

TORF Methodology

April 21, 2021
Revised on October 13, 2021
QUICK Benchmarks Inc.

(This English translation is provided exclusively as a convenience. Any questions that may arise in interpretation of words and provisions of this methodology shall be interpreted in accordance with the Japanese original.)

Contents

1. Introduction
2. Definition of Key Terms
3. Reporting Data
4. Calculation
5. Publication and Revision
6. Review and Change of TORF Calculation Method, etc.
7. Governance Structure
8. Rules to be Complied by Reporting Brokers
9. Inquiries

1 Introduction

1.1 Overview

This document outlines the calculation and publication of the Tokyo Term Risk Free Rate (TORF).

TORF is calculated based on the transaction rate of OIS transactions in Japanese yen, and is intended to show the risk-free rate of Japanese yen term products at the beginning of the interest rate calculation period ("fixing in advance" method).

1.2 Benchmark Administration

TORF is managed by QUICK Benchmarks, Inc. (hereinafter referred to as "QBS"). QBS is a wholly owned subsidiary of QUICK Corp. (hereinafter referred to as "QUICK").

As the administrator of TORF, QBS handles all aspects of TORF, including the collection of reporting rates (input data), calculation and publication of TORF, governance of the TORF operations, monitoring of the operational framework, and compliance.

1.3 Description of TORF

Benchmark name	TORF (Tokyo Term Risk Free Rate)
Calculation and publication	QBS
Data source	Japanese yen OIS market data, 365-day basis
Tenor	1 month, 3 months, 6 months
Reference time	15:00 JST on a Tokyo business day
Publication time	Around 17:00 JST on the same day
Digits	5th decimal place (6th decimal place is rounded half up), Unit: %.
Minimum number of reporting companies	2 companies

TORF refers to the average of interest rate for three maturities (6th decimal place is rounded half up to the 5th decimal place) calculated by QBS using the method specified in the Calculation Guidelines, for each period of the 1-month, 3-month and 6-month Japanese Yen OIS transaction rates reported by reporting brokers to QBS in accordance with the provisions of the Code of Conduct.

If the reporting brokers are unable to report the data for all the tenors for some reason, such as a system failure at the reporting brokers, the data for the tenor(s) reported shall be used and calculated using the method described above.

The main feature of the TORF is that it uses the transaction rate of the Japanese Yen OIS market, rather than an interest rate index that relies on the rate submitted by the panel banks.

In addition, TORF has the following two features to more accurately reflect the value of the Japanese Yen OIS market and to calculate the official rate objectively and mechanically without using expert judgment.

a) Use of execution rates and quote rates

If a transaction is executed, the execution rate will be used as the highest priority, and if a transaction is not executed or does not meet the specified criteria even if it is executed, the quoted rate will be used. The best Bid and best Offer from voice brokers

will be used as the quote rate, and in the future, the quote rate of the Central Limited Order Book (CLOB) is expected to be used.

b) Adoption of Waterfall methodology

“Waterfall methodology” is to set priorities as follows:

- (i) The execution rate is used as the highest priority, and if there is no execution rate or if the execution rate does not meet the specified criteria, the quoted rate is used;
- (ii) Even if the quoted rate is used, priority is given to the one that is considered to reflect the market value more appropriately.

This allows the calculation to be based on an objective and mechanical method, regardless of the number of transactions, without having to be judged on a case-by-case basis by experts.

1.4 Target readers for this Methodology

The document is intended for TORF users, reporting brokers who provide data, participants and related parties in the Japanese yen OIS market which is the basis for the calculation of TORF, purchasers and sellers of financial products incorporating TORF as well as the parties involved in those transactions, and other parties with a direct or indirect interest in TORF.

1.5 Publication of this Methodology

This document will be posted on the QBS website and, if necessary, can be obtained from QBS and QUICK.

1.6 Revision of this Methodology

This document shall be revised by the Board of Directors after approval of the TORF Oversight Committee.

2 Definition of Key Terms

The terms used in this document are described below.

