

## Recent Development of the OIS (Overnight Index Swap) Market in Japan

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As short-term interest rates have become higher and more volatile since the end of the quantitative easing policy in March 2006, an interest rate swap, referred to as an OIS (Overnight Index Swap), which exchanges the uncollateralized overnight call rate over a specified period and a certain fixed interest rate, has begun to be traded actively. The use of the OIS enables financial institutions to conduct more finely-tuned risk management than other conventional hedging tools. The OIS also provides an effective way to monitor market perceptions about the Bank of Japan's monetary policy. For the time being, participants in the Japanese OIS market are almost entirely limited to overseas financial institutions. With growth in needs to hedge interest rate risks and to conduct arbitrage transactions, an increasing number of financial institutions are likely to enter the market, thus making the market more liquid.

### Introduction: Developments in the money markets after the end of the quantitative easing policy

In March 2006, the Bank of Japan (BOJ) decided to change the operating target of money market operations from the outstanding balance of current accounts at the BOJ to the uncollateralized overnight (O/N) call rate, and to encourage the rate to remain at effectively zero percent (end of the quantitative easing policy, QEP, hereafter). Then in July, the BOJ raised the target level of the uncollateralized O/N call rate to around 0.25%. In the meantime, as the outstanding balance of current accounts decreased, the rates for overnight loans,<sup>1</sup> including the uncollateralized O/N call rates and repo rates (spot next, S/N) began to edge up from May onwards.

Short-term interest rates<sup>2</sup>, which remained at very low levels under the QEP, also showed a gradual rise<sup>3</sup> mainly reflecting market participants' growing expectations of a rise in the policy target rate amid the improved outlook for business conditions and prices in Japan. Recently, market participants have been quite conscious about volatility of short-term interest rates, such as the one-month and three-month rates.

Under these circumstances, an interest rate swap referred to as an OIS (Overnight Index Swap<sup>4</sup>), which exchanges the uncollateralized overnight call rate over a specified period and a certain fixed interest rate, has begun to be traded actively.

This *Review* briefly surveys the recent development of the Japanese OIS market as one of the visible changes in the money markets after the end of the QEP. Particular attention is paid to the background of the recent increases in the OIS transactions in Japan, market participants' motives for such transactions, monitoring of market

expectations using the OIS interest rates, and some issues pertaining to further development of the market.

### Increasing hedging demands against short-term interest rate risks

In the yen-denominated interest rate markets, financial derivatives, such as euro-yen futures (whose underlying asset is the three-month euro-yen TIBOR<sup>5</sup>), interest rate swaps (whose typical underlying asset is the six-month LIBOR<sup>6</sup>), and JGB futures,<sup>7</sup> have been utilized for hedging against interest rate risks and for constructing arbitrage positions between short-term and medium-/long-term interest rates.

After the end of the QEP, the OIS transactions, which are interest rate swaps for trading the difference in interest rates between overnight loans and short-term instruments, have been growing. This reflects the growing hedging demands of financial institutions due to higher levels and volatility of short-term interest rates.

### What is an OIS?

An OIS is an interest rate agreement that involves the exchange of the overnight rate compounded over a specified term and a fixed interest rate. Typical terms of the OIS are from several weeks up to about two years. In the Japanese OIS market, the weighted average uncollateralized O/N call rate released by the BOJ on a daily basis is traded as a floating interest rate in the OTC (Over the Counter) market. This is the first full-fledged financial derivatives for overnight rates in Japan.

Turning to overseas markets, financial derivatives for overnight rates have been actively traded in the OTC markets or on exchanges. Banks, securities firms, hedge-funds, and other financial institutions actively trade such

derivatives for hedging and conducting arbitrage transactions. As a result, the markets are highly liquid and have been recognized as principal ones in the money markets (BOX).

From the standpoint of monetary policy implemented by the central banks in the euro area and the United States (ECB, FRB)<sup>8</sup>, these derivatives provide an effective way to monitor market perceptions about their monetary policy stance, since they trade overnight rates (EONIA<sup>9</sup> for the euro area, FF rate<sup>10</sup> for the United States), which are either policy target rate itself or closely related to the target rate. The ECB and FRB therefore have a keen interest in the developments in these derivatives markets (to be discussed later).

