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The Japanese Yen Interest Rate Swap Market Observed from OTC Derivative Transaction Data: the Impact of COVID-19

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Interest rate swaps are a type of transactions in which different types of interest payments are exchanged between two parties. They are actively used for a wide range of purposes such as hedges against interest rate risks and alternative investment vehicles to bonds. This report uses granular data of transactions in the Japanese yen interest rate swap market collected in Japan to review the developments in the market with a focus on transactions by sector of market participants. The analysis reveals transaction relationships between different sectors of market participants as well as the size and trends of net positions of new transactions that reflect their motivation for trading. The results suggest that there were significant changes in the market structure when international financial markets were significantly destabilized due to the COVID-19 pandemic in March 2020, as seen by, for example, the net positions of some sectors reversing from the average market structure.

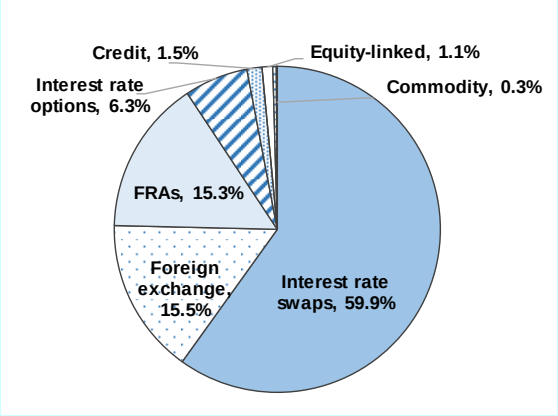
Introduction

Interest rate swaps (IRSs) are a type of contracts in which two parties exchange different types of interest payments such as fixed and floating interest rates. IRSs are actively traded by not only financial institutions but also non-financial corporations. Among over-the-counter (OTC) derivative transactions, the share of the IRSs is the largest in terms of the transaction volume (Chart 1).

IRSs are actively used for a wide range of purposes such as hedges against interest rate risks and alternative investment vehicles to bonds. Given their close links with other interest rate markets, including those of government bonds and corporate bonds, and money markets, developments in IRS markets provide beneficial information for understanding market participants' outlook on interest rates.

This report provides an overview of the Japanese yen (JPY) IRS market using granular data collected in Japan that record detailed information on OTC derivative transactions (hereafter the OTC derivative transaction data), with a focus on the transaction behavior by sector of market participants, which could not be captured with existing data. Moreover, this report reviews the initial impact of the COVID-19 pandemic on the market and developments in the market in Japan thereafter.

[Chart 1] Decomposition of OTC derivative transaction volume



Note: Figures represent the share of derivatives outstanding measured by notional amount as at end-June 2020.
Source: Calculated by authors based on the Regular Derivatives Market Statistics.

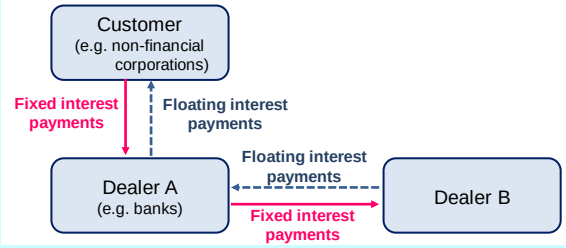
Overview of Interest Rate Swaps

An IRS transaction is, in general, an exchange of different types of interest payments, such as fixed and floating interest rates, between two parties over a period of time set in a contract. Typically, non-financial corporations use IRSs to hedge risks of an increase in interest payments for debts based on floating rates in case of a rise in those rates. Future interest payments can be fixed by entering into "payer swaps" -- in which the non-financial corporations pay fixed interest payments to dealers including banks and receive floating interest payments from them. From the dealers' perspective, they are "receiver swaps" -- in which they receive fixed interest payments from the non-financial

corporations and pay floating interest payments to them -- and they must accept the risks of a rise in interest rates.