Key Terms	Definition
Bid/Offer	In the case of a swap transaction between a fixed interest rate and a floating interest rate such as OIS, Bid refers to "fixed interest payment and floating interest receipt" and Offer refers to "fixed interest receipt and floating interest payment."
CLOB	Central Limit Order Book A centralized limit order book. It is a system in which over-the-counter limit orders (Bid and Offer) are centralized on a single board and matched according to the principles of price and time priority. In addition to this CLOB, the electronic trading system includes a method called RFQ (Request for Quote).
OIS	OIS stands for Overnight Index Swap. Japanese yen OIS transactions are interest rate swaps that use the Japanese yen average uncollateralized overnight call rate (TONA; Tokyo Overnight Average Rate) as the reference floating interest rate. The execution rate or quote rate reported by reporting brokers to calculate TORF is the interest rate on the fixed interest rate side that is exchanged for TONA, which is a floating interest rate.
TORF production rate	TORF production rates are calculated under the governance system as a financial benchmark, and can be used in financial transactions. On the other hand, prior to the publication of TORF production rates, "prototype rates" are published, and these are for market participants and interest rate benchmark users for developing their administrative frameworks etc., but not for use in financial transactions.
Outright transaction	A single transaction that is not combined with other transactions.
Waterfall methodology	This is a method for TORF calculation by specifying in advance the types and calculation methods of reporting data used at the time of calculation, and mechanically selecting appropriate calculation methods etc. based on the status of transactions and the content of quote data. The merits of this method include being able to ensure objectivity and transparency because it can be calculated without relying on expert judgment, and being able to select a calculation method that more appropriately represents the market value depending on the volume of transactions.
Spot start	The transaction period starts two business days after the execution of the contract.
Quote data	Order data presented on the premise of a transaction. Indicative data, which is submitted but not based on the premise of a transaction, such as the data delivered by brokers and financial institutions via information terminals etc., is not used in the TORF production rate. The data of this interest rate part is called "quote rate."
Voice broker	A broker who acts as an intermediary in interest rate swap transactions by exchanging "voice" information with dealers who are customers using a telephone or other means.
Reporting Data	Transaction data reported by a reporting broker to QBS for TORF. There are two types of data: execution data reported by the broker when a trade is executed at the broker, and quote data submitted to the broker.

Reporting rate	The items in the reporting data that relate to interest rates.
Execution data	Executed transaction data. The data that was executed at the reporting broker.
Reporting broker	A money broker or other intermediary selected by QBS in accordance with the procedures set out in the Operational Rules to report execution and quote data to QBS for the purpose of TORF calculation and publication.
Notional weighted trimmed average	The calculation method of the first level in TORF. It is a calculation method that uses executed transaction data (execution data), excludes a certain percentage of the reported execution rates above and below, and then averages the results weighted by the notional amount. Extremely high or low execution rates are excluded, and orders with a higher notional amount are given more weight in the calculation results.
Operational Rules	These rules stipulate the calculation and publication policies and administration framework that QBS must comply with for TORF calculation. In order to avoid fraudulent manipulation of financial benchmarks by benchmark administrators (QBS in the case of TORF), Article 156-87 of the Financial Instruments and Exchange Act requires specified financial benchmark calculators to establish Operational Rules.
Code of Conduct	A set of rules that reporting brokers as data providers must follow in reporting execution and quote rates in order for TORF to be trusted by markets and users as financial benchmarks.
Minimum number of reporting companies	Minimum number of reporting companies to calculate and publish TORF in the event of a sudden decrease in the number of reporting brokers due to the occurrence of emergency situations such as damage to related facilities, power outages, extreme market stress, or circumstances that prevent reporting of rates. If the number of reporting companies falls below the minimum number of reporting companies, the TORF Contingency Plan specifies measures to be taken in such situations.
Reference order	While an actual order is "an order placed with a clear intention of executing a transaction," a reference order refers to an order that may not necessarily execute a transaction. It may be submitted for the purpose of forming a market view of trading participants and for smooth execution of transactions.
Information vendor	A company that presents official rates, etc. delivered by QBS through online services, etc. Among the information vendors, QUICK directly receives the official rates, etc. from QBS, while other information vendors receive them through QUICK.
Actual order (firm order)	An order placed with a clear intention to make a transaction.
Order with notional amount information	In this document, this term refers to an order that is an actual order (firm order), which shows not only the quote rate but also the notional amount information, and which is ready to be executed including the notional amount. Orders that include not only the quote rate but also the notional amount are considered to be highly reliable, as the data shows a higher willingness to execute and a higher probability of execution.