## Recent development of the Japanese OIS market

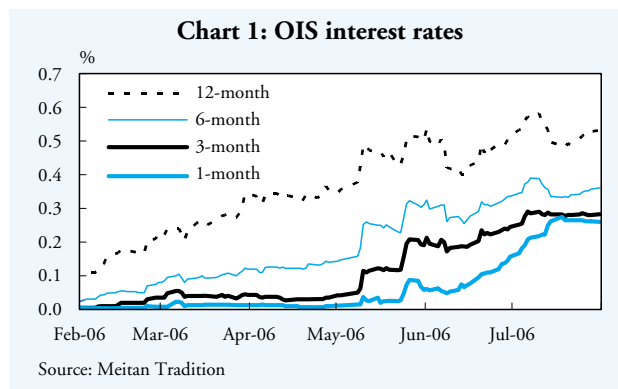
### Transaction volume has remained low since the establishment of the market in mid-1997

In Japan, the OIS market was launched in mid-1997, but it was not until quite recently that it started to grow. The main reasons for this delayed growth are as follows: 1) Overnight interest rates remained at effectively zero percent during the period from the introduction of the zero interest rate policy (February 1999) through the end of the QEP (March 2006), except for certain periods. 2) Under these circumstances, short-term interest rates also

remained at extremely low levels. These market conditions discouraged financial institutions from entering the market. It is because they did not need to hedge against short-term interest rate risks, nor did they find profitable arbitrage opportunities.

### Transaction volume began to grow as market participants began to anticipate the end of the QEP

The OIS transaction volume began to grow as market participants began to anticipate the end of the QEP. Active OIS transactions reflect market participants' expectations of the timing and pace of the future rises in the policy target rate following the end of the QEP. Factoring in these expectations, the level and volatility of the OIS interest rates rose gradually (Chart 1).



### [BOX] Derivatives markets for overnight rates in the United States and the euro area

Regarding derivatives markets for overnight rates, the dominant instrument in the United States is the 30 day Fed Funds Futures listed on the CBOT (FF futures, hereafter). In the euro area, in contrast, the EONIA swap, which is the OIS transactions in the OTC market is dominant (BOX Chart 1).

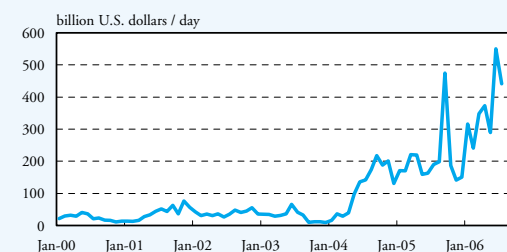
**BOX Chart1: FF futures and EONIA swaps**

	United States	euro area
Name	30 Day Fed Funds Futures (FF Futures)	EONIA swaps
Main instruments	Chicago Board of Trades (CBOT)	OTC
Underlying assets	FF rate	EONIA
Major transaction specs	The average of daily FF rates for each delivery month is exchanged for a fixed rate. Transactions usually concentrate on the products whose contract months are one to three months ahead.	The compound interest rate of EONIA for a specified term is exchanged for a fixed rate. The main terms of transactions are one month to one year.

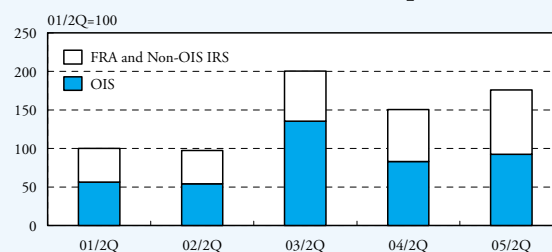
Notes: OIS is also traded in the U.S. OTC market, though the transaction volume is smaller than that of EONIA swaps. In the euro area, EONIA futures, which are similar to FF futures, are listed on Eurex and Euronext.liffe, but transaction volume is negligible.

