FX market structure include: (1) the electronification of the FX derivatives markets; (2) the growth of “dark pools” and “dark orders”; (3) new peer-to-peer FX trading platforms; and (4) “unification” of algorithm platforms that trade across different asset classes.³

Highlights: FX interventions

The motivations, objectives, and operational aspects of FXIs were generally similar in 2022 and 2020, despite the different market backdrop. But central banks intervened with lower volumes and less frequently in 2022 than in 2020. The most relevant motivations for intervening in 2022 were to contain stressed trading conditions and to alleviate funding shortages. Excessive volatility and illiquid FX markets remained the most important market factors supporting the decision to intervene. However, central banks’ tolerance for FX volatility varied, which influenced the decision to intervene or not.

Operational aspects of FXIs did not vary considerably between 2022 and 2020. FXIs were generally done on a discretionary basis in response to market developments. The onshore spot market remained the main instrument although many central banks intervened in the derivatives markets.

Most central banks rely on one execution method for FXIs, with two-thirds using electronic platforms. The objectives of FXIs can also be a consideration in determining trade execution tactics.

Signalling FXIs can have different merits. Signalling was seen by some as important to strengthen the impact of FXIs when intervening infrequently or to restore market functioning. For frequent interventions though, the benefits of signalling each intervention may be minimal. Some participants also pointed to potential risks from signalling.

FXIs were viewed as being effective, especially in the short run. Any assessment of their effectiveness should however be done in the context of the initial objectives. Measuring and quantifying the effectiveness of FXIs remain a challenge. The cost of FXIs was not seen as a significant consideration for many workshop participants. The cost of carry was largely viewed as the cost of insurance to hold reserves. Some participants expressed concern that FXIs can create moral hazard and impede the development of deep and liquid FX markets.

Central banks recognized the need to evolve their FX operations and market monitoring in response to market structure changes. As more segments of the FX market become more electronic (eg FX swaps and NDFs), new venues for FXIs may need to be explored. Central banks are also adapting their market monitoring methods in response to the structural changes in FX markets.

³ A glossary at the end provides details for some of the technical terms used in this document.

1. Market backdrop and discussions with the private sector

The dominant theme in FX markets for most of 2022 was the sharp and rapid appreciation of the US dollar. On a broad basis, the US dollar appreciated by about 15% from January 2022 to its peak in late September 2022, in part reflecting favourable interest rate differentials amidst rapid tightening by the Federal Reserve. On a regional basis, the US dollar appreciated almost 20% against G10 currencies, 13% against LATAM currencies and 10% against Asian currencies (Graph 1.A). This was followed by a relatively rapid depreciation of the dollar beginning in Q4 2022, as markets started pricing in the end of the rate hike cycle and potentially rate cuts on expectations of an economic slowdown. Moreover, recovery in broad risk sentiment also weighed on the US dollar over this period. More recently, the dollar has fluctuated on an uncertain outlook for US interest rates. The US dollar initially appreciated on expectations that US rates would be “higher for longer” but subsequently declined amid a rapid decline in US yields.

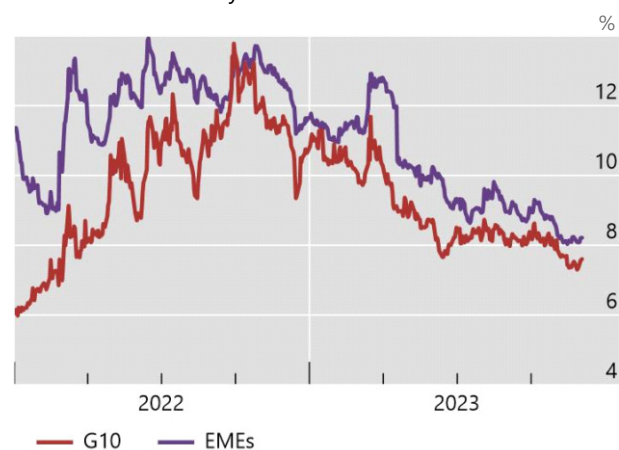
US dollar appreciated and volatility increased in 2022

Graph 1

A. FX indices level



B. FX indices volatility



Sources: Bloomberg; JP Morgan.

FX volatility across markets broadly tracked the moves in the US dollar index. Implied FX volatility rose for most of 2022, reaching a peak in late September (Graph 1.B). Since then, volatility declined and has remained relatively subdued, despite significant shocks such as the banking failures in March 2023, the Bank of Japan’s modification to its yield curve control in July 2023, and the most recent fluctuations in US yields.

Since the beginning of the tightening cycle, FX markets remained generally resilient. One private sector participant highlighted that FX market resilience is affected by the ratio of carry-to-volatility. While low carry-to-volatility does not automatically result in depreciation pressures, it may increase the vulnerability of a currency once pressures emerge. This was evident in LATAM currencies in 2022. At that time, the Chilean peso experienced a sharp depreciation and market dysfunction. A key trigger was domestic issues. But Chile had the lowest interest rates and lowest carry-to-volatility ratio in the region. In contrast, higher ratios in currencies like the Mexican peso and Brazilian real made them more resilient against the US dollar that year.

Workshop participants generally agreed that low levels of carry-to-volatility can increase vulnerabilities of the FX market to shocks. But there were no obvious reasons why this metric is more important for LATAM currencies than Asian currencies.⁴ Some participants argued that strong macro-financial policies were the most important factor supporting FX market resilience.

1.1 Structural changes in FX markets

The discussion with the private sector confirmed and nuanced some of the well-known structural changes in FX markets (see Annex 1 for an overview).

The private sector participants highlighted the on-going liquidity shift from primary venues (eg EBS and Refinitiv Matching) to other venues, which have become vital for price discovery in FX markets. For example, participants emphasised the growth in volumes in CME-listed futures, especially for G7 currencies. Volumes of EURUSD futures traded on the CME are about five times those traded on EBS. In addition, greater FX volumes have been internalised by banks and other dark pools. FX volumes traded on secondary venues have also increased, driven for instance by smaller minimum trade sizes. As a result, these venues are growing in importance as a source of price discovery. However, there was agreement that the traditional primary markets remain an important source for price discovery.

Structural factors and regulation both contributed to the growth of CME-listed futures. First, the creation of a “basis” product (known as “FX Link”) seamlessly connects the futures markets with the spot OTC market and has facilitated trading of futures. Second, compared with the primary venues that update prices every 5 milliseconds, futures have the benefit of real-time pricing, which in turn encourages participation from high frequency trading firms. Last, futures provide regulatory benefits as they are cleared products and have lower capital charges.

Central bank participants questioned the robustness of volumes of CME-listed futures and volumes on other secondary venues during periods of heightened volatility. For example, CME futures open interest fell sharply during the Covid-19 crisis and trading of FX Link ceased. CME also has price limits which could create additional volatility and discontinuity in times of market stress as spot markets continue to trade.