In IRSs, dealers act as market makers who passively provide their customers -- including non-financial corporations, institutional investors, and banks -- with opportunities for both payer and receiver swaps. Dealers usually adjust their positions and hedge interest rate risks by making transactions with other dealers, in the direction opposite to that of the transactions made with their customers (Chart 2).[1]

[Chart 2] Illustration of an IRS



OTC Derivative Transaction Data

The OTC derivative transaction data used in this report are transaction-by-transaction data based on reports from the trade repository and financial institutions in Japan.[2] The data record detailed information on each transaction such as the notional amount, names of the two parties involved, types of reference rates, and residual maturity.[3] These data enable analyses of transaction details by breaking down the transactions by attributes of the parties that include which sectors the market participants belong to. Moreover, it is possible to carry out such analyses on a daily or monthly basis.[4,5]

The data cover transactions where at least one of the parties is a Japanese financial institution or a foreign financial institution operating in Japan (hereafter the "reporting financial institutions"). That is, they contain transactions between two reporting financial institutions as well as those between a reporting financial institution and a non-reporting financial institution such as a non-financial corporation, individual investor, or financial institution based in a foreign country.[6] By examining the latter type of transactions, it is possible to grasp transaction behaviors of Japanese non-financial corporations, or a portion of those of foreign investors. Nevertheless, it should be noted that the data do not cover transactions between two non-reporting financial institutions, nor do they cover intra-group transactions (e.g., transactions that involve the headquarters of a reporting financial institution and one of its foreign branches). Hence, the data do not enable grasping global transactions of the JPY IRS market comprehensively.

It should also be noted that, in Japan, IRS transactions between major financial institutions are centrally cleared at the clearing house.[7] Therefore, a transaction between two parties originally counted as one before clearing is often recorded as two separate transactions between the clearing house and each of the two parties involved in the original transaction. In the analysis in this report, original transactions before being cleared at the clearing house are estimated from the available data, using information on the transaction date and other terms and conditions, so that the market structure can be ascertained in detail.[8]

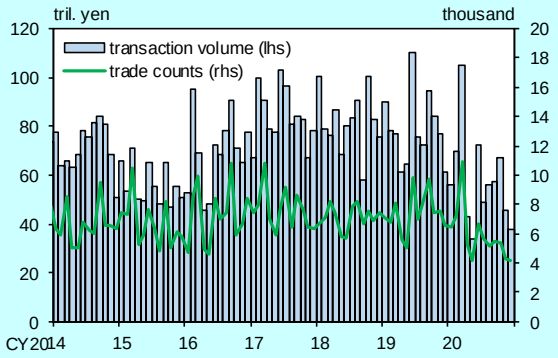
Trends in the JPY IRS Market in Japan Observed from Granular Data

Turnover

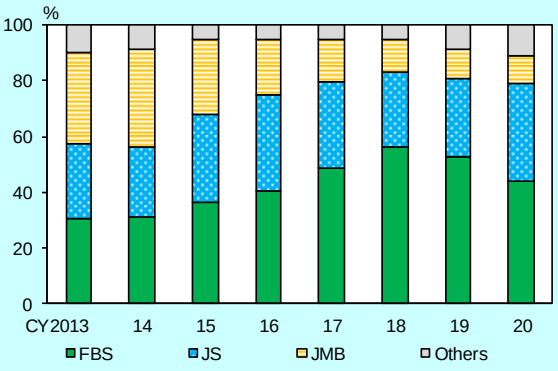
In recent years, the volume (notional amount) of new monthly transactions conducted by reporting financial institutions has been around 50-100 trillion yen and the number of transactions has been around 5-10 thousand (Chart 3). By sector of market participants, around 90

[Chart 3] Turnover of JPY IRSs

Monthly transaction volume and trade counts



Composition of turnover by sector of market participants



Note: FBS, JS, and JMB represent foreign banks and securities companies, Japanese securities companies, and Japanese major banks, respectively. The same applies hereafter.

Source: The OTC derivative transaction data.

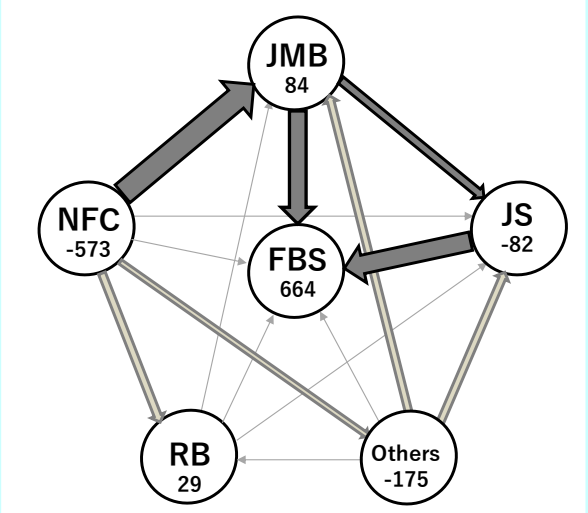
percent of all the transactions in 2020 were conducted by dealers including foreign banks and securities companies, Japanese securities companies, and Japanese major banks.[9] Their large market share reflects the fact that they conduct a large amount of both the payer and receiver swaps as market makers.

