

## **Foreign Exchange Option Market through the Lens of OTC Derivative Transaction Data: Recent Market Developments**

Financial Markets Department  
TAKIZUKA Yasutaka, MARUYAMA Rinto\*

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Foreign Exchange (FX) options are one of the tools used by non-financial corporations, institutional investors, and other market participants to hedge or take FX risks. Although those option transactions and prices can reflect the participants' risk awareness, it may not be enough for monetary authorities to monitor FX options using the existing transaction statistics, whose data are often coarse and published less frequently. This report uses more granular data, the over-the-counter (OTC) derivative transaction data collected in Japan, and reveals some interesting characteristics of the USD/JPY FX option market, including trading volumes by option type, strike prices of traded options, and the trading relationships among the major sectors of market participants.

### **Introduction**

An FX option is a right to buy or sell a certain currency (e.g., the US dollar) at a specified exchange rate on or before a specified date. Various entities such as non-financial corporations and institutional investors trade FX options actively as one type of derivatives. Their transactions and prices can reflect those entities' market views and risk awareness.

There are some statistics that shed light on transactions in the derivatives market including FX options. For example, the Bank for International Settlements (BIS), together with the world's central banks, conducts the *Triennial Central Bank Survey of Foreign Exchange and Over-the-counter Derivatives Markets (BIS Triennial Survey)*, thanks to cooperation from major market participants<sup>1</sup>. While these existing statistics are useful as overviews of the market, they are published less frequently, such as once every half a year or even only every three years. In addition, these statistics do not cover details, for example, the option type or buying/selling position held by each entity. Thus, the existing statistics are not sufficient to understand market developments in detail.

Therefore, this report uses more granular data, the OTC Derivative Transaction Data collected in Japan,<sup>2</sup> and reveals the recent developments in the USD/JPY FX option market.

### **OTC derivative transaction data**

The OTC derivative transaction data collected in Japan include each individual transaction's settlement date, transaction parties, transaction conditions, etc. In the FX option dataset in particular, there is a variety of information about the options such as the currency pair (e.g., USD/JPY), whether the contract type is "right to buy (call)" or "right to sell (put)," and whether the option's holder can exercise it "only at the expiration date (European)" or "at any time before the expiration date (American)." Moreover, the dataset includes such detailed information about the transactions as the strike price, who "receives" or "pays" the compensation (option premium), etc., as a result of the option contract. These sources allow us to aggregate or analyze the transaction data from a larger variety of aspects and in a timelier fashion than the existing statistics.

Country authorities (for example, in Japan, the Financial Services Agency) have collected transaction data in order to gauge systemic risks and improve transparency in the OTC derivative market in light of the lessons from the global financial crisis. Nonetheless, there have not been a large number of analyses globally<sup>3</sup>, given that the confidentiality of each transaction should be safeguarded and that data cleansing requires substantial time and cost.

This report analyzes the FX option transaction data from the OTC derivative transaction data collected in Japan. In detail, we work with the dataset of

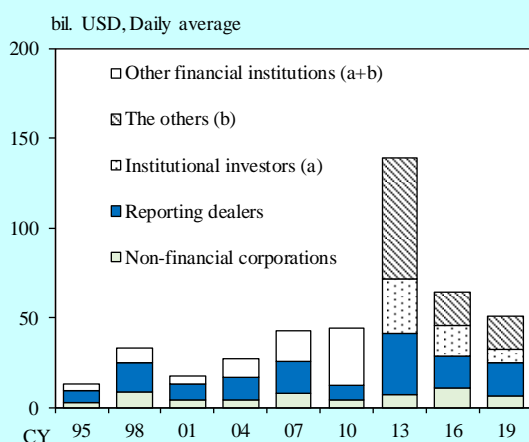
transactions settled after 2016 and we remove a portion of the dataset that has outliers and missing data in terms of strike prices or other items<sup>4</sup>. Although the dataset covers the transactions where at least one of the parties is a Japanese financial institution or a foreign institution based in Japan, the data do not include the transactions among the companies in the same group (e.g., transactions between a parent company and its subsidiary companies) or transactions among non-residents<sup>5</sup>.