While volumes of CME-listed and on secondary venues may not be robust during periods of heightened volatility, views contrasted as to whether liquidity returns to primary venues when volatility is high.⁵ One market participant argued that volumes increase on primary venues because dealers are less willing to warehouse risk in these conditions, and therefore hedge their flows in the primary markets. Another market participant argued that volumes fall on primary markets because dealers tend to internalise more of the flows when volatility is high.

⁴ While interest rate differentials contributed to weakness in Asian currencies as well, one private sector participant stressed that idiosyncratic drivers likely had a greater impact. For example, structural factors such as increased demand for US dollars from corporate sector for FDI, and the global shift in demand for services relative to goods might have also contributed to the weakness in the local currency.

⁵ Volumes traded on primary venues did not increase during the volatility in 2022, unlike previous episodes of volatility (Annex 2). See M Drehmann and V Sushko, “Global foreign exchange market in a higher volatility environment”, *BIS Quarterly Review*, December 2022

Market participants highlighted several other structural developments:

1. The electrification of the FX derivatives markets. Dealers are increasingly pricing and executing FX swaps and NDFs with clients electronically. They still hedge their positions in the inter-dealer market by voice due to challenges such as credit limits and usage of collateral. Market participants expect these markets to become automated as the technology improves and banks become comfortable hedging electronically. Although still primarily a voice driven market, FX options trading is also gradually becoming more automated.
2. The growth of “dark pools” and “dark orders”. FX markets are becoming more opaque with the increased use of “dark pools” and “dark orders”. Dark pools are trading venues with no pre-trade transparency requirements, on which large orders can be executed with minimal adverse price effects. “Dark orders” are orders that are not visible in the central limit order book but can interact with both lit orders and other dark orders. Market participants are increasingly trading on dark venues where they can offset flows at the “mid-market” price without the need to trade on the open market and pay the bid-offer spread. There are also specific liquidity pools for matching month-end FX flows, which can be quite substantial. The ultimate objective is to match as much of the flows within these pools as possible to limit market impact. But the lack of transparency can undermine price discovery and make it difficult to assess the true FX liquidity.
3. New peer-to-peer FX trading platforms. While still not a large part of the FX market, peer-to-peer FX platforms, which match buy-side clients directly are growing. Banks view these platforms as a threat to their business models.
4. “Unification” of algorithm platforms that trade across different asset classes. Rather than having different algorithms and platforms for different asset classes, dealers are consolidating these different products into a “unified” platform.

2. FX interventions

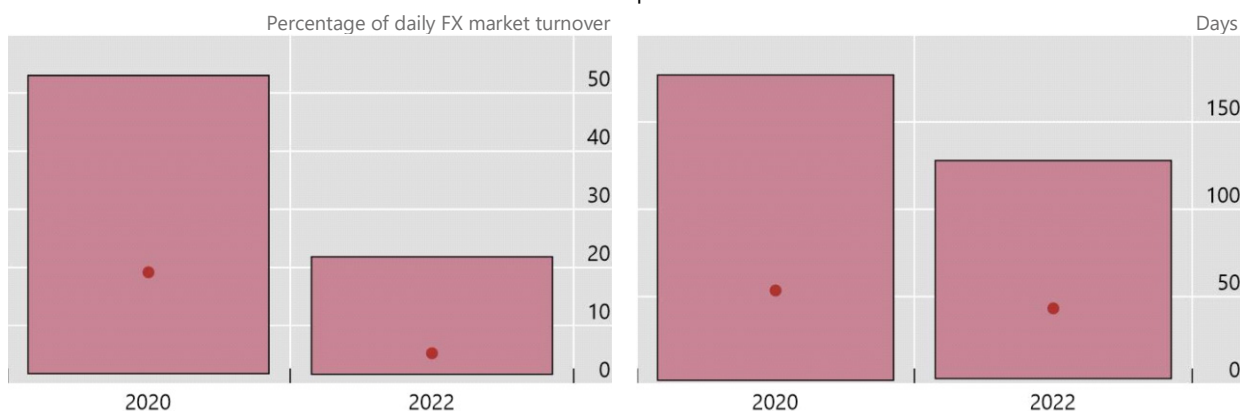
The second part of the workshop focused on central banks’ FXIs. Central bank participants explored the goals and objectives, benefits and costs, and discussed the operational aspects of FXIs such as the means of execution and instruments used.

In 2022, central banks intervened with lower volumes and less frequently than in 2020. The average intervention volumes (relative to daily market turnover) fell significantly, from about 19% in 2020 to about 5% in 2022 (Graph 2.B). The average number of days of interventions also fell slightly from 53 to 43 (Graph 2.A).⁶ All central banks for which information for both years is available reported a drop in the numbers of days they intervened.

⁶ The maximum number of days intervened are skewed higher by one central bank that intervened frequently in both periods.

A. Size of interventions relative to FX market turnover

B. Average number of days when interventions took place



¹ 2020: Seven central banks. 2022: Six central banks.

Source: MC survey on FX interventions 2021 and 2023.

2.1 To intervene or not – motivations and objectives

The motivations for FXIs were very similar in 2022 compared to two years earlier. The most frequently cited motivation for intervening remained the containment of stressed trading conditions (Graph 3). Over 60% of respondents said that this was a very important or somewhat important motivation.⁷ Alleviating funding shortages was the second most important motivation for FXIs. Despite higher inflation, maintaining price stability decreased in importance with only two central banks highlighting it as a “very important” objective, one of which was an advanced economy. The most significant difference between 2020 and 2022 was that building reserves was rarely cited as a motivation for FXIs last year.

The similarity in the motivations in 2022 and 2020 perplexed some participants given the very different market environments. In 2022, some currencies depreciated significantly, reflecting in part differences in monetary policy stances, while some FX markets were characterised by severe market dysfunction in 2020. However, many central banks that intervened in both periods emphasised that their FXIs in 2022 were not done to affect the level of the exchange rate and therefore the motivations remained largely unchanged.