Matching terms and conditions	After the conditions regarding the execution rate are agreed upon, OIS traders check whether other conditions (e.g., notional amount, start date, end date, clearing organization, method of calculating the number of days, method of handling holidays, etc.) are consistent with each other in preparation for the execution. When all the conditions are agreed, the transaction is officially executed.
Centrally-cleared transaction	Over-the-counter (OTC) derivatives transactions, including Japanese yen OIS transactions, that are cleared by a central counterparty (CCP). In OTC derivative transactions, if one party defaults on its obligations, the impact will spread to the counterparties. In contrast, clearance at a CCP insulates both parties from default by the original counterparty because the counterparty is replaced by the CCP. The CCP in Japan is the Japan Securities Clearing Corporation (JSCC), and the CCP in the UK is LCH. From the perspective of TORF calculation, if a CCP is not used in an OIS transaction, the credit risk of the counterparty will be included in the transaction rate, while the credit risk of the counterparty will be included in the calculated rate when calculating the term risk free rate. However, the credit risk of the counterparty can be excluded by assuming that the transaction is conducted through a CCP such as JSCC or LCH.
Agree	When the Bid side and Offer side agree on the execution rate and other conditions.
Expert judgment	Making judgements at the discretion of those with expert knowledge in calculating benchmarks, rather than objectively using predetermined definitions and calculation formulas. Following the revelation of the LIBOR manipulation scandal, there is a need for objectivity in the calculation and publication of financial benchmarks. For this reason, if expert judgment is to be used in calculating financial benchmarks, it is necessary to formulate usage guidelines and supervise the exercise of judgments. TORF is designed not to use expert judgment.
Notional amount	Interest rate swaps are based on transactions in which both parties lend funds to each other's counterparties. In the case of JPY-JPY interest rate swap transactions, such as Japanese yen OIS transactions, the principal portion is the same amount as each other, so the payment and receipt of the principal portion are omitted. However, the amount equivalent to the deducted interest rate difference needs to be settled, and the amount of nominal principal is needed to calculate the settlement amount, and this nominal principal is called the "notional amount."
Order pair	An order in which both Bid and Offer are submitted at the same time. It is in a so-called "matching" state, where the Bid side and Offer side are negotiating for execution.
Quality weighted average	The calculation method of Level 3 and Level 5 in TORF. It is an average weighted by the reciprocal of the difference (spread) between the Bid and the Offer, and the smaller the spread between the Bid and the Offer, the more importance it is given in the calculation. Based on the idea that "the smaller the difference between the Bid and the Offer, the higher the probability of execution and the higher the reliability of

	the Mid rate between the Bid and the Offer,” it is designed so that the smaller the spread, the higher the weighting in the average.
--	--

3 Reporting Data

3.1 Requirements for OIS transactions subject to reporting data

Reporting data is created based on transaction data for Japanese yen OIS transactions that meet all of the following requirements:

Transaction requirements to be adopted in reporting data
(1) Spot start (starts two business days after the execution of the contract)
(2) Outright transaction of Japanese yen OIS
(3) A tenor of 1 month, 3 months, or 6 months
(4) 365-day basis
(5) Transactions during Tokyo business days
(6) Centrally-cleared transaction (transactions supposed to be cleared at either JSCC or LCH)
(7) Transactions that have been executed or are valid for orders between JST15:00:01 on the previous business day and JST15:00:00 on the current business day

A voice broker selected by QBS reports data that meets the above requirements. In the future, if OIS transactions on CLOBs grow to a scale comparable to the amount and number of transactions with voice brokers, CLOB data will also be used.

3.2 Reporting Data Type

There are two types of reporting data: "execution data" and "quote data."

