

## Electronic Foreign Exchange Trading (e-FX): Developments in and implications for the Tokyo FX Market

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In the foreign exchange market, electronic trading (e-FX) has developed and expanded, bringing benefits such as lower trading costs and more trading options. To take advantage of these benefits, e-FX customers need to choose appropriate trading venues and methods. In addition, the development of e-FX has led to a fragmentation of liquidity in the foreign exchange market, making it more difficult to monitor market trends, and there are concerns that price discovery in the foreign exchange market may be undermined in the future. Furthermore, as the e-FX infrastructure advances internationally, the presence of the Tokyo market as a financial center may be affected, involving an outflow of foreign exchange transactions.

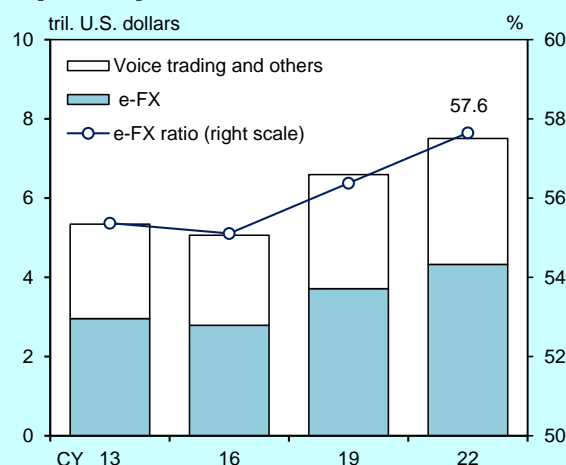
### Introduction

Global digitalization has had a significant impact on the foreign exchange (FX) market, as manifested in the development of electronic FX trading (e-FX). According to the triennial survey of FX market turnover conducted by the Bank for International Settlements (BIS survey), the ratio of e-FX to total FX transactions (e-FX ratio) has been on an upward trend since 2013, when the e-FX survey began (Chart 1). The latest survey, conducted in 2022, shows the massive size of the global FX market, with \$7.5 trillion in volume per business day, of which e-FX accounts for nearly 60%.

Since the FX market consists mainly of over-the-counter transactions, a comprehensive understanding is inherently difficult. The structure has become even more complex with the development and expansion of e-FX. In monitoring the FX market, it is important to note that liquidity is more fragmented as a result of the increase in the number of venues where e-FX is conducted and the diversification of services offered. This makes it difficult to monitor market trends, and there are concerns that price discovery in the FX market may be undermined in the future.

This paper describes the development of e-FX and reviews its current status in the Tokyo market. It also discusses the structural changes in the FX market in recent years related to the development of e-FX and addresses the implications of these changes.

[Chart 1] Global FX Transaction Volume



Notes: 1. Latest data as of 2022.  
2. Transaction volume is the daily average in USD for each survey period, adjusted for both local and cross-border double counting of transactions between two reporting dealers ("net-net basis").  
3. e-FX ratio is the ratio of e-FX to total FX transactions (the same applies hereinafter).

Source: BIS.

### Development of e-FX

#### Voice trading and e-FX

The FX market is traditionally divided into the "inter-dealer market," where market makers (the sell-side, such as large banks and security firms) trade with each other, and the "dealer-to-customer market," where market makers trade with their customers (the buy-side, such as corporations, institutional investors and FX retail aggregators). This two-tier structure corresponds to the wholesale and retail markets<sup>1</sup>. Market makers trade in the dealer-to-customer market, while they

hedge their FX risk in the inter-dealer market.

FX trading forms can be broadly categorized into “voice trading” and “e-FX,” based on the presence of human communication. Voice trading refers to trading via telephone, email or chat. When it was common for market participants to conduct voice trading over dedicated telephone lines, the FX market was called a telephone market. In contrast, e-FX refers to trading where orders are executed electronically via computer terminals. With the expansion of e-FX, the FX market is now sometimes called a screen market.

### Development of primary venues

The history of e-FX began with electronic brokers in the inter-dealer market. With their convenience, diminishing costs (small additional costs as trading volume increases), and network externalities (once liquidity is gathered, more liquidity is gathered), electronic brokers took over the market share of traditional voice brokers<sup>2</sup>. The major electronic brokers, which have gained a significant share of the FX market, are still positioned as the main venues today and are generally referred to as "primary venues."