## Recent characteristics of the USD/JPY FX option market in Japan

### Characteristics seen from BIS Triennial Survey

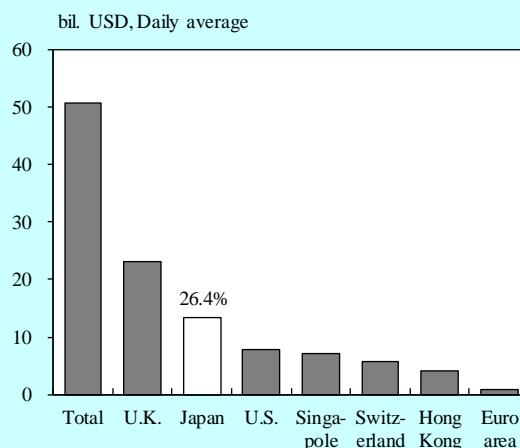
Firstly, we present an overview of the Japanese USD/JPY FX option market compared with the global market within the scope of the BIS Triennial Survey. The trading volume increased in 2013, when the USD/JPY spot rate exhibited large-scale movements, partly due to the effects of the introduction of the Bank of Japan (BOJ)'s Quantitative and Qualitative Monetary Easing.<sup>6</sup> After that, the volume declined until 2019 (Chart 1). Meanwhile, the transactions in Japan have been about a quarter of global trading, which is second only to the U.K. (Chart 2). In the entity data, "the others," which includes hedge funds, has a larger share in the global market than that in Japanese market. On the other hand, in Japan, both non-financial corporations and institutional investors account for about one-third of the total transactions (Chart 3).

[Chart 1] The USD/JPY FX Option Transactions



Note: As at April for each year. The breakdowns of "other financial institutions" were reported from 2013.  
Source: BIS "Triennial Central Bank Survey of Foreign Exchange and Over-the-counter (OTC) Derivatives Markets."

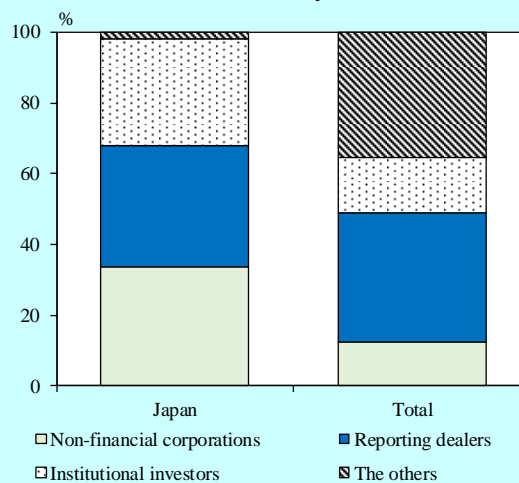
[Chart 2] The USD/JPY FX Option Transactions by Country and Area



Note: As at April 2019. Total does not match the sum of country breakdowns as it excludes the double-counting of transactions between local and cross-border dealers. Euro area represents the sum of 13 countries which belong to the European Union and whose data are available.

Source: BIS "Triennial Central Bank Survey of Foreign Exchange and Over-the-counter (OTC) Derivatives Markets."

[Chart 3] The USD/JPY FX Option Transactions by Entity



Note: As at April 2019.

Source: BIS "Triennial Central Bank Survey of Foreign Exchange and Over-the-counter (OTC) Derivatives Markets."