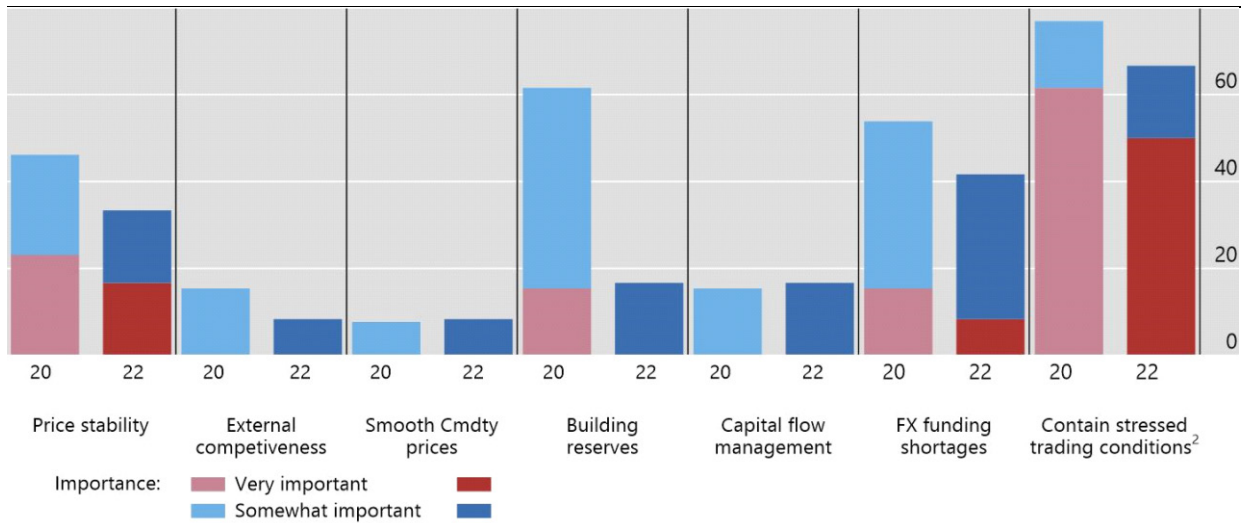
The market factors supporting the decision to intervene – or the intermediate objectives – were also broadly unchanged in 2022 compared to 2020. Excessive volatility and illiquid FX markets remained the most important market factors (Graph 4). Two significant changes from 2020 were the increased importance of exchange rate misalignments and pressures arising from international investor flows, with over 40% of respondents citing them, compared to about 20% in 2020.

⁷ Although this is a slight decline from the previous survey, this mainly reflects the change in the composition of central banks that intervened in 2022 and 2020. The importance of “containing stressed market conditions” was identical when comparing the survey results of central banks that intervened in both 2020 and 2022.

Containing stressed conditions remained the primary motivation for FXIs¹

As a percentage of respondents

Graph 3



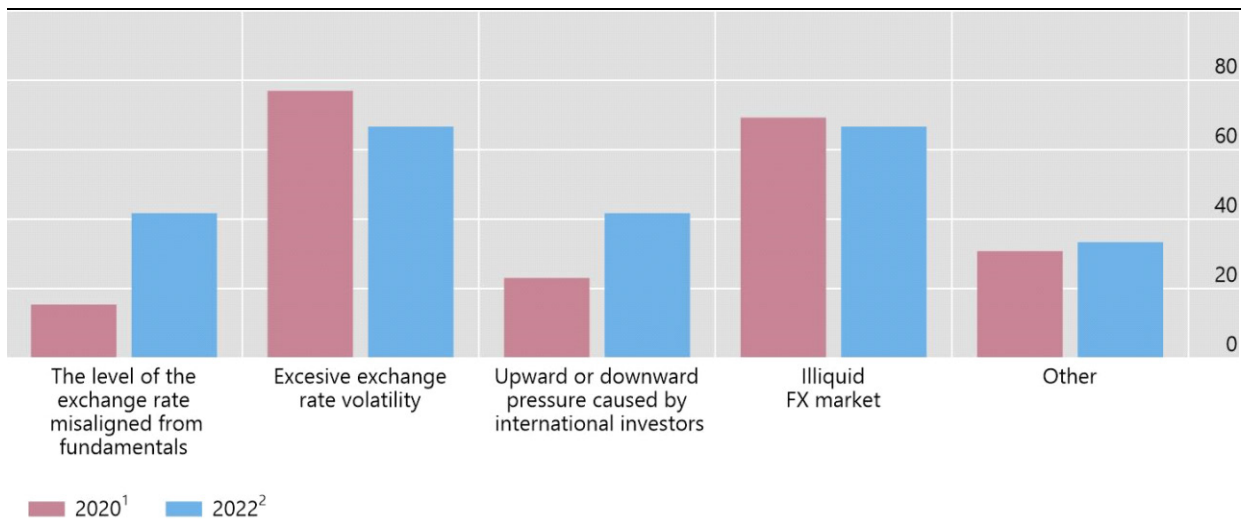
¹ 2020: 13 central banks. 2022: 12 central banks.

Source: MC survey on FX interventions 2021 and 2023.

Excessive volatility and illiquid FX markets were the most important market factors in the decision to intervene

As a percentage of respondents

Graph 4



¹ 13 central banks. ² 12 central banks. Sum of very and somewhat important.

Source: MC survey on FX interventions 2021 and 2023.

Although excessive volatility was generally an important market indicator, central banks' tolerance for FX volatility varied, which influenced the decision to intervene. While this may have reflected different preferences, it also depended on the nature of the shock and potential impact on the economy. Some central banks deemed the volatility in their markets in 2022 as excessive and therefore intervened. Others demonstrated a high tolerance for volatility and chose not to intervene. For instance, one central bank cited domestic fundamental factors for the increase in volatility – a situation where they deem FXIs not to be very effective. One participant argued that high FX volatility is also beneficial insofar as it creates incentives for hedging activity by market participants. This can increase resilience and deepen FX markets.

2.2 Integrated policy frameworks – useful in theory, less so in practice

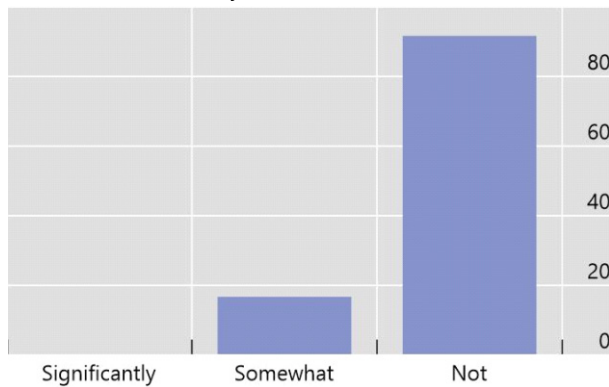
In recent years, significant progress has been made to deepen analytical frameworks for FXIs.⁸ But workshop participants had different views on their value. Several central banks argued that they provide a useful theoretical framework for when FXIs might be appropriate. Others were more sceptical. One central bank argued that these frameworks normalise the use of FXIs and capital controls, as opposed to promoting the “first best”, which is having sound macroeconomic fundamentals and liquid, flexible, and resilient financial markets. This central bank considered that the frameworks reduce the threshold for FXIs, which could lead to a sub-optimal equilibrium in FX markets globally.