Transaction volume of FF futures has been increasing and currently amounts to 30-50 trillion yen per day (BOX Chart 2). While no official data is available for the EONIA swap, it can be inferred from the following that transaction volume may reach 20 trillion yen per day. 1) ECB surveys suggest that the OIS transactions account for 50% in the euro OTC IRS/FRA markets (BOX Chart 3) and 2) the total transaction volume in the euro IRS/FRA markets reached 400 billion U.S. dollars per day in April 2004 (BIS "Triennial Central Bank Survey 2004"). Thus, these markets are much larger than the Japanese OIS market, whose transactions amounted to about 1 trillion yen per day at the historical peak in July 2006.

**BOX Chart 2: Transactions of FF futures**



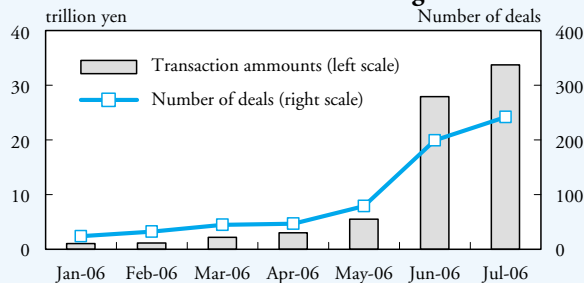
**BOX Chart 3: Trend in EONIA swap transactions**



Transaction volume and the number of transactions both increased with the rise in the OIS interest rates (Chart 2). In particular, the one-month OIS interest rate rose substantially and the transaction volume increased rapidly in June and the first half of July, as market participants were almost certain that the BOJ would decide to raise the policy target rate at its Monetary Policy Meeting of July 14. The transaction volume of all yen-denominated interest rate swaps<sup>11</sup> through brokers<sup>12</sup> (Chart 3) shows that in June and July, the OIS transaction volume exceeded that of all non-OIS interest rate swaps (IRS) with terms of less than one year.

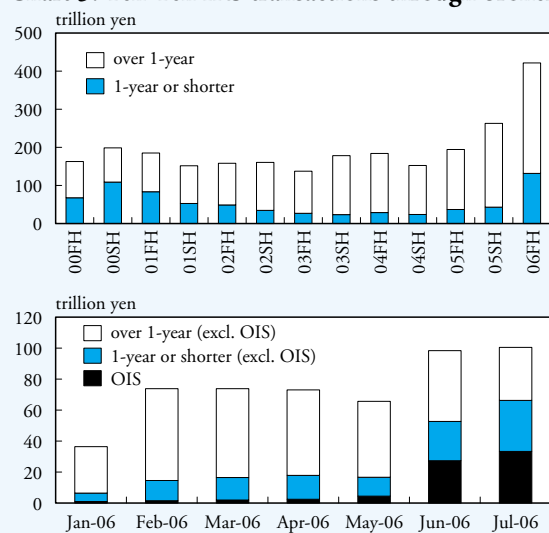
The OIS transaction volume by term (Chart 4) shows that very short-term transactions with one- to three-month terms were highly active in June and July, as compared to March. This indicates that market participants' active OIS transactions were motivated by the expected rise in the policy target rate in July.

**Chart 2: OIS transactions through brokers**



Source: Money Brokers Association, Tokyo

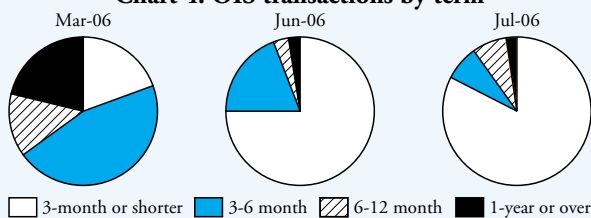
**Chart 3: Yen-Yen IRS transactions through brokers**



Notes: 1. The upper chart shows the yen-yen IRS transactions in each half year.  
2. OIS transaction volume in the lower chart is sums of 1-year or shorter and over 1-year.