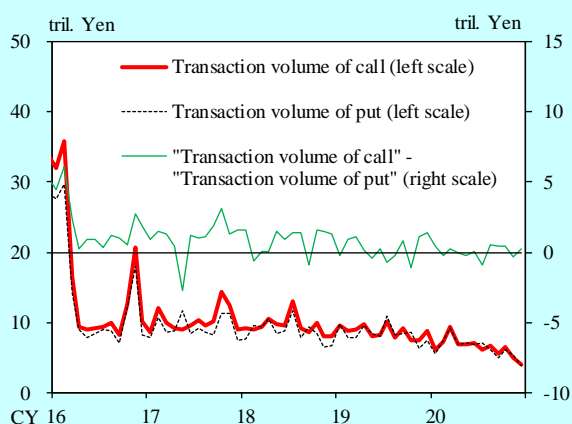
### Characteristics seen from OTC derivative transaction data

Next, we summarize some recent characteristics of the Japanese USD/JPY FX option transactions with the OTC derivative transaction data.

## I. Trading Volumes and Major Options

In the trading volumes (Chart 4), we can see that both call and put option transaction volumes continue to decrease, and both transaction volumes have been moving together. As a result, the deviations between call and put option transaction volumes have been shrinking. Furthermore, in terms of the maturities, while less than 3 months occupies the clear majority, its share has recently been decreasing (Chart 5). This may reflect the diminished option needs especially for short-term hedges, while the price range (the deviation between the highest price and the lowest price, Chart 6) and the volatility of the USD/JPY spot rate have also decreased over the same years.

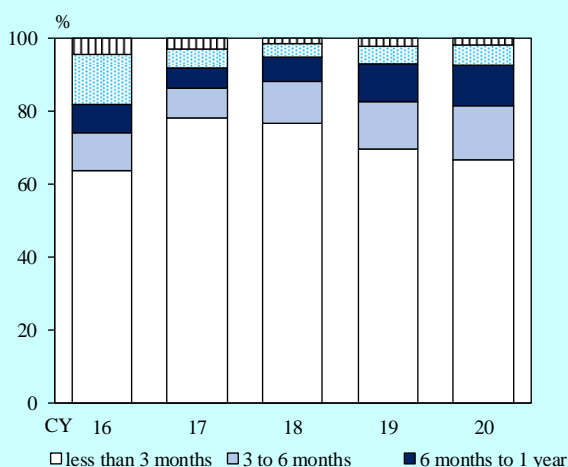
[Chart 4] The USD/JPY FX Option Transactions by Call Option and Put Option (Domestic Market)



Note: Latest data as at December 2020. Transaction volumes represent the sum of notional value in the USD/JPY (European) FX options.

Source: OTC Derivative Transaction Data

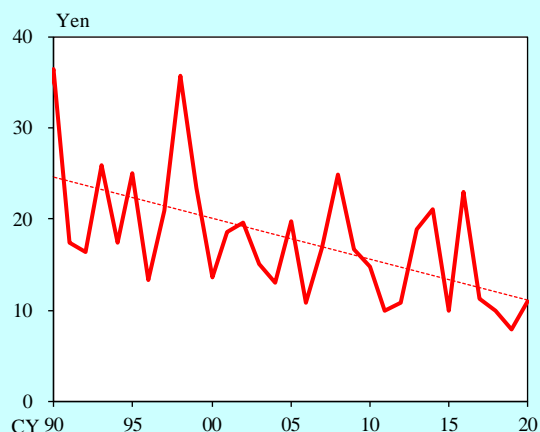
[Chart 5] Share of Transactions by Maturity (Domestic Market)



Note: Calculated from the USD/JPY (European) FX options.

Source: OTC Derivative Transaction Data

[Chart 6] Price Range of the USD/JPY

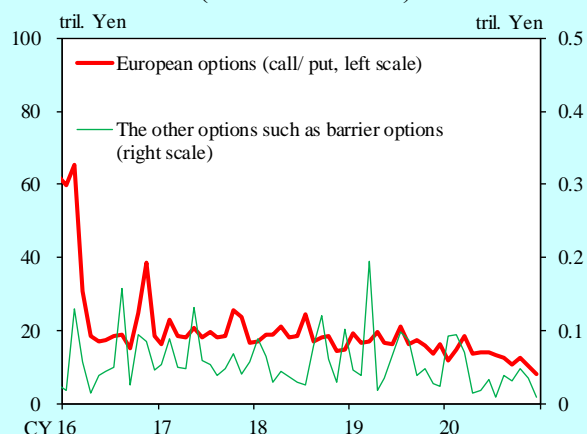


Note: The deviation between the highest and lowest spot rate in each year.