The trading protocol used for primary venues is the Central Limit Order Books (CLOBs). Participants can place their own buy and sell orders and can also take orders placed by other participants. As with exchange-traded transactions, the trading rule is clear. Price and time take precedence over execution, regardless of the names of the participants or the size of the transaction.

In addition, primary venues do not allow for "last look," a practice in e-FX where a market maker receiving a trade request has a final opportunity to accept or reject the request at its quoted price. Therefore, the price on primary venues can be considered a firm price subject to execution.

The BIS Markets Committee points out the following about primary venues (note: an ECN, or Electronic Communication Network, is a system that electronically matches buy and sell orders for securities and is roughly equivalent to an e-FX venue): “Primary ECNs have been integral to price discovery for several reasons. First, because they provide real-time data on prices and trades, thereby enhancing transparency. Second, because of the high precision of the price signal, given that limit orders on these platforms are firm (as opposed to indicative quotes). Third, because pre-trade anonymity prevents price discrimination. And, finally, because inter-dealer flows directed to primary ECNs are an important aggregator of information stemming from dealers trading with clients.”<sup>3</sup>

### Development of secondary venues

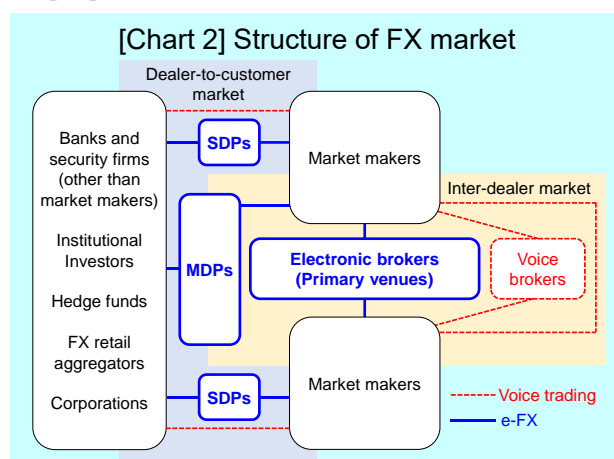
Following the advent of electronic brokers, e-FX also developed in the dealer-to-customer market, dominated by voice trading. Specifically, Single Dealer Platforms (SDPs), where each market maker operates independently to provide liquidity, and Multi Dealer Platforms (MDPs), where multiple market makers compete with each other to provide liquidity on the same venues, were established.

SDPs began in the mid-1990s, and particularly in the 2000s, a number of major market makers established these venues. Financial institutions, especially in Europe and the United States, invested aggressively in their own SDPs and in the execution algorithms<sup>4</sup> offered to their customers in order to increase convenience and price competitiveness.

MDPs were introduced around the same time as SDPs and have been used by numerous customers, since they allow an easy comparison of prices offered by multiple market makers and best execution at a low cost. In addition, MDPs have developed their services to meet the various needs of individual market participants, such as expanding tradable products, currency pairs and the detailed setting of trading rules.

These venues are referred to as "secondary venues," in contrast to primary venues. The emergence of a large number of secondary venues has led to a change in the relative presence among venues. In particular, the development of SDPs has encouraged the internalization of customer orders by the market makers operating the venues (marry trading), which has led to a reduction in trading volumes in the inter-dealer market. Furthermore, MDPs, which have developed mainly in the dealer-to-customer market, have also seen an increase in transactions between financial institutions, including market makers, as their services have become more diversified. As a result, the share of primary venues in the inter-dealer market is declining.

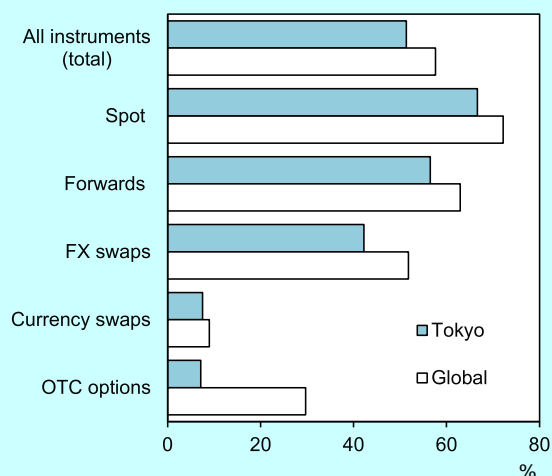
Based on the above description, Chart 2 shows a simple picture of the current structure of the FX market.