Sources: Money Brokers Association, Tokyo; Bank of Japan

**Chart 4: OIS transactions by term**



Source: Money Brokers Association, Tokyo

## A handful of financial institutions have participated in the market so far

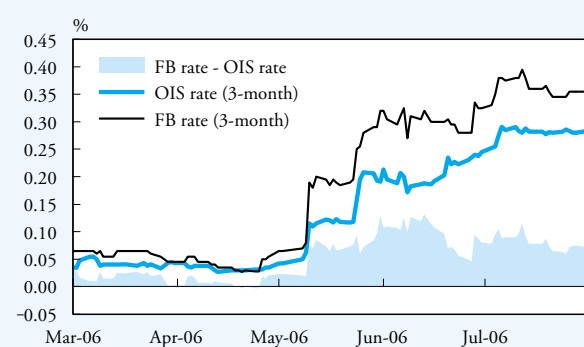
For the time being, market participants are almost entirely limited to a small group of overseas financial institutions. In particular, some European financial institutions, which have accumulated the know-how and infrastructure for the OIS transactions from their trading experiences in the euro OTC markets (EONIA swap market, for instance), seem to serve as primary market makers<sup>13</sup> in the Japanese OIS market. Some U.S. financial institutions have started to enter the market since mid-May when the short-term interest rates edged up. However, Japanese financial institutions such as major banks have not participated in the market so far.

## Examples of trading observed in the Japanese OIS market

These overseas financial institutions are mainly utilizing the OIS for two purposes: to earn profits from arbitrage transactions with other markets by taking advantage of the rise in the short-term interest rates, and to hedge against short-term interest rate risks.

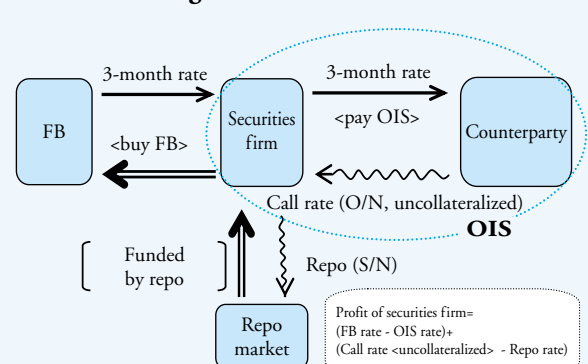
Specifically, the three-month FB rate went up after mid-May reflecting heightened expectations of rising funding costs in the near future. Taking advantage of this opportunity, some overseas financial institutions became active in constructing arbitrage positions in which they pay the OIS (fixed) interest rate and receive the three-month FB rate they purchased. They profited from the difference between these two rates, and also hedged their interest rate risks (Charts 5, 6).

**Chart 5: FB and OIS rates**



Sources: Meitan Tradition, Bank of Japan

**Chart 6: Arbitrage transactions between FB and OIS**



Furthermore, demands for receiving the OIS interest rates increased as they edged up, and such positions were constructed by some financial institutions. Specifically, some preferred receiving the OIS interest rate to holding cash bonds from concerns over large fluctuations in the funding costs for cash bonds, which correspond to repo rates in most cases. Others opted for receiving the OIS interest rate when they were unable to successfully purchase sufficient amounts of FBs at auctions.

## Merits of the OIS

### Making the money markets more liquid

Market participants can benefit from utilizing the OIS in the following ways. First, market participants who rely on overnight funding can more directly manage the risk of a rise in overnight rates by utilizing the OIS than the alternative derivatives for 3-6 month floating rates. In this respect, the OTC scheme may be more desirable since it would match the start date and trading terms to their hedging targets.

The OIS is also attractive as a tool for arbitrage transactions that do not expand balance sheets. As mentioned above, arbitrage transactions between the OIS and short-term bonds, such as FBs, have already been conducted actively. In addition, some market participants may prefer the OIS to short-term cash bonds for constructing short-term positions since they do not need to expand their balance sheets, and hence can avoid risks from fluctuations of repo-funding costs.

In these ways, growth of the OIS market is likely to provide hedging tools against overnight interest rate risks and expand arbitrage opportunities. Thus, it is likely to make the money markets more liquid, and thus to contribute to forming a smoother yield curve over the short-term maturity zone.

### Market expectations about future overnight rates implied in interest rate derivatives

As mentioned above, the OIS and other similar derivatives, whose underlying assets are overnight rates, provide an effective way to extract market perceptions about monetary policy stance since these derivatives

involve direct trading in market expectations about future overnight rates<sup>14</sup>.