Source: Bloomberg

In terms of the option types, the simple European options account for almost all trading volume, with the other types of options, which have complex contracts about strike prices,<sup>7</sup> appearing in limited amounts (Chart 7). One of the reasons for this may be related to the fact that a relatively small number of entities in Japan prefer speculative trades (e.g., hedge funds) compared to the situation in foreign countries as described in the previous section.

[Chart 7] The USD/JPY FX Option Transactions (Domestic Market)



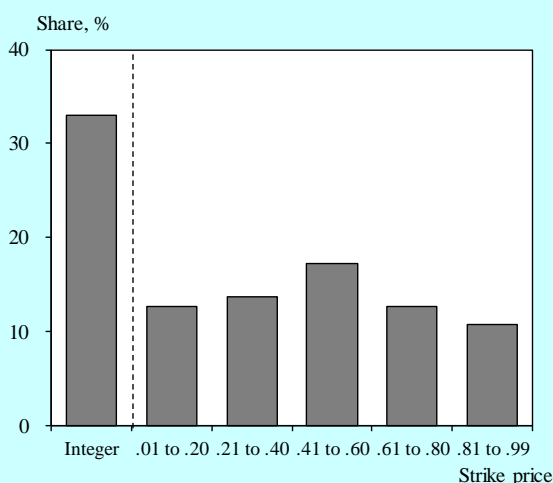
Note: Latest data as at December 2020. Transaction volumes represent sum of notional value in the USD/JPY (European) FX options.

Source: OTC Derivative Transaction Data

## II. Distribution of Strike Prices

With regard to the strike prices in transaction-by-transaction data, integer prices, such as "X.00 Yen," appear more often than other prices (Chart 8). Although the strike prices in actual trades rely on daily spot rates, integer prices may be given more priority than prices that are very carefully calculated in units of 0.01 Yen.

[Chart 8] Share of Transactions by Strike Price (Domestic Market)

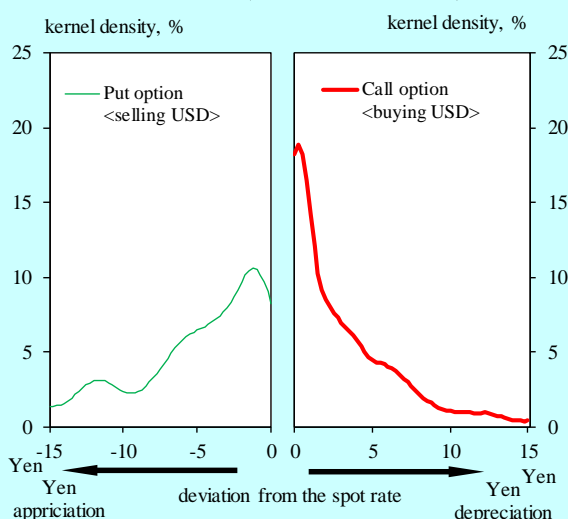


Note: Calculated from the USD/JPY (European) FX options whose settlement dates are from January 2016 to December 2020. Shares by strike price.

Source: OTC Derivative Transaction Data

Next, we confirm the distribution of strike prices normalized by the deviation from the spot rate on each settlement day. Both call and put options have relatively large transaction volumes when their strike prices are distant from the spot rates. In other words, we can observe that options are traded to prepare for potentially large-scale price increase or decrease risks (Chart 9). Particularly, put (sell USD and buy JPY) options, whose values increase during the JPY appreciation against USD, have a larger portion distant

[Chart 9] Distributions of the USD/JPY FX Option Strike Prices (Domestic Market)



Note1: Calculated from the USD/JPY (European) FX options whose settlement dates are from January 2016 to December 2020.