(1) Execution Data

Execution data is data related to transactions executed at the reporting broker, and must meet all of the following requirements:

Requirements for execution data
All of the "Transaction Requirements" described in 3.1 must be met
(i) Spot start (starts two business days after the execution of the contract)
(ii) Outright transaction of Japanese yen OIS
(iii) A tenor of 1 month, 3 months, or 6 months
(iv) 365-day basis
(v) Transactions during Tokyo business days
(vi) Either "JSCC" or "LCH" as the clearing organization
(vii) Transactions executed between JST15:00:01 on the previous business day and JST15:00:00 on the current business day
Includes all the following "Items Required for Execution Data"
(viii) The "Execution Rate" field contains a number.
(ix) The "Notional Amount" field contains a number greater than zero.

(2) Quote Data

Quote data is the data of orders submitted by trading participants at the reporting broker, and must meet all of the following requirements:

Requirements for quote data
All of the "Transaction Requirements" described in 3.1 must be met

	(i) Spot start (starts two business days after the execution of the contract)
	(ii) Outright transaction of Japanese yen OIS
	(iii) A tenor of 1 month, 3 months, or 6 months
	(iv) 365-day basis
	(v) Transactions during Tokyo business days
	(vi) The clearing organization includes either "JSCC" or "LCH," or both of them, or does not include either of them.
	(vii) Orders valid between JST15:00:01 on the previous business day and JST15:00:00 on the current business day
	Includes the following "Item Required for Quote Data"
	(viii) "Quote Rate Status" is an actual order (firm order)*.

*If the reporting data of the reporting broker includes information such as "reference orders," which are not necessarily executed, this item must be an "actual order."

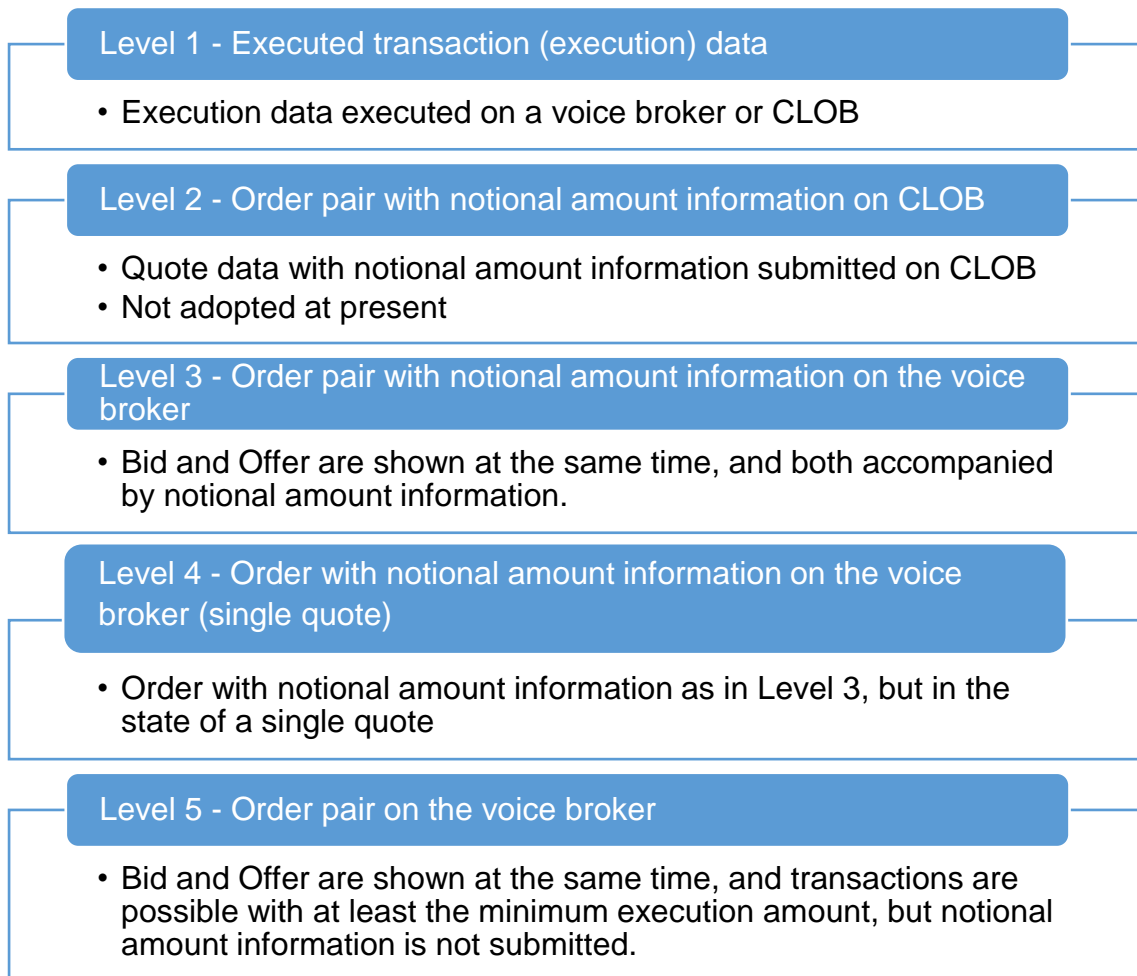
Of the quote data that meets this requirement, the best quotes (the best Bid and best Offer) are used in the calculation.