In the euro area and the United States, central banks and market analysts often estimate the probabilities of monetary policy changes implied in these instruments and make use of them as one of their monitoring tools.

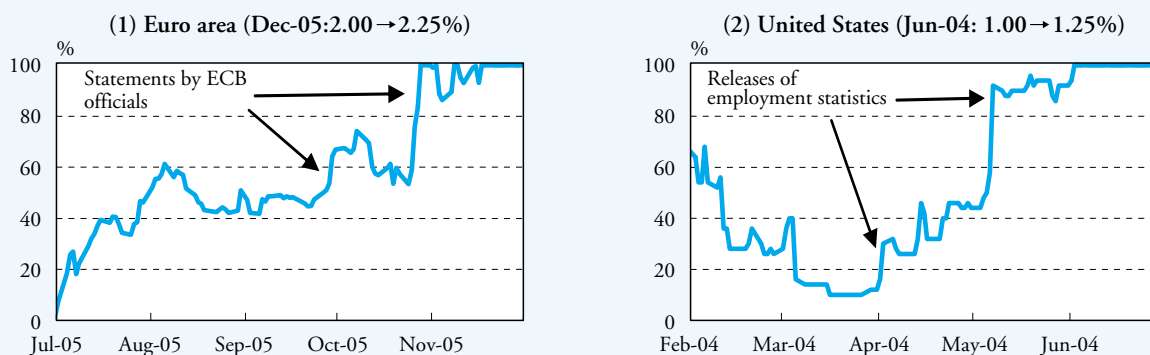
In practice, the probabilities of a change in the policy target rate up to a few months ahead are usually estimated under the assumptions that risk premiums due to future uncertainties are negligible and that the forward rate in each month depends solely on expectations about possible changes in the policy target rate during the same month<sup>15</sup>.

### Cases of the euro area and the United States

Under the above assumptions, we estimated the probabilities of a rate change implied in the interest rate derivatives. Specifically, 1) for the euro area, we estimated the probability of the ECB's raising the target rate (the minimum bid rate of the MROs) from 2.0% to 2.25% in December 2005, and 2) for the United States, we estimated the probability of the FRB's raising the target rate (FF rate) from 1.0% to 1.25% in June 2004<sup>16</sup>. The estimated probabilities show that market expectations of rate hikes were gradually rising in response to the releases of statistics and the statements of high-ranking central bank officials, among others (Chart 7).

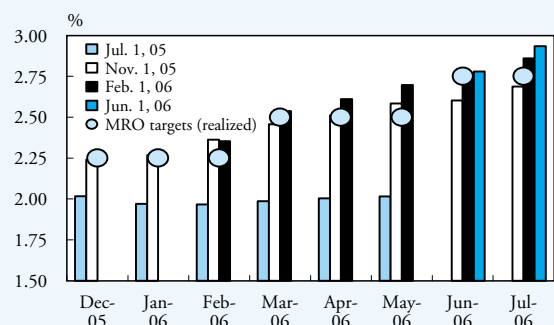
Also by using forward rate curves implied in these derivatives interest rates, we can observe market expectations of future monetary policy evolving over time. The forward rate curves of the EONIA swaps imply that in July 2005, market participants expected monetary policy to be unchanged for a while. After the early fall, expectations were altered and market participants anticipated that the ECB would raise its target rate by 0.25% every quarter (Chart 8). It should be noted, however, that the longer the horizon of the forward rate curves, the more biased the estimates might be, since for such horizons, market liquidity is generally not high enough and risk premiums may not be negligible.

**Chart 7: Probabilities of monetary policy changes implied in EONIA swaps and FF futures**



Sources: FBE, Bloomberg, Bank of Japan

**Chart 8: Forward rate curves implied in EONIA swaps**

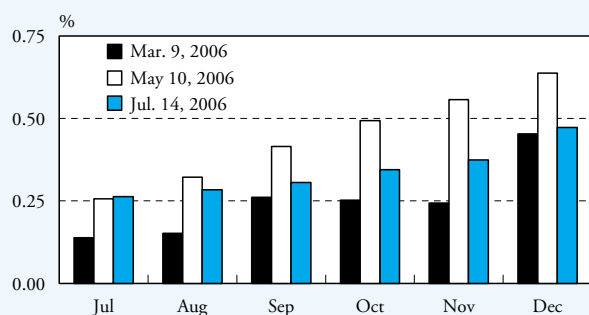


Note: 1-month forward rate for each month.  
Sources: FBE, Bank of Japan

## The case of Japan

We also estimated forward rate curves from the Japanese OIS interest rates. The estimated forward rates after the end of the QEP indicate that 1) the BOJ's decision to raise the target rate by 0.25% in July had been factored in since around mid-May and 2) many market participants expect a gradual rise in the target rate, although market expectations about future monetary policy have not yet converged (Chart 9).