Net positions

To construct an overview of transaction relationships between participants in the IRS markets, net positions can be utilized -- they are calculated by subtracting the volume of new payer swaps from that of new receiver swaps of each entity or sector of market participants.[10] In general, an entity realizes gains or losses in its receiver swaps when interest rates decline or rise, and vice versa in the case of payer swaps. Therefore, the entity's net position is likely to reflect its outlook on interest rates or its motivation for hedging risks of a rise or decline in interest rates. The OTC derivative transaction data enable the identification of the party on the payer side or the receiver side in each IRS transaction, thereby making analyses of the net positions possible.[11]

Chart 4 outlines the network structure of trading positions between different sectors of market participants of the JPY IRS market in Japan. It is based on the average net positions up to end-2019 in order to draw a comparison with developments in the market during the COVID-19 pandemic in 2020.[12] Until the end of 2019, non-financial corporations were the largest net payers of fixed interest payments (about 570 billion yen per month) and foreign banks and securities companies were the largest net receivers (about 660 billion yen per month). The needs of non-financial corporations, to conduct payer swaps and to hedge risks of a rise in interest rates, are fulfilled by foreign banks and securities companies in the market as a whole. The bilateral relationships between different sectors of market participants indicated by arrows in Chart 4 illustrate this process in detail, namely that non-financial corporations' needs to conduct payer swaps are fulfilled by Japanese major banks first, then transferred to foreign banks and securities companies directly or via Japanese securities companies. As mentioned above, it is considered that foreign banks and securities companies adjust their positions, thereby transferring the interest rate risks that they take on to foreign investors through transactions between non-reporting financial institutions, for example, foreign financial institutions, so these transactions cannot be captured in the data.

[Chart 4] Transaction network between different sectors of market participants



Notes: 1. Figures indicate the averages of net positions -- calculated by subtracting the monthly volume of new payer swaps from that of the new receiver swaps -- for each sector of market participants from April 2013 to December 2019, in billion yen. Arrows represent the transfer of risks of a rise in interest rates between different sectors of market participants, from net payers to net receivers of JPY IRSs.

2. NFC and RB represent non-financial corporations and regional banks, respectively. Regional banks include the Shoko Chukin Bank and *Shinkin* banks. The same applies hereafter.

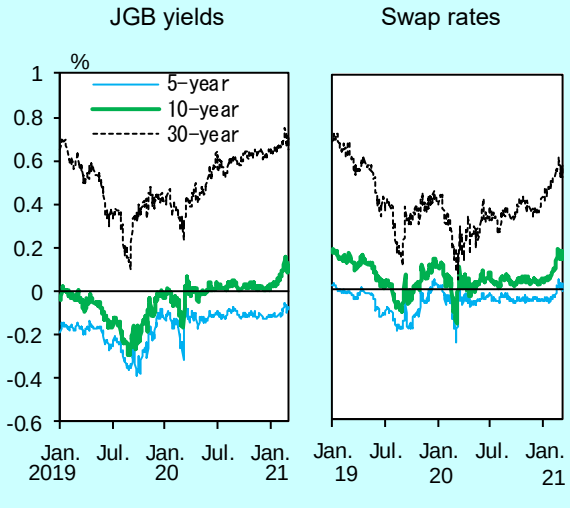
Source: The OTC derivative transaction data.