4 Calculation

4.1 Waterfall Methodology

Using the following waterfall methodology, the data for calculation defined for each level from the reporting data are extracted and the publication data of TORF are calculated.

< Overview of the waterfall methodology >



<Level judgement of reporting data based on waterfall methodology>

The levels of reporting data are judged per data item based on the following requirements:

- ✧ Level 1: Must be "execution data" as stipulated in 3.2(1)
- ✧ Level 2: (Not adopted since there are virtually no OIS transactions on CLOB at present.)
- ✧ Level 3: All of the following requirements must be met:

"Level 3 - Order pair with notional amount information on the voice broker" requirements

(1) The quote rate and notional amount of Bid and Offer each contain valid numbers. (The notional amount does not have to be the same for Bid and Offer.)

(2) The notional amount of Bid and Offer is equal to or greater than the respective thresholds (if thresholds have been set).

"Level 3 - Order pair with notional amount information on the voice broker" requirements
(3) There is a change in the quote rate of either the best Bid or the best Offer compared to the last data of the same broker.

❖ Level 4: All of the following requirements must be met:

"Level 4 - Order with notional amount information on the voice broker (single quote)" requirements
(1) The quote rate and notional amount of the Bid side have valid numbers and the notional amount of the Offer is null, or the quote rate and notional amount of the Offer side have valid numbers and the notional amount of the Bid is null.
(2) The notional amount of the side with the quote rate (Bid side or Offer side) is greater than or equal to the threshold (if a threshold has been set).
(3) Compared to the last data of the same broker, there is a change in the quote rate or notional amount of the order side that contains the quote rate and notional amount.

※ *If there is at least one data item of Level 4 for both Bid and Offer that meets this requirement in the same tenor of the same reporting broker, it will be used as the Level 4 data.

❖ Level 5: All of the following requirements must be met:

"Level 5 - Order pair on the voice broker" requirements
(1) The quote rate of Bid and Offer each has a valid number.
(2) There is a change in the quote rate of either the best Bid or the best Offer compared to the last data of the same broker.

※ If the number of data in Level 3 is less than the threshold, the order pair that should have been treated as Level 3 is added to Level 5.

※ If Level 4 cannot be calculated and there is data with a quote rate that does not have a number in the notional amount on the opposite side of the order that should have been treated as the Level 4, it is added to Level 5 as a pair.

4.2 Level Judgment and Calculation

For each tenor, we synthesize the data reported by the reporting brokers and determine whether the data meets the level judgment criteria from Level 1 to Level 5 listed below. The calculation will be done using the method for the level that meets the criteria, and if the criteria cannot be met, it will be done with the lower level's method.

❖ Judgment and calculation method of Level 1

➤ Criteria

Calculated as Level 1 if all of the following requirements are met when combining data from all reporting brokers.

Criteria for Level 1
(1) Among the data of all reporting brokers, there is at least one executed transaction data that corresponds to Level 1.
(2) The total notional amount is equal to or greater than the threshold (if a threshold has been set).