**Chart 9: Forward rate curves implied in OIS (Japan)**



Note: 1-month forward rate from 15th of each month.  
Sources: Meitan Tradition, Bank of Japan

Although the transactions have been increasing, the Japanese OIS market is still small in size and market participants are limited as mentioned above. Thus, we should be cautious in interpreting the information implied in the OIS interest rates. However, the OIS interest rates are likely to become reliable enough for extracting market expectations about monetary policy stance as in the euro area and the United States in the future, as market transactions will increase further and market participants will become more diversified.

## Outlook for the Japanese OIS market and some issues toward further development

### Potential demands for the OIS

As the Japanese money markets will become more active and short-term interest rates will become more volatile, demands for hedging and arbitrage transactions are expected to grow further.

Japanese banks have large amounts of short-term yen

positions, including overnight positions, demand or short-term time deposits, and short-term loans. Their profits may become unstable if short-term interest rates become volatile due to possible mismatch of terms among these positions. In such instances, the OIS could be useful as an ALM<sup>17</sup> tool.

Also, market participants whose yen funding availabilities are limited by credit lines<sup>18</sup> can make short-term positions using the OIS without incurring risks from funding costs, as well as without expanding balance sheets. Furthermore, given the trend toward increased issuance of government bonds including FBs, the repo market, overnight repo market in particular, has been expanding as a funding market for those bonds. These developments suggest that demands for the OIS transactions will increase in the near future.

### Some issues toward further development

Some Japanese financial institutions are now considering starting the OIS transactions. The issues to be examined upon starting OIS transactions include: 1) They need to clarify their actual ALM needs for finely-tuned risk management based on overnight interest rates, 2) They need to weigh the potential merits and the costs of the OIS transactions including operational costs and system installation costs, and 3) They need to examine concrete methods for evaluating their positions on a mark-to-market basis.

Regarding the third issue, a number of market participants in the euro area are using the EONIA Swap Index<sup>19</sup> for mark-to-market evaluation of their positions, which has been released as the benchmark interest rate on a daily basis for the EONIA swap since June 2005. The high reliability of the EONIA Swap Index is regarded to have contributed to higher liquidity in the EONIA swap market. The introduction of such an index for the Japanese OIS market or the provision of continuous and reliable indications by market brokers may encourage Japanese financial institutions to enter the OIS market.

### Main differences between OTC and exchange transactions

In the euro area and the United States, financial derivatives for overnight rates can be traded both in the OTC markets and on exchanges (BOX). The main difference between OTC and exchange transactions, in general, can be summarized as follows.

The main advantage of the OTC transactions such as the EONIA swaps is the flexibility in terms of start date and trading terms. However, the existence of reliable price indications, as well as market makers who offer liquidity, is crucial for market development.

In contrast, in the case of exchange transactions such as FF futures, liquidity is relatively easy to maintain since the listed products are highly standardized and market prices are visible. However, the listed products are not so flexible and may not completely match the exact needs of individual participants.

In Japan, OIS transactions in the OTC market have just started to grow while no products have been listed on exchanges. Some market participants assert that the needs for highly-liquid listed products will increase as the OIS transactions will become more active.

The necessity for listed products should be carefully examined from the perspective of potential demands for the financial derivatives whose underlying assets are overnight instruments, as well as the advantages and costs from the transactions on exchanges.

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<sup>1</sup> Overnight transactions of funds have several forms depending on the timing when the fund transfer starts, such as (i) overnight (O/N), which starts on the contracted day, (ii) tomorrow next (T/N), which starts on the next day after the contracted date, and (iii) spot next (S/N), which starts on the second day after the contracted day.