Developments in the JPY IRS Market in Japan during the COVID-19 Pandemic

JPY IRS Market in March 2020

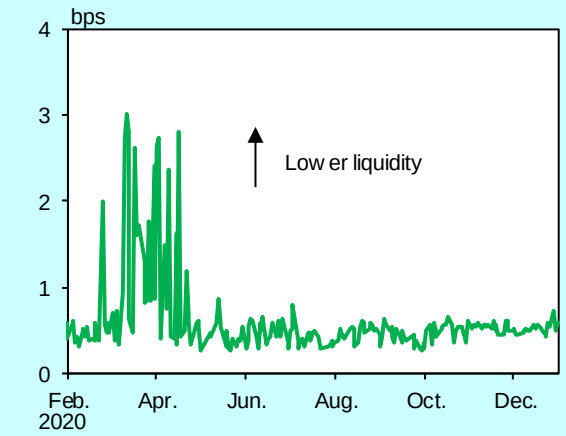
In March 2020, international financial markets were destabilized due to the impact of the COVID-19 pandemic. The market liquidity and functioning of the JPY IRS market in Japan deteriorated as seen in the large fluctuations in swap rates, in a manner similar to that of Japanese government bond (JGB) yields (Chart 5) and the widening of the bid-ask spread during the same period (Chart 6). The results of a survey of global market participants including Japanese financial institutions

[Chart 5] JGB yields and swap rates



Source: Bloomberg.

[Chart 6] Bid-ask spread



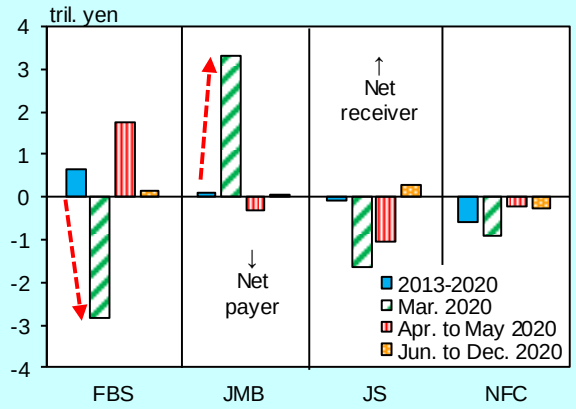
Note: The bid-ask spread of 10-year JPY IRSs based on 6-month yen LIBOR.

Source: Bloomberg.

showed that (1) the overall market's needs were lopsided on the unwinding of receiver swaps and (2) the volatility had heightened during this period, leading to the lowering of the market liquidity.[13]

Turning to the actual net positions of each sector of market participants in March 2020, calculated using the OTC derivative transaction data, foreign banks and securities companies were net fixed interest payers, totally opposite to the average market structure up to end-2019, as outlined in the previous section (Chart 7). The significant difference in the net positions of foreign banks and securities companies, compared to normal times, seems to have reflected the rapid unwinding of IRS positions by their customers, including foreign investors. It is suggested that their customers had to reduce the interest rate risks on their portfolios due to a decline in their risk tolerance and an increase in the redemption of their investment trusts. Meanwhile, Japanese major banks increased their receiver positions, suggesting that they have possibly taken on the risks of a rise in interest rates transferred from foreign banks and securities companies.

[Chart 7] Net positions by sector of market participants during the COVID-19 pandemic



Note: The data represent monthly averages of net positions of each sector of market participants in each period.

Source: The OTC derivative transaction data.

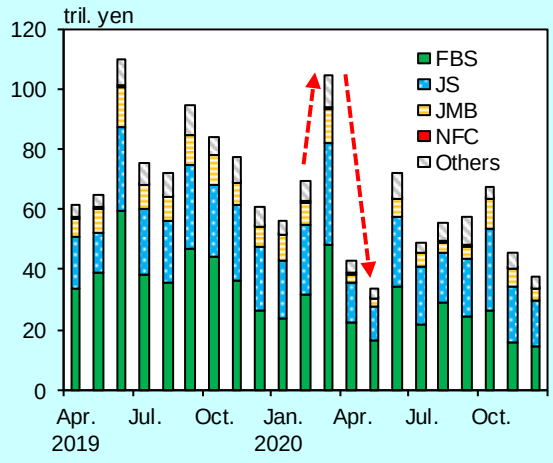
It has been pointed out that, in the cash JGB and JGB futures markets, foreign investors also unwound their long positions abruptly and that Japanese banks and institutional investors bought on reaction.[14] The developments in the JPY IRS market in Japan in this period, as described above, were consistent with those in other interest rate markets.

Developments since April 2020

The turnovers in April and May 2020 significantly decreased, to levels around 60 percent of those in the previous year, offsetting the rapid increase in March (Chart 8). Several factors have been pointed out to which this can be attributed, such as constraints on the conduct of transactions caused by the increase in working from home under the state of emergency and reduced trading capacities of some market participants due to the increase in margins at the clearing house reflecting the increased volatility in March (Chart 9). Meanwhile, the bid-ask spread remained wide and the market liquidity seemed to have remained low (Chart 6).