## Development by instruments of transaction

There are differences in the development and expansion of e-FX by transaction instrument. In this respect, a comparison of e-FX ratios by instrument in the BIS survey shows that spot, forward and FX swap transactions, in that order, tend to have higher e-FX ratios, while currency swap and option transactions have lower e-FX ratios, noting that there are large fluctuations depending on the survey period (Chart 3).

[Chart 3] e-FX ratio by Instrument of Transaction



Notes: 1. Data as of 2022.  
2. Global e-FX ratios are net-net basis. The Tokyo market e-FX ratios are adjusted for the local double counting of transactions between two reporting dealers in Japan ("net-gross" basis).  
Sources: BIS; BOJ.

For spot trading, the e-FX ratio is above 60% in both the global and Tokyo markets, indicating a significant expansion of e-FX. This is due to the history of e-FX venues, which were first established and developed in the spot market. The use of e-FX was encouraged from an early stage in terms of price competition since spot trading is a simpler instrument than other instruments, with less scope for customers to adjust trading conditions and the difficulty of differentiating services between market makers. Given this development of e-FX, the FX spot trading business is sometimes referred to as the "commodity business" or "data transmission business."

While the trend toward e-FX is expanding globally for instruments other than spot, the following section reviews developments in the Tokyo market, with a particular focus on spot and forward trading, where e-FX has grown significantly.

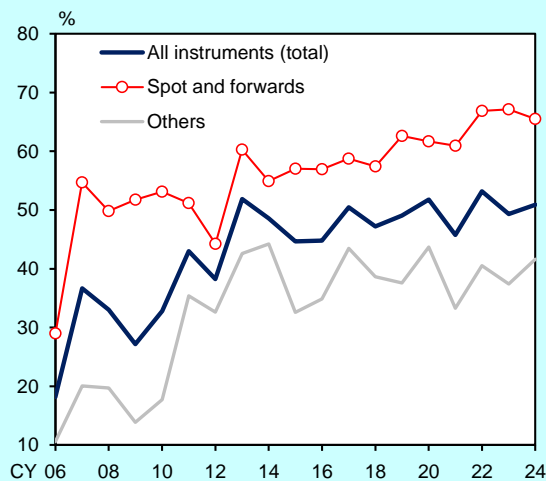
## e-FX in the Tokyo Market

### Changes in e-FX ratio

e-FX has been expanding in the Tokyo market as well. According to the Tokyo Foreign Exchange Market

Committee, which has tracked the e-FX ratio in its turnover survey since 2006 (prior to the BIS survey), the e-FX ratio has risen from around 20% in the first year of the survey to approximately 50% in recent years (Chart 4).

[Chart 4] e-FX Ratio in Tokyo Market



Note: Data are from April surveys for each year. Latest data as of April 2024.  
Source: Tokyo Foreign Exchange Market Committee.

The e-FX ratio for spot and forward transactions has continued to rise steadily into the 2020s and is currently close to 70%, despite the fact that the relatively low e-FX ratio for other transactions has had a negative effect on the overall e-FX ratio.

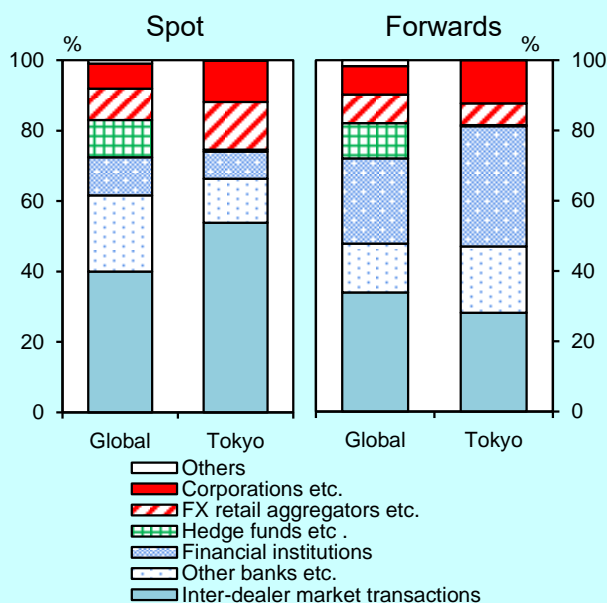
### Characteristics by type of market participant

That the e-FX ratio in the Tokyo market is somewhat lower than that in the global market (Chart 3 above) can be attributed to various factors, including differences in attitude between Japanese and foreign financial institutions; however, the lower ratio is also influenced by the composition of market participants. A comparison of the trading volume by type of market participant for spot and forward transactions between the Tokyo market and the global market shows that "Corporations etc." accounts for a large share in the Tokyo market, while "Hedge funds etc." accounts for a small share (Chart 5).