Note2: Horizontal axis represents deviation from the USD/JPY spot (at PM 5:00 EDT in the option settlement day) to the strike price.

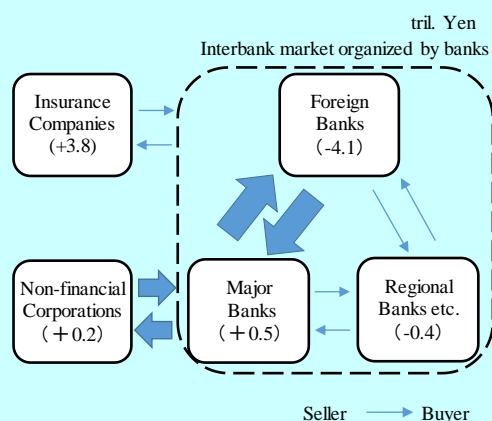
Source: OTC Derivative Transaction Data, Bloomberg

from the spot rate than call (buy USD and sell JPY) options have. This implies that Japanese market participants, overall, have more needs to handle with the large-scale JPY appreciation risks than with JPY depreciation risks.

### III. Market Structures

In order to understand market structures, we look at relationships in European option transactions, which cover almost all of the trading volume, among major entities in Japan from 2016 to 2020 (Chart 10). Non-financial corporations and insurance companies have mostly contracted with banks. The banks have a market making function passively providing opportunity to buy or sell FX options in response to the customers' needs. At the same time of the market making, they have offset their FX risk exposure from their net positions to generally neutral ones by adjusting (hedging) them in the interbank market<sup>8</sup>.

[Chart 10] Trading Network of the USD/JPY FX Options (Domestic Market)



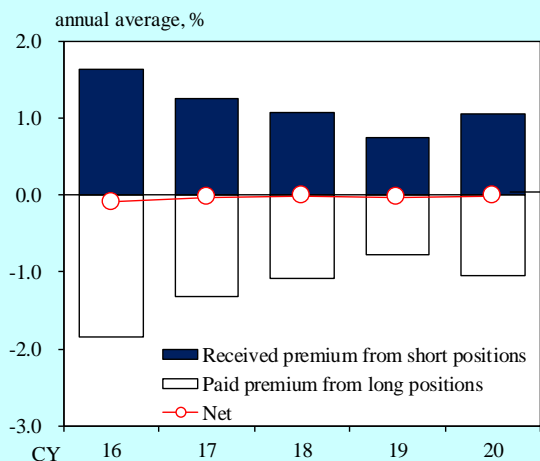
Note: Calculated from the USD/JPY (European) FX options whose settlement dates are from January 2016 to December 2020. The size of arrows represents transaction volume made by each counterparty. Net European option transaction volumes settled are written in brackets. Positive values mean net long. Negative values mean net short.

Source: OTC Derivative Transaction Data

Japanese non-financial corporations have large transaction volumes, and they have held almost the same sizes of long positions and short positions over the years. In general, Japanese non-financial corporations are said to use cross-currency forwards as the main hedging tools for FX risks in exports and imports. On the other hand, they use FX options as complementally tools because FX options are not guaranteed to protect them from large enough FX rate shifts. Thus, non-financial corporations combine long and short positions of call and put options to alleviate the paid premium from long positions with the received

premium from short positions in order to reduce expenses in overall transactions<sup>9</sup> (Chart 11). Recently, the share of less than 3 months has been decreasing among non-financial corporations, as well as in the overall market (Chart 12).