Conceptual frameworks were not an important consideration for FXIs

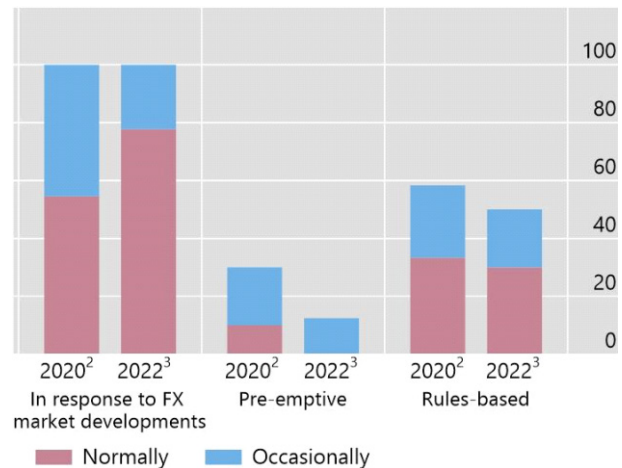
As a percentage of respondents

Graph 5

A. How far have recent advances in conceptual frameworks affected your motivations to intervene?¹



B. Intervention timing



¹ Nine central banks responded. The survey asked if conceptual frameworks affected the motivations to intervene and if they were helpful in making practical decisions. All those that answered “somewhat affected” also said they were “somewhat helpful”. All those that said they did “not affect” their motivations to intervene did not find them useful in making practical decisions. ² 12 central banks. ³ 13 central banks.

Source: MC survey on FX interventions 2021 and 2023.

⁸ For example, see BIS (2022): “[Macro-financial stability frameworks and external financial conditions](#)”, “[Report to the G20 Finance Ministers and Central Bank Governors](#)”, and IMF (2020): “[Toward an integrated policy framework](#)”, *IMF Policy Paper*.

There was agreement that these frameworks were very difficult to operationalize and had little impact in practice, even if they may be useful in theory. Survey respondents noted that these frameworks did not generally affect the motivations to intervene (Graph 5.A). In the survey, less than 20% of central banks indicated that these frameworks had some influence on their decision to intervene. These central banks further indicated that these frameworks were at best only “somewhat helpful” in making practical decisions about FXIs.

2.3 Operational aspects of interventions

Central banks adapt their FXI tactics in response to their objectives, the market environment and the market structure. Flexibility around operational aspects is generally important to enhance the effectiveness of FXIs. There was broad acknowledgement of the need to continue to enhance toolkits for FXIs given the ongoing structural changes in FX markets.

The workshop discussed several operational aspects more specifically.

Timing and market monitoring

FXIs were generally done on a discretionary basis, in response to market developments. This is similar to 2020. About 20% of central banks have only a rule-based intervention policy (Graph 5.B). For example, the HKMA operates under a currency board framework and provides Convertibility Undertakings (CU), under which the HKMA commits to sell Hong Kong dollars upon request by banks at the strong-side CU rate of HK\$7.75 per US Dollar, and to buy US dollars upon request by banks at the weak-side CU of HK\$7.85 per US Dollar. The strong- and weak-side CU together keep the Hong Kong dollar – US dollar exchange rate stable within this band. 25% of respondents indicated that they have both a rules-based FXI policy and intervene on a discretionary basis based on market conditions. For example, the Banco de Mexico has an automatic “intervention” program to hedge oil revenues, but they can also conduct interventions to address market dysfunction on a discretionary basis.

Given that most central bank FXIs are done on a discretionary basis, monitoring of FX markets is a critical function. Central banks closely monitor market variables including exchange rate levels and volatility (on an absolute basis and relative to peers), liquidity conditions (bid-offer spreads), and implied FX funding rates. Some central banks have access to a wider array of macroeconomic, price and order flow data (eg trade flows vs portfolio flows). The structured data is further complemented by market intelligence.⁹

Central banks agreed that market monitoring needs to evolve in response to the structural changes in FX markets. For instance, central banks that trade electronically on multiple platforms noted that the amount of real-time data from these trading venues requires new tools (eg the Rio monitoring platform developed by the BIS Innovation Hub) and methods to monitor and assess liquidity conditions.

⁹ See Markets Committee (2023): “[Market intelligence at central banks](#)”, Insights from a Markets Committee Workshop chaired by Andréa M. Maechler (SNB)

Instrument

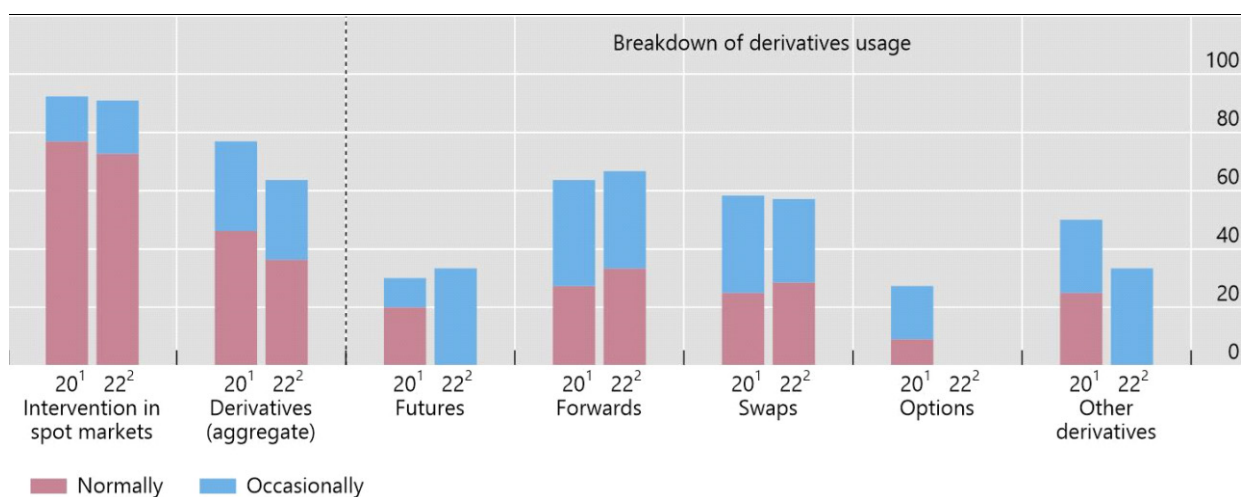
The choice of whether to intervene in the spot or derivative markets can depend on the objectives and nature of the shock. A central bank seeking to smooth exchange rate volatility might intervene in spot or derivative markets depending on the source of FX pressure and the structure of the market. In some countries, for example, central banks intervene in the futures market because it is more liquid and where a large part of price discovery occurs. Central banks can alleviate foreign currency funding shortages by intervening directly in the FX swaps market.

Given the intermediate objectives for FXIs in 2022 and 2020 were broadly the same, the choice of instruments remained similar. In general, FXIs continued to be primarily conducted in the onshore spot market, in line with 2020 (Graph 6). Only three central banks reported intervening in the offshore market in 2022. There was a slight decline in the number of central banks intervening in the derivatives markets relative to 2020. However, this largely reflects compositional changes of the survey.