In this regard, looking at the e-FX ratio by type of market participant, the e-FX ratio for "Corporations etc." is lower than that for "Inter-dealer market transactions" and "Other financial institutions," indicating that corporations continue to focus on voice trading (Chart 6). The large share for "Corporations etc." in the Tokyo market should be one of the factors pushing down the overall e-FX ratio. Corporations engage in FX transactions to convert foreign currency earned from exports and overseas production into yen,

as well as to obtain foreign currency necessary for importing raw materials, etc. However, preferences for e-FX are not uniform.

[Chart 5] Transaction Volume by Type of Market Participant



Notes: 1. Data as of 2022.  
2. Global data are net-net basis. The Tokyo market data are net-gross basis.  
3. "Inter-dealer market transactions" refers to transactions between reporting dealers (the same applies hereinafter). "Other banks etc." refers to inter-dealer market participants other than reporting dealers.

Source: BIS.

[Chart 6] e-FX Ratio by Type of Market Participant in Tokyo Market

	Inter-dealer market transactions	Other financial institutions	Corporations etc.
All instruments (total)	51%	54%	37%
Spot	67%	77%	35%
Forwards	72%	59%	10%

Notes: 1. Data as of 2022.  
2. Net-gross basis.  
3. "Other financial institutions" including other inter-dealer market participants other than reporting dealers, financial institutions, hedge funds, and FX aggregators etc. (the same applies hereinafter).

Source: BOJ.

In interviews by the Bank of Japan, corporations that prefer voice trading stated that they value the relationship with their main bank when selecting a market maker and have little need to compare multiple prices. Moreover, the small size and low frequency of FX transactions make it difficult to motivate them to

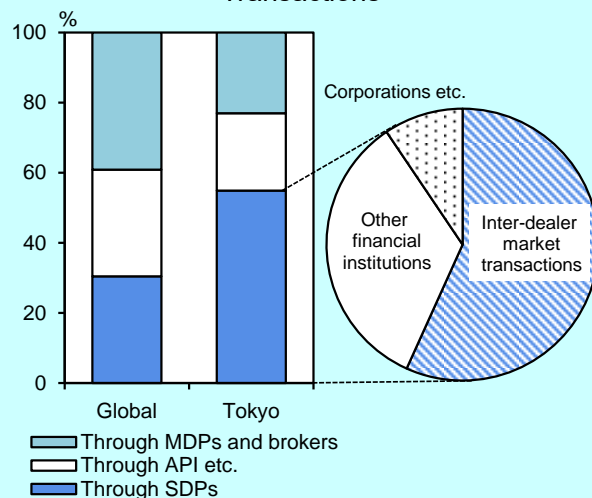
adopt e-FX. In addition, the opportunity to actually hear the financial market information offered by FX dealers in association with their FX transactions appears to be an advantage of voice trading.

On the other hand, some corporations reported moving from voice trading to e-FX, citing the growing awareness of best execution in FX transactions as the reason. In addition, there were cases where the efficiency and labor savings of the administrative process from execution to settlement are incentives. There were also cases where e-FX was being implemented as part of DX, including data sharing within the corporation. If these trends continue, it can be expected that e-FX will be more widely adopted by Japanese corporations.

Notably, e-FX is actively used by FX retail aggregators (known as "FX firms") in the Tokyo market that manage retail FX margin trading. FX retail aggregators are highly compatible with e-FX in that they accept orders from retail investors over the Internet and are sensitive to transaction speed (latency). The recent growth in retail FX trading is likely to contribute to the expansion of e-FX in Japan<sup>5</sup>.

Looking at the share of spot transactions by venue, the Tokyo market is dominated by transactions through SDPs (Chart 7). Among these, while "Inter-dealer market transactions" accounts for the largest share<sup>6</sup>, "Other financial institutions," including FX retail aggregators, also has a large share. One of the characteristics of the Tokyo market is that many venues focus on attracting FX retail aggregators, and the trend for FX retail aggregators is significant when monitoring the e-FX trend.