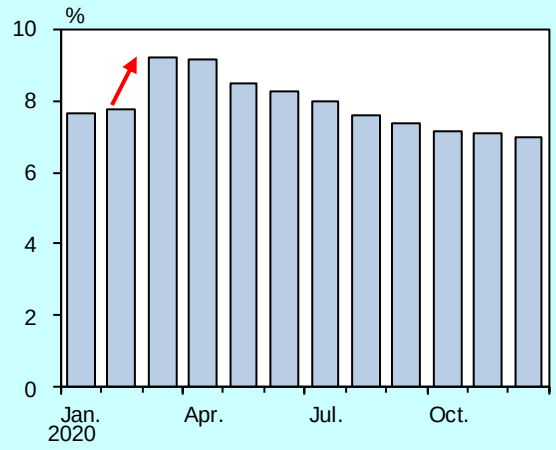
In contrast, the net positions of each sector of market participants -- calculated using the OTC derivative transaction data -- indicated that foreign banks and securities companies had become net receivers again and thus the unwinding of positions by foreign investors observed in March had come to a halt (Chart 7). The net positions have been recovering to their average levels before the pandemic and the bid-ask spread has been on a narrowing trend since June, suggesting that the

[Chart 8] Turnover during the COVID-19 pandemic



Source: The OTC derivative transaction data.

[Chart 9] Margins at the clearing house



Note: The data represent the shares of initial margins to the notional amount of standard 30-year JPY IRS transactions.

Source: Calculated by the authors based on data published by the Japan Securities Clearing Corporation.

JPY IRS market has been regaining stability in line with the recovery in the functioning of international financial markets (Charts 6 and 7).

Concluding Remarks

This report reviews the developments in the JPY IRS market in Japan including transactions by sector of market participants, which existing data cannot capture. The benefits of granular data are made clear once again in grasping developments in financial markets, as seen in the analysis that reveals the changes in trading behaviors of market participants of various sectors since the market turmoil in March 2020.

It would be possible to analyze and assess actual market developments more precisely by continuing to accumulate granular data, together with further improving the data cleansing and utilization methods. Moreover, publishing outcomes of analysis and assessment using granular data would also contribute to improving market transparency. For this purpose, the Bank of Japan (BOJ) established the Financial Market Data Planning Group in its Financial Markets Department in March 2018 and the group has been actively engaged in strict data management and transaction-level data analysis with the aim of grasping market liquidity and functioning. In addition to those of JPY IRSs in Japan shown in this report, the BOJ has released analyses of foreign exchange options and cross-currency swaps markets that utilized the OTC derivative transaction data. It is important to advance the practice of utilizing granular data and to make continuous efforts to grasp the actual market developments in further detail.[15]

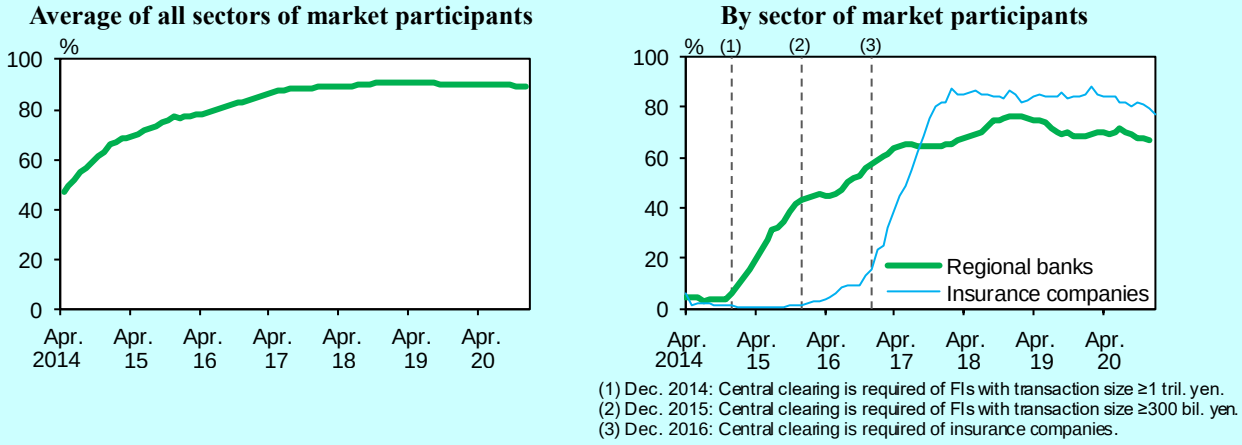
BOX: Characteristics of the JPY IRS market in Japan observed from the OTC derivative transaction data

The OTC derivative transaction data record detailed information on each transaction such as entity names of the parties involved as well as terms and conditions. Therefore, the data may be utilized to grasp the market structure in various aspects, in addition to transaction details by sector of market participants shown in the report.