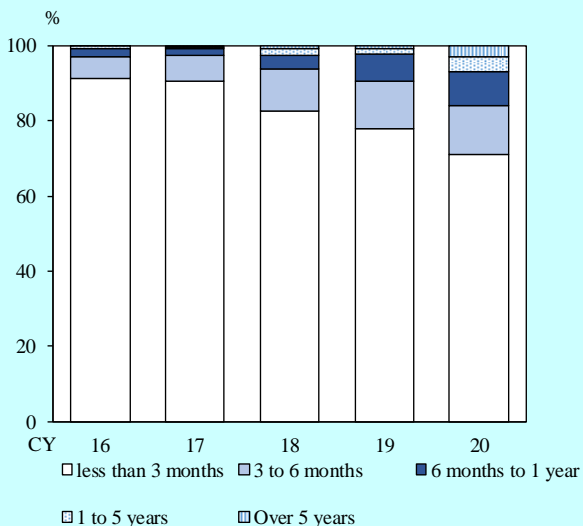
[Chart 11] Non-financial Corporations' Received and Paid Premium (Domestic Market)



Note: Premium/Transaction volume described in percentage. Calculated from the USD/JPY (European) FX options traded by non-financial corporations.

Source: OTC Derivative Transaction Data

[Chart 12] Share of Transactions by Maturity (Non-financial Corporations, Domestic Market)



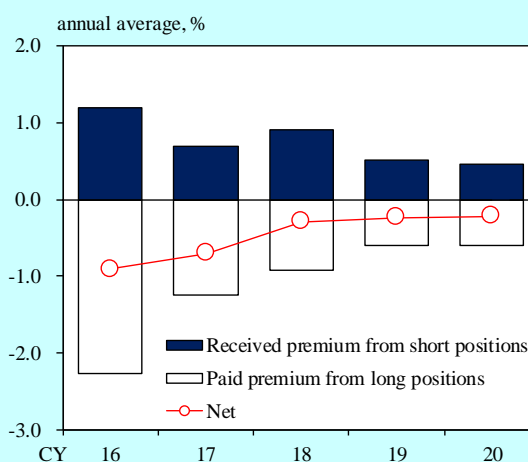
Note: Calculated from the USD/JPY (European) FX options traded by non-financial corporations.

Source: OTC Derivative Transaction Data

Japanese insurance companies have net long positions mainly because of put (sell USD and buy JPY) options whose counterparties are banks. In general, Japanese insurance companies are said to have a greater need to buy put options, whose values increase during the JPY appreciation against USD. This is because insurance companies are trying to hedge the

FX risks from their foreign currency denominated assets converted to JPY. In fact, their paid premiums to the counterparties in long positions slightly exceed the received premiums from the counterparties in short positions<sup>10</sup> (Chart 13). Nevertheless, while the price range of USD/JPY has recently been shrinking, the gap between the paid and received premiums has been diminishing. Meanwhile, although the less than 3 months share is smaller than its share in the overall transactions, it has been decreasing in the long run among insurance companies, as in the overall market (Chart 14).

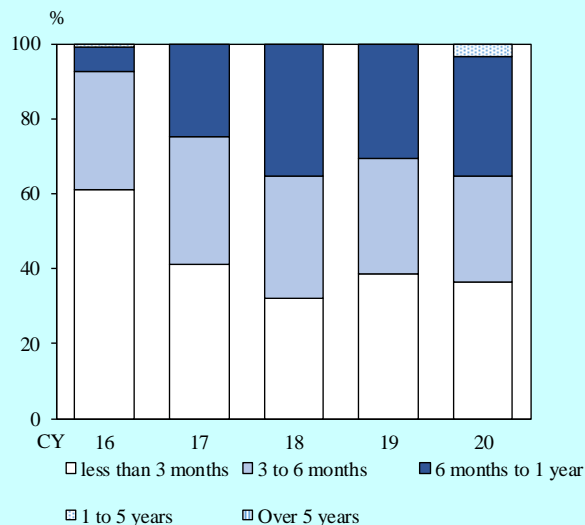
[Chart 13] Insurance Companies' Received and Paid Premium (Domestic Market)



Note: Premium/Transaction volume described in percentage. Calculated from the USD/JPY (European) FX options traded by insurance companies.

Source: OTC Derivative Transaction Data

[Chart 14] Share of Transactions by Maturity (Insurance Companies, Domestic Market)



Note: Calculated from USD/JPY (European) FX options traded by insurance companies.