➤ Calculation method (notional weighted trimmed average based on the executed transaction rate)

- i) Arrange the executed transaction data in ascending order by execution rate, and exclude outliers above and below the exclusion criterion percentile value (*) of the outlier test based on the notional amount.
- ii) Perform a weighted average by notional amount for the executed transaction data excluding outliers.

$$\text{Notional Weighted Average} = \frac{\sum \text{Rate}_i * \text{Notional}_i}{\sum \text{Notional}_i}$$

Notional Weighted Average: Calculated rate based on weighted average of notional amount

i: Serial number of Level 1 data

Rate: Execution rate in data serial number i

Notional_i: Notional amount in data serial number i

(*) Based on examples of domestic and overseas interest rate benchmarks, the 25th percentile is used at the beginning of the production rate.

- ✧ Judgment and calculation method of Level 2
Currently, OIS transactions on CLOBs are virtually non-existent and therefore not adopted, so they are omitted.
- ✧ Judgment and calculation method of Level 3
There are two cases for this level: "Level 3A" (when the Bid and Offer quote rates are the same) and "Level 3B" (when the Bid rate is lower than the Offer rate).

In Japanese yen OIS transactions, there are rare cases where the two parties agree on the rate, but in the process of matching the terms and conditions, there is a disagreement on the notional amount or the clearing organization between JSCC and LCH. In such a case, the "Bid rate = Offer rate" state is reached just before the execution.

At the stage of this "Bid rate = Offer rate" state, traders on both sides are considered to be matching terms and conditions based on the assumption that they have executed the transaction, and therefore, the data should be fully respected as calculation data. Also, as described below, Level 3 is based on a quality weighted average using the difference (spread) between the Bid and Offer rates, which cannot be calculated when the spread is zero. For this reason, the quality weighted average cannot be used when "Bid rate = Offer rate" occurs in Level 3. Therefore, the data with such "Bid rate = Offer rate" is used as the highest priority, and a simple average is performed for it.

Based on the above, two types were made in Level 3: "Level 3A" (a combination of Bid rate = Offer rate in Level 3) and "Level 3B" (an order pair with Bid rate < Offer rate in Level 3).

- Level 3A
 - Criteria
Calculated as Level 3A if all of the following requirements are met when combining data from all reporting brokers.

Criteria for Level 3A

(1) Level 1 and Level 2 are not adopted.
--

(2) Among the data of all reporting brokers, there is at least one order pair that corresponds to Level 3 and has the same Bid and Offer rates.
(3) The number of order pairs corresponding to Level 3A, i.e., classified as Level 3 and with "Bid rate = Offer rate," is greater than or equal to the threshold (if the threshold for the lower limit of the number of order pairs has been set).
(4) For the order pair corresponding to Level 3A, the notional amount of each Bid and Offer is greater than or equal to the threshold (if a threshold per data has been set).

- Calculation method (simple average of order pairs with notional amount information where Bid rate = Offer rate)
Perform a simple average for the quote rates for each order pair where the Bid rate and Offer rate are the same.

$$Average = \frac{\sum Rate_i}{N}$$

Average: Calculated rate based on simple average

N: Number of data

Rate: Quote rate of the order pair in data serial number i

➤ Level 3B

- Criteria
Calculated as Level 3B if all of the following requirements are met when combining data from all reporting brokers.

Criteria for Level 3B
(1) Level 1, Level 2, and Level 3A are not adopted.
(2) Among the data of all reporting brokers, there is at least one pair of data that corresponds to Level 3.
(3) The number of order pairs corresponding to Level 3B is greater than or equal to the threshold (if a threshold has been set).
(4) For the order pair corresponding to Level 3B, the notional amount of each Bid and Offer is greater than or equal to the threshold (if a threshold per data has been set).