[Chart 7] Share by Venue in e-FX Spot Transactions



Notes: 1. Data as of 2022.  
2. Global data are net-net basis. The Tokyo market data are net-gross basis.  
Sources: BIS; BOJ.

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## Implications of e-FX Development

As mentioned above, e-FX has expanded both in terms of the number of venues and the variety of services. As a result, customers have more opportunities to trade at better prices (tighter spreads) and with less market impact than in the past. On the other hand, with the expanding presence of secondary venues in e-FX, liquidity that was previously concentrated in primary venues is now fragmented across a variety of venues. This poses new challenges for stakeholders, both inside and outside the FX market, in monitoring market trends. From a slightly different perspective, the development of e-FX also has an impact on the market presence of individual countries and regions due to the location of the e-FX infrastructure. This section summarizes the possible impact of the development of e-FX on the structure of the FX markets.

### *Diversification of trading methods*

As mentioned earlier, primary venues use CLOBs, a clear trading protocol. On the other hand, secondary venues, in which not only market makers but also customers participate, are currently said to have more than 75 venues<sup>7</sup>, with trading methods that are notably diverse. For example, secondary venues allow customers to request prices from multiple market makers simultaneously, or to request streaming delivery at any time. By using these services, customers can increase their chances of trading at more favorable prices.

In addition, rather than “lit venues,” where the order book is visible to all participants, “dark pools,” where the order book is not displayed, have also emerged in recent years. Dark pools are increasingly used because they allow participants to trade mechanically according to certain rule<sup>8</sup> while keeping their own orders secret and limiting the price impact on the market.

### *Fragmentation of liquidity and more difficult in monitoring market trends*

As noted above, the internalization of customer orders by market makers through SDPs and the growth of inter-dealer market transactions in MDPs have led to a significant decline in the share of primary venues, even after the early 2020s<sup>9</sup>.

As a result, there has been significant international concern regarding the possibility of undermining price discovery in the FX market<sup>10</sup>. Prices at primary venues are commonly referred to as representative prices in the FX market. For this reason, the primary venues are

positioned as the most important venues from the perspective of proper monitoring of the FX market. In this regard, it is not easy to find the mid-market price, the mid-point between the highest buy order (bid price) and the lowest sell order (ask price), for the market as a whole from information on various secondary venues with different liquidity qualities.

Furthermore, it may not be appropriate to rely solely on primary venue information to assess overall market liquidity, such as bid-ask spreads and market depth (the total size of buy and sell orders). However, there are also considerations and practical hurdles to assessing overall market conditions from secondary venue information. In particular, market makers often offer prices to multiple venues simultaneously, in which case simply adding individual liquidities risks overestimating the size of overall liquidity. Moreover, in dark pools, obtaining liquidity information is not feasible.

The recent development of algorithmic trading<sup>11</sup> has also made it more difficult to assess market liquidity. For example, even when trading on lit venues, if algorithmic trading is used to mechanically repeat orders in minimum trade sizes at specific prices by dividing the original trade amount, others are not able to judge the (potential) market depth.

The growing complexity of the market has important implications not only for the entities that monitor the FX market – including authorities responsible for oversight – but also for customers using e-FX. While a greater choice of available venues increases the opportunities for customers to trade at more favorable prices, they must also make appropriate choices among the differently characterized venues to meet their trading needs. The difficulty of making such choices is further compounded by the fact that each venue has different characteristics in terms of the implications of information on price and liquidity<sup>12</sup>.

### *e-FX and the presence of FX markets*

e-FX approaches can also affect the presence of FX markets in each country and region. Watanabe et al. (2023)<sup>13</sup>, which analyzed the downtrend in the share of Japan in global FX turnover, organized the characteristics of each country's FX market by type. The report pointed out that in "international financial center type" regions, such as the United Kingdom, Hong Kong SAR, and Singapore, their share, including transactions in foreign currencies, has increased more than the share in only the local currency. In these regions, e-FX infrastructure is being actively developed, and latency-sensitive customers are

establishing trading bases<sup>14</sup>. This is expected to attract trading demand from other regions. With this in mind, BOX presents a recent example of such an initiative in Singapore.

## Concluding Remarks

The focus of this paper has been on e-FX, which has seen significant development and expansion within the FX market. The increase in the number of e-FX venues and the diversification of services have brought benefits to individual customers using e-FX, such as

lower costs and greater choice in FX trading.