Spot market interventions remained the most common instrument

As a percentage of respondents

Graph 6



¹ 13 central banks. ² 12 central banks. Interventions in spot markets include both onshore and offshore to be consistent with previous surveys. When comparing only those central banks that intervened in both 2020 and 2022, there was an increase in the use of forwards and swaps, while the importance of the futures market remained the same.

Source: MC survey on FX interventions 2021 and 2023.

Size

There was consensus that the size of FXIs necessary to impact markets and achieve the stated objectives is extremely difficult to estimate *a priori*. On the one hand, there are times when what may be viewed to be a “large” amount for FXIs have limited market impact. On the other hand, a few central banks noted that there have also been occasions when the actual FXI amounts were smaller than they had initially expected to use.

Trade execution

As FX markets have become more electronic, central banks are increasingly including electronic platforms as a venue for FXIs. The survey shows that 60% of central banks

use electronic platforms, while 40% trade by voice. Most tended to use one execution method with only 20% indicating they executed trades both electronically and by voice. 20% intervened on primary anonymous trading venues such as Refinitiv Matching or EBS. Some central banks have developed in-house electronic trading platforms for FXIs (shown under "other").

The objectives of FXIs are also a consideration in determining trade execution tactics. For example, if signalling is important, central banks may choose to intervene directly with banks (see below). However, if the objective is to replenish FX reserves, electronic trading using FX execution algorithms can provide the benefit of limiting market impact and information leakage. A few central banks seem to use FX execution algorithms already for this purpose.

The electronification of the FX swap and NDF market could have implications for execution of FXIs in the future. As these markets start to trade electronically and liquidity migrates to electronic platforms, central banks may need to consider whether their interventions in these markets should also be done electronically as opposed to voice execution currently.

Signalling and communications

Participants debated the merits and strategies of signalling FXIs. When intervening infrequently or for the first time after a long spell of non-interventions, signalling was seen by some as important to strengthen the market impact of FXIs. Signalling can also be beneficial to restore market functioning by announcing the central bank is present, akin to a market maker of last resort. In these situations, intervening by voice has advantages as the message is more widely broadcast. However, many central banks that intervene frequently suggested minimal benefits of signalling each intervention. Some participants also pointed to potential risks. For example, signalling may be perceived as targeting a specific exchange rate level or conflicting with the monetary policy stance in some situations. But even if each FXI is not announced, central banks may still communicate with the market, for instance, as part of their communications surrounding monetary policy announcements or by announcing an overall volume of planned FXI.

Participants agreed that communicating the objectives and benefits of FXIs to the wider public is important, especially as its effectiveness is difficult to explain and quantify. One central bank noted that the decline in the market value of their reserves as global interest rates increased (as opposed to actual liquidation of reserves) posed some challenges, which they tried to address through proactive communications.

Despite some communication challenges around the fluctuations in the level of reserves, central banks did not experience any issues with liquidating reserves to raise cash for intervention.

Sterilisation

The macro-economic environment and operational framework can impact whether and how FXIs are sterilized. The MC Survey indicated that 80% of central banks "usually" or "occasionally" sterilise their FXIs. Sterilisations are generally conducted with market-based tools such as issuing central bank securities or FX swaps (Graph 7). A few central banks used non-market instruments such as increasing reserve requirements. At the workshop, some central banks noted that they reduced the amount that was sterilised to tighten domestic monetary conditions to support their

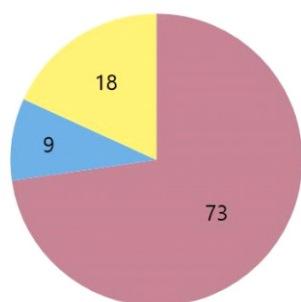
monetary policy objectives. The monetary policy operational framework also impacts sterilisation decisions. For instance, in a tiering or floor system, the domestic interest rate can remain anchored at the target even without any sterilisation.

Most central banks sterilized their FXIs with market based instruments¹

As a percentage of respondents

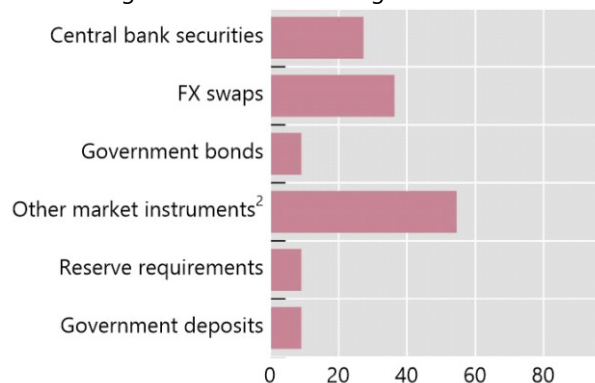
Graph 7

A. Percentage that sterilize interventions



Usually Occasionally Never

B. Percentage that use the following to sterilize



¹ 12 central banks. ² Other market instruments include for instance repos and reverse repos.

Source: MC survey on FX interventions 2023.

2.4 Benefits, effectiveness and costs of interventions

Participants generally viewed their FXIs as being effective, especially in the short run. They stressed that any assessment of the effectiveness of FXIs should be done in the context of the initial objectives. In 2022, these were mainly to reduce excessive volatility and address market dysfunction. In these instances, central banks viewed their FXIs as being targeted and effective.

There was strong consensus that measuring and quantifying the effectiveness of FXIs is very challenging. Exchange rates can move due to factors outside of a central bank's control, making it almost impossible to isolate the impact of FXIs. Assessing the effectiveness also requires measuring a counterfactual, which is challenging to say the least. That said, central banks that intervened to alleviate foreign exchange funding shortages pointed to the decline in implied US dollar funding rates as evidence that their FXIs were effective.

The survey highlighted more divergent views around the timeframe in which FXIs are judged to be effective than in 2020. Around 40% of respondents indicated that FXIs are effective for less than one week, independent of the objective (Graph 8). At the same time 30-40% of central banks judged that FXIs affected FX markets for up to six months or even beyond, an increase since the previous survey.