<sup>2</sup> In this *Review*, short-term interest rates refer to those whose maturities are longer than overnight and up to about one-year, including one-week interest rates and three-month interest rates.

<sup>3</sup> For more details of the developments in the short-term money markets in this period, see Financial Markets Department, Bank of Japan [2006] “Financial Market Report – Developments during the First Half of 2006 –” and its Supplement.

<sup>4</sup> Sometimes, the OIS is used to stand for the Overnight Interest Rate Swap.

<sup>5</sup> Tokyo Interbank Offered Rate.

<sup>6</sup> London Interbank Offered Rate.

<sup>7</sup> Financial derivatives traded on the Tokyo Stock Exchange. Currently, the long-term (10-year) and medium-term (5-year) contracts can be traded, and transactions are particularly active for the 10-year futures. Actual transactions are conducted based on the fictitious bonds named the standardized bonds with 6% coupon for the 10-year contracts.

<sup>8</sup> ECB: European Central Bank. FRB: Federal Reserve Board.

<sup>9</sup> Euro Overnight Index Average. This is computed as the weighted average of all uncollateralized overnight lending transactions in the euro interbank market. The EONIA itself is not a policy target rate for the ECB, but is one of the key interbank interest rates in the euro area. The ECB have adopted the minimum bid rate on the main refinancing operations (MROs) as its policy target rate since June 2006. Note, however, that the EONIA has had a very close relationship to the minimum bid rate of the MROs. Therefore, the EONIA swap interest rate can be viewed as reflecting market perceptions about the ECB's monetary policy stance.

<sup>10</sup> Federal Funds rate. Federal Funds are reserve deposits that commercial banks deposit with the Federal Reserve Banks established under the FRS (Federal Reserve System). Commercial banks advance funds to each other in the form of the federal funds, and the interest rates on these transactions are called the FF rates. The target level of the FF rates is decided by the Federal Reserve Board at the FOMC (Federal Open Market Committees).

<sup>11</sup> Almost all the OIS transactions are currently traded through brokers, while non-OIS interest rates swaps (particularly over the one-year maturity zones) are substantially traded through direct deals (DDs).

<sup>12</sup> Intermediate agents for financial trades such as interest rates, foreign exchanges, and financial derivatives. Intermediate agents contribute to finding trading parties for banks or securities firms that indicate in advance the terms and conditions they desire, such as the rates, amounts, and terms. DDs are seen in the OTC transactions, in addition to transactions through brokers.

<sup>13</sup> Dealers that are obliged to quote buy and sell prices in return for certain privileges within a market. Market makers contribute to maintaining market liquidity.

<sup>14</sup> In extracting market expectations about future monetary policy changes from interest rates on derivatives whose underlying asset is a short-term interest rate such as the euroyen futures, the spread between the short-term interest rate and overnight rate, called the basis spread, needs to be estimated in advance under certain assumptions. For more details, see Financial Markets Department, Bank of Japan [2006] “Financial Markets Report – Developments during the First Half of 2006 – (Appendix 1).”

<sup>15</sup> In practice, there are a number of more complex methods, in which the information other than the underlying interest rates, such as the implied volatility of options or the term structure of interest rates, is used.

<sup>16</sup> Taking the U.S. case for instance, the implied probabilities of monetary policy changes are mostly estimated by comparing 1) the FF futures interest rate in the month during which the FOMC under study will be held and 2) the average interest rate between the current FF futures interest rate until the FOMC date and its hypothesized rate if the target rate is changed. When 1) is larger than 2), we regard the probability to be 100% in Chart 7.

<sup>17</sup> Asset and Liability Management. ALM aims to control interest rate and liquidity risks by attaining the best matching between assets and liabilities in terms of maturities and other properties. ALM is mainly used by financial institutions.

<sup>18</sup> Limit of credit set depending on the financial standing of counterparties.

<sup>19</sup> The EONIA Swap Index is the average of mid market rates quoted by 25 panel banks. Under the support of the FBE (European Banking Federation), a steering committee whose members are the main participants in the EONIA swap markets monitors the accuracy of the index.

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