- Calculation method (quality weighted average using Bid-Offer spread)
Perform a simple average for the Bid rate and Offer rate to obtain the Mid rate.

$$MidRate_i = \frac{(BidRate_i + OfferRate_i)}{2}$$

With the difference between the Offer rate and the Bid rate as the spread, obtain its reciprocal.

$$Reciprocal_Spread_i = \frac{1}{(OfferRate_i - BidRate_i)}$$

Then perform a weighted average on the Mid rate by the reciprocal of the spread.

$$\text{Quality Weighted Average} = \frac{\sum \text{MidRate}_i * \text{Reciprocal_Spread}_i}{\sum \text{Reciprocal_Spread}_i}$$

i: Data serial number

MidRate_i: Mid rate for data serial number i

BidRate_i: Bid rate for data serial number i

OfferRate_i: Offer rate for data serial number i

Reciprocal_Spread_i: Reciprocal of the spread between Bid and Offer for data serial number i

Quality Weighted Average: Calculated rate based on quality weighted average

Reasons for not using notional amount in Level 3

Level 3 is calculated using an "order pair with notional amount information on the voice broker." An "order pair with notional amount information" means that the Bid and Offer with notional amount information are shown at the same time. Orders with notional amount information are given higher priority than the Level 5 data without notional amount information, based on the notion that they are highly reliable orders with a higher willingness to execute and as the data with higher probability of execution.

However, the calculation does not take into account the size of the notional amount as in Level 1 (notional weighted trimmed average). This is due to the fact that orders with a small difference between Bid and Offer are emphasized based on the waterfall methodology, which gives priority to those that more appropriately reflect market values. In other words, an order with a smaller difference between Bid and Offer is considered more likely to be executed and more reliable. Even if the order has a large notional amount, if the difference between Bid and Offer is extremely large, the possibility of execution is extremely low. In particular, when the OIS market is in the growth stage, orders with an extremely large difference between the Bid and Offer are likely to be the best quotes. In order to prevent such manipulation of benchmarks, "quality weighted average" is adopted, where the smaller the difference between the Bid and Offer, the more emphasis it is placed on.

✧ Judgment and calculation method of Level 4

➤ Criteria

Calculated as Level 4 if all of the following requirements are met when combining data from all reporting brokers.

Criteria for Level 4
(1) Levels 1 through 3 are not adopted.

(2) Among the data of the same reporting broker, there is at least one data for Bid and Offer each that corresponds to Level 4.

(3) The sum of the notional amounts of quote data corresponding to Level 4 is greater than or equal to the threshold (if a threshold has been set).

(4) For the quote data corresponding to Level 4, the notional amount is above the threshold (if a threshold per data has been set).

- Calculation method (simple average based on the quote rate with notional amount information)

Perform a simple average for the averages of the Bid and Offer rates that correspond to Level 4. (In the case of Level 4, Bid and Offer are not necessarily submitted at the same time, so the quality weighted average using the Bid-Offer spread as in Level 3B is not performed.)

$$Averaged_BidRate = \frac{\sum BidRate_i}{BidN}$$

$$Averaged_OfferRate = \frac{\sum OfferRate_i}{OfferN}$$

$$Average = \frac{(Averaged_BidRate + Averaged_OfferRate)}{2}$$

i: Data serial number

Averaged_BidRate: Average of Bid rates

BidRate_i: Bid rate for data serial number i

BidN: Number of Bid rates (number of data)

Averaged_OfferRate: Average of Offer rates

OfferRate_i: Offer rate for data serial number i

OfferN: Number of Offer rates (number of data)

Average: Calculated rate based on simple average

Reasons for not using notional amount in Level 4

Level 4 is calculated using an "order with notional amount information on the voice broker." Although Level 4 is in a single quote state, the calculation is based on the Bid and Offer with notional amount information as in Level 3.

Also, as with Level 3, the notional amount information is not used in the calculation of Level 4. As with Level 3, this is to prevent the calculated value from being significantly affected when an order with a large notional amount is placed at an extremely high Offer rate or an extremely low Bid rate, where the probability of execution is low.

However, unlike Level 3, Level 4 is not in the state of an order pair. Therefore, the Bid and Offer are set as simple averages, and the weights of each order are set equal.

◇ Judgment and calculation method of Level 5

As with Level 3, two types were made in Level 5: "Level 5A" (when the Bid and Offer quote rates are the same) and "Level 5B" (when the Bid rate is lower than the Offer rate). The reason for this is the same as the purpose of "Judgment and calculation method of Level 3."

➤ Level 5A

- Criteria

Calculated as Level 5A if all of the following requirements are met when combining data from all reporting brokers.