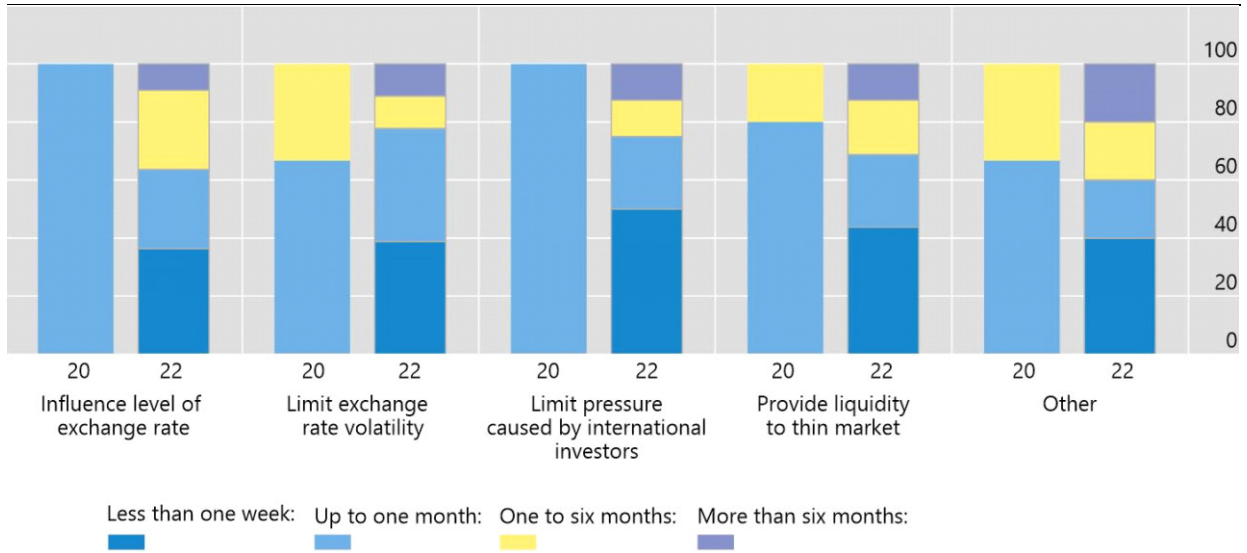
The cost of FXIs was not seen as a significant consideration for many workshop participants. The cost of carry was largely viewed as the cost of insurance to hold reserves for FXIs. Only about 30% of survey participants indicated that these carry costs were a very important or somewhat important consideration (Graph 9). 40% of respondents cited moral hazard as a somewhat important consideration. Some participants felt that central bank FXIs can impede the development of deep and liquid FX markets through less hedging activity. It also could result in excessive risk

taking by market participants as it shields investors from adverse exchange rate movements.

FXIs were assessed as being the most effective in the short run¹

As a percentage of respondents who pursue the respective objective, as indicated in Graph 5

Graph 8



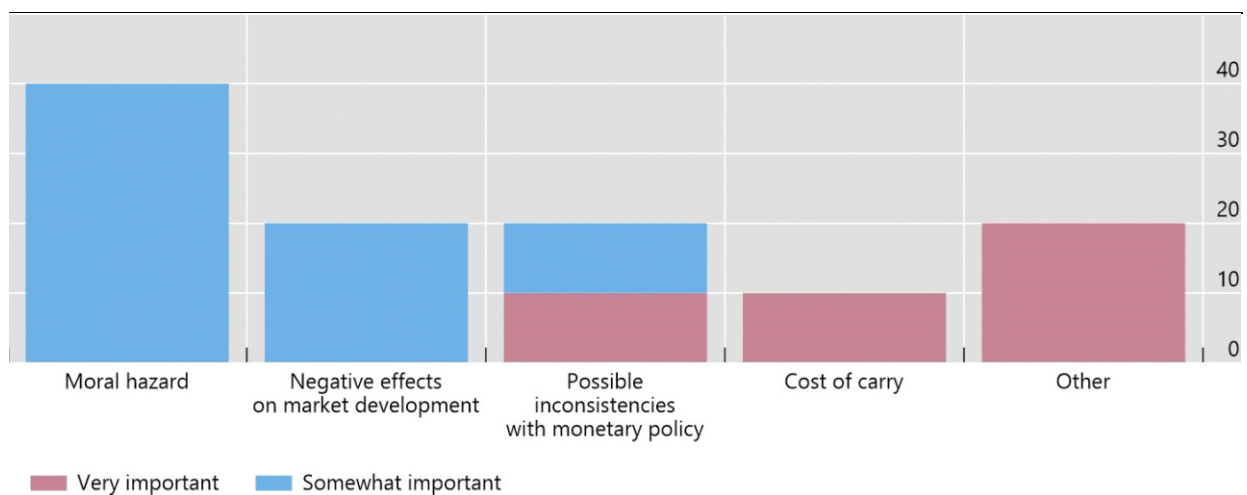
¹ 2020: 13 central banks. 2022: 12 central banks. The actual number varies depending on the objective. The "less than 1 week" option was added in the 2023 survey.

Source: MC survey on FX interventions 2021 and 2023.

Moral hazard was the most cited cost consideration¹

As a percentage of respondents

Graph 9



¹ 10 central banks.

Source: MC survey on FX interventions 2023.

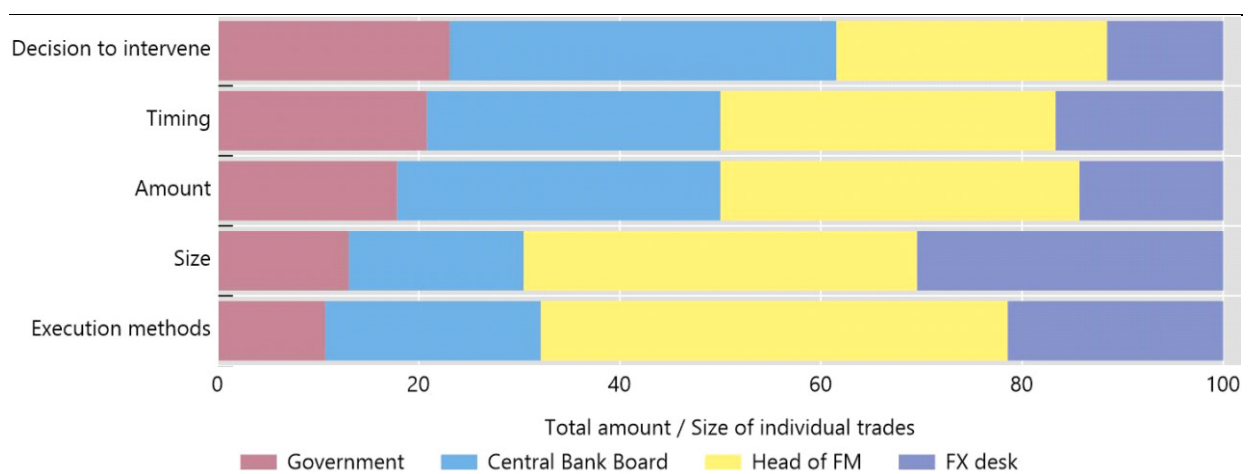
2.5 Governance, timing and market monitoring

Governance around FX reserves and FXIs varies by jurisdictions. A clear hierarchy of decision making emerges from the survey. The decision to intervene is taken primarily by the government and / or the boards at the central banks (Graph 10). 30% reported that the decision is made solely by boards of central banks, while 20% indicated that the decision is made jointly with the government. The appropriate execution method for FXIs is usually made by the head of the markets department. FX desks at central banks have limited discretion when intervening. 25% of central banks indicated that the decision on trade size is made solely at the desk level.

Governments and boards at central banks are the main decision makers¹

In per cent

Graph 10



¹ 17 central banks.

Sources: MC survey on FX interventions 2023.