Centrally cleared transactions

The share of centrally cleared transactions in the total transactions in the JPY IRS market in Japan has been around 90 percent since 2017, up from the level in 2014, which was about 60 to 70 percent. By sector of market participants, meanwhile, the share based on transactions conducted by regional banks and insurance companies has significantly increased. This likely reflects the amendments to the regulations on OTC derivatives that made central clearing a legal obligation. Specifically, transactions conducted by financial institutions with an average amount outstanding of transactions over 1 trillion yen, including regional banks, and transactions conducted by all insurance companies became subject to central clearing from December 2014 and from December 2016, respectively (for the former, the threshold was lowered to 300 billion yen in December 2015).

Share of central clearing



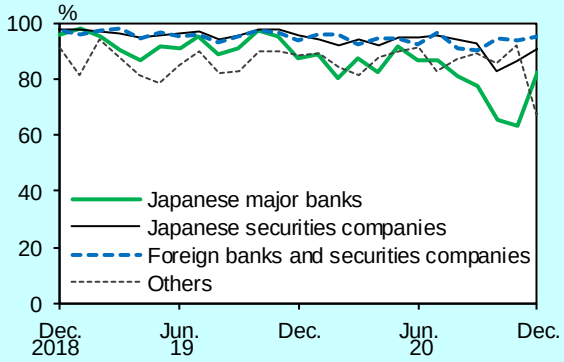
(1) Dec. 2014: Central clearing is required of FIs with transaction size ≥1 tril. yen.
(2) Dec. 2015: Central clearing is required of FIs with transaction size ≥300 bil. yen.
(3) Dec. 2016: Central clearing is required of insurance companies.

Notes: 1. Data indicate 12-month backward moving averages of the share of centrally cleared transactions among all new transactions on a monthly basis.
2. In the right chart, FIs stands for financial institutions.
Source: The OTC derivative transaction data.

Transaction volume by type of reference rates

The publication of LIBOR will be ceased at the end of 2021 except for those of certain U.S. dollar LIBOR tenor settings. In this regard, interest rates referenced in the JPY IRS market should be shifted to other interest rate benchmarks by the end of 2021. It is possible to grasp the transition by each sector of market participants by monitoring the changes in the shares of LIBOR-referencing transactions calculated from the transaction data of the OTC derivatives.

Shares of LIBOR-referencing transactions



Source: The OTC derivative transaction data.

[*] Currently at the Personnel and Corporate Affairs Department
[**] Currently at the International Department

[1] Dealers manage interest rate risks of their entire portfolios by not only conducting IRSs opposite to those conducted for their customers, but also handling other products such as cash JGBs and JGB futures.

[2] In Japan, DTCC Data Repository (Japan) KK operates as the trade repository.

[3] Data on OTC derivative transactions are collected as part of efforts to improve transparency in OTC derivative markets in response to the Global Financial Crisis in the late 2000s. In Japan, data are collected by the Financial Services Agency and shared with the Bank of Japan.

[4] Trends in the JPY IRS market can be captured by the following statistics: (1) Regular Derivatives Market Statistics in Japan, (2) Central Bank Survey of Foreign Exchange and Derivatives Market Activity in Japan -- both of which are released by the Bank of Japan, (3) Statistics for Interest Rate Swap by the Japan Securities Clearing Corporation (JSCC), and (4) "*Tentō Deribatibu Torihiki Jōhō* (Figures aggregating the OTC derivative transactions, available only in Japanese)" by the Financial Services Agency. Data used in this report are advantageous among these statistics in terms of the granularity of the information; however, the statistics listed above should be referred to in accordance with the objectives of analyses, as there are pros and cons in each of them in terms of, for example, the length of the time-series data or international comparability.