Source: OTC Derivative Transaction Data

In order to assess how Japanese banks' positions have developed through their transactions with their customers such as non-financial corporations and insurance companies<sup>11</sup>, we analyze historical net positions held by all entities excluding banks (Chart 15). The net positions (red line in the chart) in 2016, when JPY appreciated significantly in the spot market, the customers held their net long (banks' net short) positions mainly using put options. After 2017, as the USD/JPY price range diminished, there were not any one-sided deviations in the net positions.

Breaking down the positions by customer type (bars in the chart), the banks' net short positions against insurance companies have decreased, which is consistent with as described in the previous section. Furthermore, the net long positions against "the others"<sup>12</sup> including asset management companies and hedge funds have been slightly expanding. This is consistent with the general view that asset management companies and hedge funds rely more on a strategy of receiving premiums from short positions, speculating a continuation of the low volatility of USD/JPY.

## Concluding Remarks

This report visualizes characteristics of the USD/JPY FX option market developments, including transaction volumes by option type, strike price, and transaction relationship among the major entities, which are hard to determine from the existing statistics.

\* Currently at the Personnel and Corporate Affairs Department.

<sup>1</sup> The BIS, in cooperation with the world's central banks, conducts the *Triennial Central Bank Survey of Foreign Exchange and Over-the-counter Derivatives Markets*. It collects data from major financial institutions around the world (called "reporting dealers") covering comprehensive topics consistent with international protocols.

Other transaction data covering the FX option market are available. For example, the Tokyo Foreign Exchange Market Committee releases its transactions survey results semi-annually and the BOJ also semi-annually releases outstanding data in its Regular Derivatives Market Statistics in Japan.

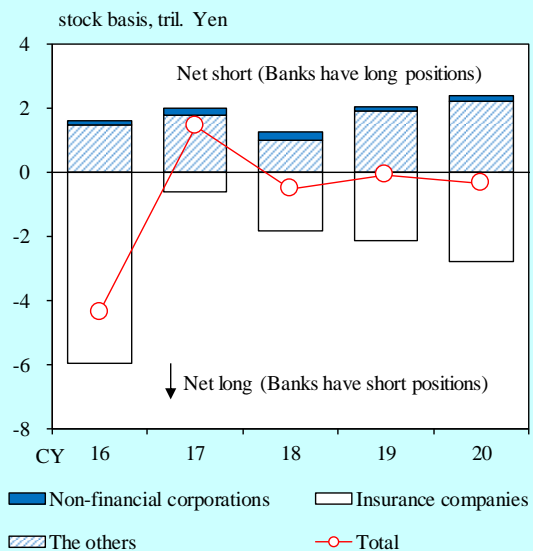
<sup>2</sup> Taking advantage of transaction-by-transaction data, this report mainly investigates FX option market developments with the OTC derivative transaction data. However, the investigations are partially done using the existing statistics.

<sup>3</sup> Some other investigations besides this report which use the OTC derivative transaction data are given below.

Washimi K. [2020] "Revisiting Determinants of Investor Sentiment in the FX Option Market by Machine Learning Approaches," Proceedings of 2020 IEEE Symposium Series on Computational Intelligence (SSCI).

Maruyama R. and Washimi K. [2021] "Cross-Currency Swap

[Chart 15] Net Positions of USD/JPY FX Options  
(Domestic Market)



Note: Annual average. Stock basis net position is calculated based on historical transaction volumes traded by each entity. The others incorporates asset management companies, hedge funds, etc.

Source: OTC Derivative Transaction Data

While the FX option transactions strongly reflect the FX spot market transactions, the FX option transactions also affect the FX spot market transactions and its volatility through banks' hedging. Therefore, it is important to continue to monitor market transactions very carefully by effectively using the OTC derivative transaction data.

Market through the Lens of OTC Derivatives Transaction Data: Impact of COVID-19 and Subsequent Recovery," Bank of Japan Review Series 2021-E-1.