On the other hand, as summarized in this paper, the development of e-FX has resulted in a more complex FX market, with various implications for both market participants and the entities that monitor the market<sup>15</sup>. In addition, as the e-FX infrastructure advances internationally, the presence of the Tokyo market as a financial center may be affected, involving an outflow of FX transactions to other financial centers. Careful monitoring of e-FX is important to follow trends in FX trading and changes in market structure.

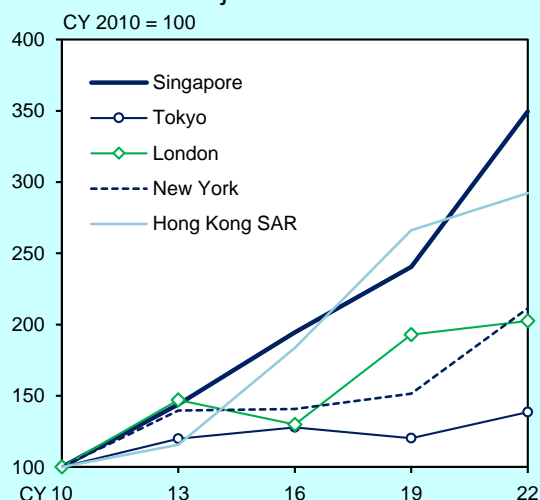
### BOX: e-FX in the Singapore market

In October 2017, the Monetary Authority of Singapore (MAS) released its strategy for growing Singapore’s financial services industry and making Singapore an international financial center in Asia (ITM: Industry Transformation Map)<sup>16</sup>. In the area of FX trading, the ITM encourages major FX market participants to set up centers for matching and pricing, with the intention of making Singapore the center of Asian time for price discovery and liquidity in FX trading. From the perspective of FX market participants, the ability to match orders without major cities such as London, New York, and Tokyo is expected to reduce the time lag between order placement and execution, and thereby avoid execution errors caused by time lag.

The launch of the “Foreign Exchange E-trading Ecosystem Grant Scheme,” a support scheme for platforms and liquidity providers related to the above, has also led to the recent expansion into Singapore of major market makers and non-banks with a strong presence in the FX market<sup>17</sup>. In light of the recent changes in the external environment, the revised growth strategy (ITM 2025) released in 2022 also calls for a broad and deep e-FX ecosystem by attracting more platforms and liquidity takers<sup>18</sup>.

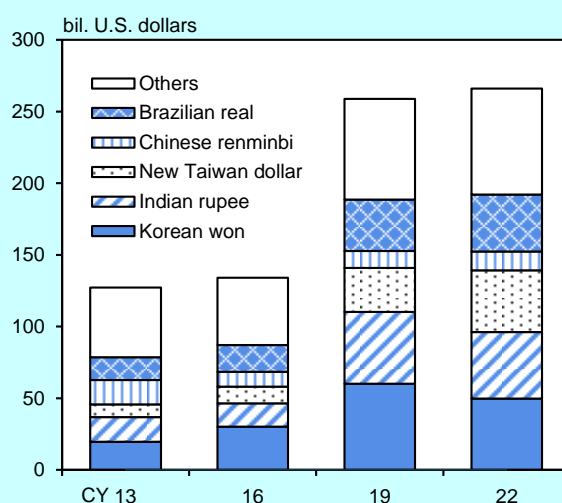
The MAS attributes the strong growth in FX trading volume in the Singapore market, particularly in the period leading up to the most recent BIS survey, to its growth strategies (BOX Chart 1). In recent years, some of the major platforms and stock exchanges in Singapore have begun to operate venues for NDF trading, which is common in emerging market currencies. It will be interesting to see if they can capture the demand for trading in emerging market currencies (especially Asian currencies), which have seen a significant growth in trading volume (BOX Chart 2)<sup>19</sup>.

[BOX Chart 1] Transaction Volume in Major FX Markets



Notes: 1. Latest data as of 2022.  
2. Net-gross basis.  
Source: BIS.

[BOX Chart 2] NDF Transaction Volume



Notes: 1. Latest data as of 2022.  
2. Net-net basis.  
Source: BIS.

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\* currently the Research and Statistics Department

\*\* currently the International Department

<sup>1</sup> In recent years, market making by non-banks not affiliated with banks or security firms has become increasingly active. These non-banks use prime brokerage (PB) services provided by banks and security firms to provide liquidity in the interdealer market. In the Tokyo market, FX retail aggregators also use PB services to trade in the interdealer market. These developments have blurred the traditional distinction in the FX market in recent years.