[5] Enormous costs required in data cleansing are recognized as an issue concerning the use of OTC derivative transaction data. The following three procedures were used as means of data cleansing prior to the analyses made in the report.

(1) Unification of entity names
Entity names are unified to eliminate the variation in form of name found in the data, which include various representations in natural languages (e.g., "AA Bank," "AA BK," and "*Ei ei ginkō* [in Japanese]") in addition to differences in identification codes such as the Business Identifier Code (BIC) and the Legal Entity Identifier (LEI) code. Entity names indicated using the codes were replaced with corresponding English terms and transformed into numerical vectors, together other terms originally representing them in natural languages in the data. The names were then clustered based on cosine similarity between them and unified to one term for each entity.

(2) Labeling the sectors of market participants
Each entity is categorized into several groups according to the objective of analyses.

(3) Elimination of double counting
Double-counted transaction volume and trade count, due to both of the counterparties of the transaction being reporting financial institutions, are eliminated.

[6] The definition of reporting entities is provided by Article 6 of the "Cabinet Office Ordinance on the Regulation of Over-the-Counter Derivatives Transactions." Specifically, a reporting entity is either a Financial Instruments Business Operator that conducts Type I Financial Instruments Business, a bank that constitutes a Registered Financial Institution, The Shoko Chukin Bank, Ltd., the Development Bank of Japan Inc., Shinkin Central Bank, the Norinchukin Bank, or an insurance company.

[7] The JSCC operates as the central counterparty for JPY IRS transactions in Japan.

[8] Original contracts before being centrally cleared were estimated from the data by comparing contracts in which fixed interest payers were the clearing house with those in which fixed interest receivers were the clearing house. We matched the contracts that were identical in terms of the reporting date and other information determining the characteristics of the contracts such as the contract date, the start and end dates of the transaction, the swap rate, the notional amount, and the type of reference rate. When more than three identical contracts were found, those with closer numbers specific to each transaction in the data were matched.

[9] It has been pointed out that the increase in turnover since 2016 reflects the increase in dealers' usage of *compression* and automatic trading via the Swap Execution Facility (SEF) after the usage of electronic trading platforms became obligatory. Compression is a mechanism for compressing the outstanding of centrally cleared IRS transactions by canceling a number of payer and receiver positions that offset each other and substituting the remainder with new contracts that are smaller in notional amounts. This reduces the amount outstanding of IRSs held by financial institutions, which is limited by regulations on leverage ratios, thus increasing their trading capacity and allowing additional new transactions.

[10] The net positions shown in this report are aggregated figures of all the terms. It would, however, be beneficial to use indicators of the amount of interest rate risks such as DV01 (the price change that occurs when the interest rate changes 1 basis point) when gauging the extent of the risk hedges carried out by each market participant. It should be noted that the payer-receiver relationships shown in this report are not different from those obtained by an alternative analysis which was calculated with the net positions based on the notional amounts adjusted by the terms of transactions (e.g., the notional amount of 10-year contracts are deemed to be 10 times larger than that of 1-year contracts), regardless of the period of the analysis, before or after the outbreak of the COVID-19 pandemic.

[11] The following article analyzes the trading relationships between different types of market participants in the IRS market in the United States using net positions.
Baker, L., R. Haynes, J. Roberts, R. Sharma, and B. Tuckman (2021). "Risk Transfer with Interest Rate Swaps." *Financial Markets, Institutions & Instruments*, 30 (1): 3–28.

[12] Chart 4 illustrating the transaction network is based on the estimated original contracts before the central clearing at the JSCC with a view to focusing on the trading relationships between entities that originally made IRS contracts. Therefore, the relationships shown in the network differ from the actual exposures between different types of market participants.

[13] For details, see the following survey of dealers in the global IRS market including Japanese dealers.
Greenwich and ISDA (2020), "The Impact of COVID-19 and Government Intervention on Swaps Market Liquidity."

[14] For details, see the following report. Okamoto, T. (2020), "Disruption in the U.S. Treasury Market and Its Effects on the Japanese Government Bond Market: Spread of COVID-19 and Financial Markets (1)," Bank of Japan Review Series, no. 20-J-9 (available only in Japanese).

[15] A special page for the analyses of the OTC derivative transaction data will be set up on the Bank of Japan's website in the near future. On the page, the outcomes of the analyses including published papers will be made available.

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