Kawai D., Hasegawa M., and Yagi R. [2021] "An Analysis of the Transaction Network in the Japanese OTC Derivatives Markets," Financial Services Agency.

In addition, the BOJ has released the FSB repo transactions data (including cross-currency repo) since 2020. For instance, see the following.

Sasamoto K., Nakamura A., Fujii T., Semba T., Suzuki K., and Shinozaki K. [2020] "New Initiatives to Improve the Transparency of Securities Financing Markets in Japan: Publication of Statistics on Securities Financing Transactions in Japan," Bank of Japan Review Series 2020-E-1.

<sup>4</sup> It should be noted that the results could vary depending on the aggregation method or data cleansing. In regard to this point, this report aggregates the FX option transactions between two reporting entities twice in case some data are reported by both entities.

<sup>5</sup> The precise scope of the reporting entities is defined by Article 6 of the "Cabinet Office Ordinance on the regulation of Over-the-counter Derivatives Transactions." Specifically, the data cover the transactions where either or both of the parties are a



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Financial Instruments Business Operator that conducts Type I Financial Instruments Business, a bank, the Shoko Chukin Bank, Ltd., the Development Bank of Japan Inc., the federation of the Shinkin banks (the district of which is the entire nation), or the Norinchukin Bank or an insurance Bank.

<sup>6</sup> The paper below indicates the BOJ's Quantitative Qualitative Monetary Easing as one of the factors for the increase in trading volume in the 2013 survey.

BIS [2013] "The Anatomy of the Global FX Market through the Lens of the 2013 Triennial Survey," BIS Quarterly Review.

<sup>7</sup> One of the complex options is the "barrier option," whose value depends on the underlying asset price path from the settlement date to the expiration date. Knock-out options (options that automatically expire when the underlying asset price reaches a specific price) and knock-in options (options that automatically come into effect when the underlying asset price reaches a specific price) are typical examples of barrier options.

<sup>8</sup> In Chart 10, foreign banks have sold options (net short). However, given that foreign banks basically intermediate the market and the OTC derivative transaction data do not cover the transactions among the same financial group, foreign banks would have offset their FX risk exposure from their net positions in Japan to more neutral ones by adjusting them in the foreign FX option market or the USD/JPY spot market.

<sup>9</sup> Through a detailed observation of the OTC derivative transaction data, we can confirm that non-financial corporations have mainly made "transactions combining long positions of call options and short positions of put options" or "transactions combining short positions of put options and long positions of call positions." These transaction types are called "the risk reversal strategy." This strategy allows hedging risks in large-scale changes of exchange rates together with reducing expenses in overall transactions.

For instance, "transactions combining long positions of put options and short positions of call options" allow hedging the risks in large-scale JPY appreciations together with reducing expenses in overall transactions. We can confirm that non-financial corporations utilize this strategy from our detailed observation of the OTC derivative transaction data.

<sup>10</sup> We can confirm that insurance companies have not only made long positions mainly comprising put options, but also some "transactions combining long positions of put options and short positions of call options" like non-financial corporations through a detailed observation of the OTC derivative transaction data. The latter transactions contribute to constructing the short positions of insurance companies.

<sup>11</sup> In general, banks adjust their FX risks from the FX option transactions with their customers by covering the transactions in the FX option market and hedging through transactions in the FX spot market. Through these banks' transactions, the FX option transactions may also affect the FX spot market.

Considering this mechanism, the facts seen in Chart 15 that banks recently have not had one-sided net short positions and that short positions have generally shrunk over the recent years imply that the FX option transactions may have contributed to the decrease in the volatility of the USD/JPY spot rate.

<sup>12</sup> Because "the others" cannot be divided into more detailed entity types (e.g., asset management companies and hedge funds) in the OTC derivative transaction data, "the others" aggregates transaction data excluding banks, non-financial corporations, and insurance company transactions. Additionally, we have to be aware that "the others" includes some transactions whose counterparty information is ambiguous.

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