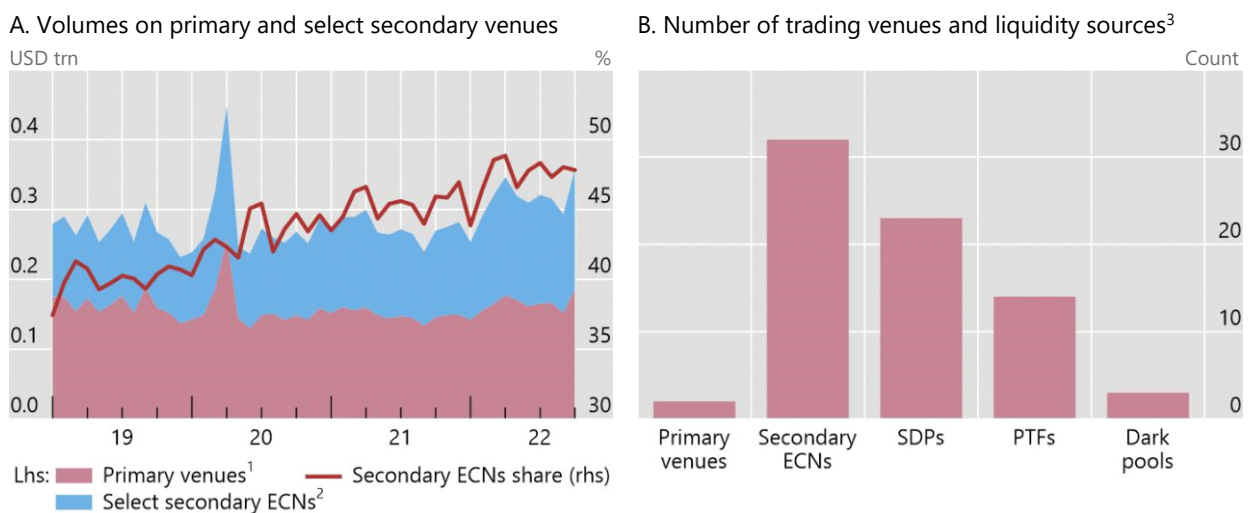
Annex 1: FX Market structure

The FX market structure has evolved significantly over the past decade for both AE and EME currencies along several dimensions. This Annex discusses several market trends focussing mainly on the FX spot market.¹⁰

- Fragmentation.** The FX market has become more fragmented.¹¹ Continuing this trend, the share of FX traded on secondary market electronic communications network (ECNs) has increased over the past years, largely at the expense of primary venues (Graph A1.A). The number of secondary market ECNs and other platforms greatly outnumbers primary venues (Graph A1.B). There are open questions on whether the growth in ECNs makes FX markets more or less resilient, especially in times of market stress.

With further FX market fragmentation, volumes across platforms diverge

Graph A1



¹ CME/NEX EBS and Refinitiv spot turnover (a proxy for trading volumes on EBS Market and Refinitiv/Reuters CLOBs). ² 360T, Cboe FX (Hotspot); Euronext FX (Fastmatch); FXSpotStream. ³ Primary venues: CME/NEX EBS Market and Refinitiv/Reuters Matching; Secondary ECNs: a variety of anonymous and disclosed multi-dealer platforms; SDPs: proprietary single-dealer platforms of FX dealer banks; PTFs: principal trading firms. Dark pools: electronic venues where information about traders' orders is not revealed to other participants.

Sources: CBOE; CME; Deutsche Borse; Euronext; FXSpotStream; MarketFactory; Refinitiv; BIS.

- Internalisation.** Greater FX volumes have been **"internalised"** by banks and other dark pools (Graph A2.A).¹² As more trades are matched internally in dark pools, less volumes are transacted on transparent venues. This could have implications for price discovery, and consequently central banks' FXIs, as central banks usually monitor volumes on "lit" primary markets to assess liquidity.

¹⁰ For a recent overview see Chaboud, A, D Rime, and S Vladyslav (2023): "The Foreign Exchange Market". Chapter 12, in *The Research Handbook of Financial Markets*, edited by Refet Gürkaynak and Jonathan Wright. Edward Elgar.

¹¹ See M Drehmann and V Sushko (2022): "Global foreign exchange market in a higher volatility environment", *BIS Quarterly Review*, December.

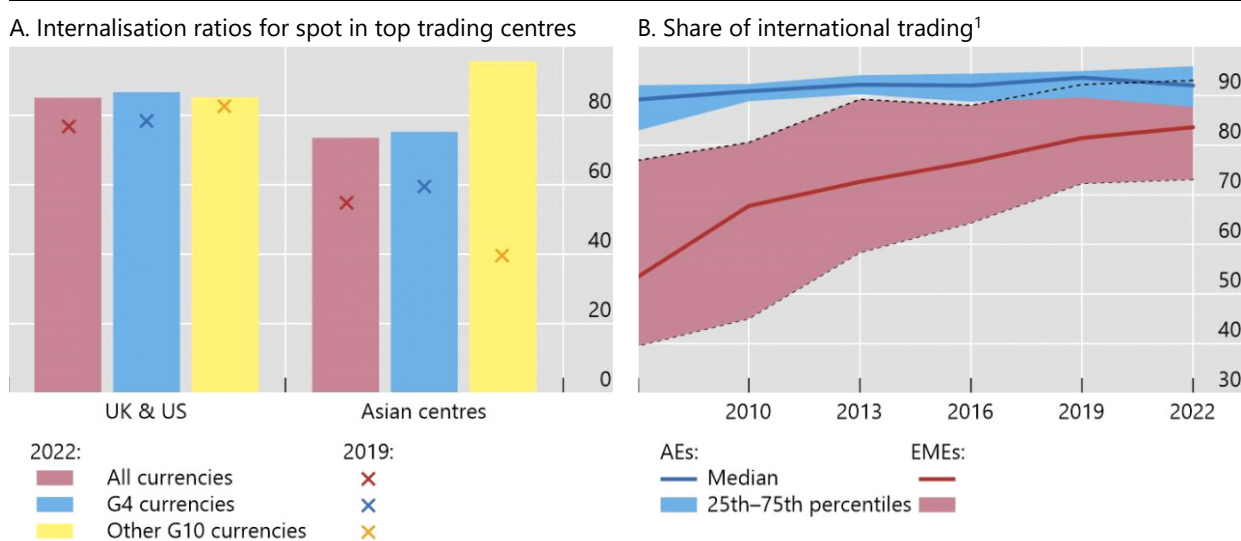
¹² Internalisation refers to the process whereby dealers seek to match staggered offsetting client flows on their own books instead of immediately hedging them in the inter-dealer market.

- Internationalisation.** Trading in EME currencies has become more “international”, ie involving at least one counterparty that resides outside the country that issued the currency.¹³ 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 A2.B). The increased internationalisation of EME currencies has led to diversification and innovation. Derivatives markets have grown as international financial investors tend to trade more heavily in derivatives. This trend could have implications for FX market structure and also influence how EME central banks choose to intervene.