<sup>2</sup> Market Policies Group, Financial Markets Department, Bank of Japan, "Increasing Use of Electronic Trading Systems and Its Implications on Japanese Financial Markets," Bank of Japan Market Review E-series, 2001-E-2 (July 2001).

([https://www.boj.or.jp/en/research/wps\\_rev/mkr/data/kmr01e02.pdf](https://www.boj.or.jp/en/research/wps_rev/mkr/data/kmr01e02.pdf))

<sup>3</sup> Markets Committee (2018), "Monitoring of fast-paced electronic markets," report submitted by a Study Group, Markets Committee Paper No. 10.

<sup>4</sup> The use of execution algorithms can reduce the price impact at the time of trading and limit costs, especially when executing large-lot trades.

<sup>5</sup> For the recent expansion of retail FX trading, see Matsuda, Oyama, Yamaoka, and Bessho (2023), "Retail Foreign Exchange Margin Trading in Japan: An Analysis from the Developments in 2022," Bank of Japan Review, 2023-E-7.

<sup>6</sup> With regard to the large share of "Interdealer market transactions" in transactions through SDPs, it is possible that foreign market makers located in Japan are actively conducting covering transactions with their overseas offices through their own SDPs for orders received from customers.

<sup>7</sup> Nordström, A. (2022), "Understanding the foreign exchange market," Penning- och valutapolitik No.1.

<sup>8</sup> For example, when buy orders and sell orders reach the same size, the rule is to execute the orders at the mid-price at a primary venue at that time.

<sup>9</sup> Of the total FX transactions in the BIS Survey, the share of indirect and anonymous electronic transactions, which approximately correspond to primary venues, declined by 7 percentage points from 2019 to 2022, falling below 10% on an all-currency basis.

<sup>10</sup> For example, in the Foreign Exchange Committee in New York (March 2024), "*some expressed concern that further decentralization away from primary venues could potentially have an impact on price discovery and should therefore be monitored.*"

(<https://www.newyorkfed.org/medialibrary/Microsites/fxc/files/2024/FXC-Mar-2024-Meeting-Minutes>)

<sup>11</sup> Koga and Takeuchi (2013), "Faster and Automated Trading in the FX Market: Changes in Market Structure and New Issues," Bank of Japan Review, 2023-J-1 (*Japanese only*).

<sup>12</sup> "Last look" is common on secondary venues. When last look

is allowed, the price is the indicative price, which is different from the farm price. Then, the quality of the price information varies.

<sup>13</sup> Watanabe, Hari, Sawada, and Bessho (2023), "Developments in and Characteristics of Japan's FX Market: An Analysis Based on the 2022 BIS Triennial Central Bank Survey," Bank of Japan Review, 2023-E-4.

<sup>14</sup> Previous studies also pointed out that customers are establishing trading bases in countries and regions with well-developed e-FX infrastructure. See, for example, Chaboud, A. et al. (2023): "The foreign exchange market," BIS Working Papers No. 1094.

<sup>15</sup> Authorities in various countries are sharing their knowledge of the latest developments surrounding e-FX and monitoring the FX market. See, for example, the discussion at a BIS Markets Committee workshop, "FX Markets and FX Interventions: Insights from a Markets Committee Workshop."

<sup>16</sup> Monetary Authority of Singapore, "Roadmap for a Leading Global Financial Centre in Asia."

(<https://www.mas.gov.sg/news/media-releases/2017/roadmap-for-a-leading-global-financial-centre-in-asia>)

<sup>17</sup> Monetary Authority of Singapore, "Financial Sector Development Fund."

(<https://www.mas.gov.sg/schemes-and-initiatives/financial-sector-development-fund-fsdf>)

<sup>18</sup> Monetary Authority of Singapore, "MAS launches Financial Services Industry Transformation Map 2025."

(<https://www.mas.gov.sg/news/media-releases/2022/mas-launches-financial-services-industry-transformation-map-2025>)

<sup>19</sup> While NDF trading volumes were roughly flat from 2019 to 2022, looking at trends thereafter, the London Foreign Exchange Joint Standing Committee's semi-annual survey shows that trading volumes in the London market, which account for more than half of NDF trading volumes, have generally continued their upward trend since 2022 through the most recent survey in October 2024.

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