Internalisation ratios have increased and EME currencies are trading globally

In per cent

Graph A2



¹ Based on data for the 11 AE currencies and 27 EME currencies. As a share of FX turnover in spot and derivatives markets, excluding exchange traded derivatives.

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

- Liquidity dynamics.** Liquidity dynamics in FX markets have changed, partly driven by the growth in the usage of algorithms to execute FX trades. Traditionally, market depth was a key metric used to assess liquidity. However, in fast-paced markets, as soon as an order is executed, it is usually replenished with a new order almost instantaneously, thus adding liquidity even if it was not visible initially. Again, there are open questions whether this different liquidity dynamic makes markets more or less resilient, but it has direct implications for how central banks should monitor and assess liquidity conditions in their markets.

¹³ See Caballero, J, A Maurin, P Wooldridge and D Xia (2022): “The internationalisation of EME currency trading”, BIS Quarterly Review, December.

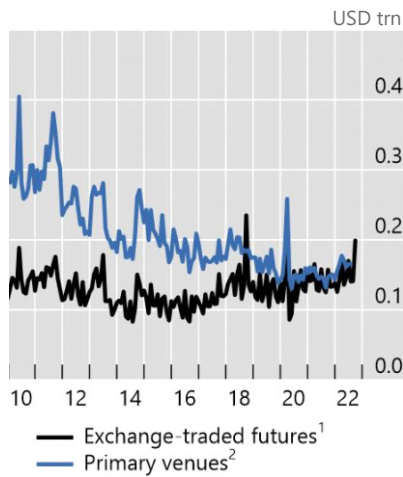
Annex 2: Additional graphs

Volumes do not return to primary venues in 2022 even as volatility spiked

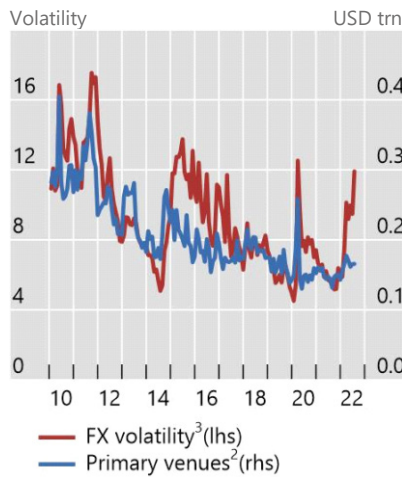
In per cent

Graph A3

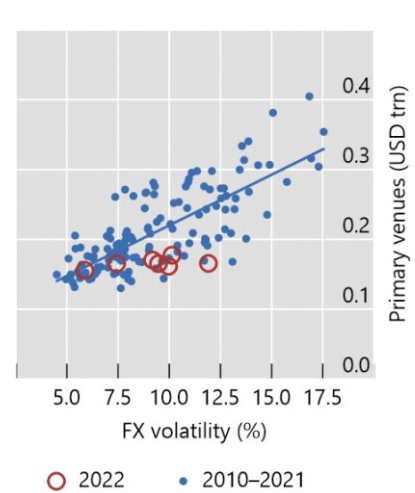
A. Trading volumes on primary venues and futures exchange



B. Trading volumes on primary venues and FX volatility



C. Trading on primary venues and FX volatility, historically and in 2022⁴



For details see M Drehmann and V Sushko (2022): “[Global foreign exchange market in a higher volatility environment](#)”, *BIS Quarterly Review*, December.

¹ Exchanged-traded currency futures turnover, all exchanges. ² CME/NEX EBS and Refinitiv spot turnover (a proxy for trading volumes on EBS Market and Refinitiv/Reuters CLOBs). ³ Deutsche Bank USD volatility index (DBCPIX) average mid-price. ⁴ R-squared = 0.6.

Sources: Refinitiv; BIS exchange-traded derivatives statistics; BIS.

Glossary

Algorithm: Broadly refers to a step-by-step procedure used for calculation or analysis. A wide range of computer programs – not limited to automated trading systems – are often made up of many algorithmic steps, often shared across multiple programs within the same organisation. An algorithm used within an automated trading system defines a set of instructions on when and how to submit, revise or cancel an order.

Basis: The price difference between cash (spot) and futures price.

Carry: Interest rate differential, usually relative to US interest rates.

Central limit order book (CLOB). A trading protocol in which outstanding offers to buy or sell are stored in a queue and are filled in a priority sequence, usually by price and time of entry. Orders to buy at prices higher than the best-selling price and orders to sell at prices lower than the best buying price are executed.

CME: *Chicago Mercantile Exchange*, a futures and options exchange (Merged with the CBOT in 2007)

Dark order: Orders that are not visible in the order book but can interact with both lit orders and other dark orders.

Dark pool: A private venue that provides for anonymous trading and that does not display the order book to market participants.

EBS: Anonymous central limit order book for spot and FX swaps trading for the dealer-to-dealer community. It's the main primary venue for EUR, JPY, and CHF.

ECN: *Electronic communication network*, a system that electronically matches buy and sell orders for securities.

Forward: A contract to exchange two currencies at a pre-agreed future date and price.

Futures: Standardised, exchange-traded derivative contracts for a pre-agreed quantity and quality of a specified asset for a price agreed today, with delivery and payment occurring at a specified date in the future (delivery date).

FX link: A transparent central limit order book on CME Globex for trading spreads between OTC FX Spot and CME FX futures, seamlessly connecting the two markets.

FX swap: Transaction involving the actual exchange of two currencies (principal amount only) on a specific date at a rate agreed at the time of the conclusion of the contract (the short leg), and a reverse exchange of the same two currencies at a date further in the future at a rate (generally different from the rate applied to the short leg) agreed at the time of the contract (the long leg).

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

Internalisation: A process by which dealers offset risk (open positions) arising from client transactions against risk (open positions) arising from transactions with other clients.

Lit venue: A trading venue where the order book is visible to all participants.

Mid-market price: The exact mid-point between the quoted Bid Price and Ask Price for a currency.

NDF: *Non deliverable forward*, contracts for the difference between an agreed exchange rate and the actual spot rate at maturity, settled with a single payment for one counterparty's profit.

OTC: *Over the counter*, the process of trading securities via a broker-dealer network as opposed to on a centralized exchange.

Price limit: The maximum price range permitted for a contract in each trading session. These price limits are measured in ticks and vary from product to product. When markets hit the price limit, different actions occur depending on the product being traded.

Primary venue: A classical exchange for settling trades in a transparent manner. For spot FX, primary venues traditionally include electronic communication networks like EBS or Refinitiv Matching

Refinitiv Matching: Anonymous central limit order book for spot and FX swaps trading for the dealer-to-dealer community. It is the main primary venue for GBP, AUD, CAD, and the Scandinavian currencies.