Criteria for Level 5A
(1) Levels 1 through 4 are not adopted.
(2) Among the data of all reporting brokers, there is at least one order pair that corresponds to Level 5 and has the same Bid and Offer rates. (As for the data excluded from Level 3A because it was less than the threshold, it should be treated as Level 5A.)
(3) The number of order pairs corresponding to Level 5A is greater than or equal to the threshold (if a threshold has been set).

- Calculation method (simple average of order pair where Bid rate = Offer rate)
Perform a simple average for the quote rates for each order pair where the Bid rate and Offer rate are the same.

$$Average = \frac{\sum Rate_i}{N}$$

Average: Simple average

N: Number of data

Rate: Rate of the order pair for data serial number i

➤ Level 5B

• Criteria

Calculated as Level 5B if all of the following requirements are met when combining data from all reporting brokers.

Criteria for Level 5B
(1) Levels 1 through 4 and Level 5A are not adopted.
(2) Among the data of all reporting brokers, there is at least one pair of data that corresponds to Level 5. (As for the data excluded from Level 3B because it was less than the threshold, it should be treated as Level 5B.)
(3) The number of order pairs corresponding to Level 5B is greater than or equal to the threshold (if a threshold has been set).

• Calculation method (quality weighted average using Bid-Offer spread)

Perform a simple average for the Bid rate and Offer rate to obtain the Mid rate.

$$MidRate_i = \frac{(BidRate_i + OfferRate_i)}{2}$$

With the difference between the Offer rate and the Bid rate as the spread, obtain its reciprocal.

$$Reciprocal_Spread_i = \frac{1}{(OfferRate_i - BidRate_i)}$$

Then perform a weighted average on the Mid rate by the reciprocal of the spread.

$$Quality\ Weighted\ Average = \frac{\sum MidRate_i * Reciprocal_Spread_i}{\sum Reciprocal_Spread_i}$$

i: Data serial number

MidRate_i: Mid rate for data serial number i

BidRate_i: Bid rate for data serial number i

OfferRate_i: Offer rate for data serial number i

Reciprocal_Spread_i: Reciprocal of the spread between Bid and Offer for data serial number i

Quality Weighted Average: Calculated rate based on quality weighted average

4.3 About Thresholds

In order to improve the robustness of TORF, QBS plans to set the following thresholds depending on the status of OIS transactions.

However, no threshold is set at the time of the start of the publication of TORF production rates. There are two reasons for this as follows:

- ① In the calculation of Level 1 (executed transaction (execution) data), it is considered that a certain level of quality can be maintained without setting a threshold by excluding the upper and lower 25th percentile of the outlier test.
- ② For Levels 3, 4, and 5 that use the voice broker's quote data, it is expected that if the threshold is set at the start of the publication of TORF production rates, it will not be possible to obtain sufficient data for calculation. Considering the fact that the

Japanese yen OIS market is still in the process of growth, we believe that not setting a threshold and utilizing as much information as possible in the calculation will rather contribute to improving the robustness of the benchmarks.

QBS has a policy of reviewing its operational framework, including the calculation methods, at least once a year in accordance with its Operational Rules, and revising them as necessary. The necessity of setting a threshold will also continue to be considered in the process of reviewing the operational framework.

Thresholds planned to be introduced in the TORF calculation (None of these thresholds will be set at the start of the publication of TORF production rates.

	Threshold per data item	Total number of data (threshold for moving down to the lower level)
Level 1	Notional amount of each transaction	Total notional amount
Level 3	Notional amount of each Bid and Offer for each order pair	Number of order pairs
Level 4	Notional amount of either Bid or Offer	Total notional amount
Level 5	—	Number of order pairs Not the threshold for moving down to the lower level, but the threshold for adopting the previous day's value*

*If there is no data corresponding to Levels 1 through 5, or if the data does not satisfy the threshold for Level 5, the official rate of the previous day will be used as the official rate of the day for the relevant tenor.

4.4 Exercise of expert judgment

QBS does not use expert judgment in TORF calculation.

5 Publication and Revision

5.1 Publication

TORF is published by QBS at around 17:00 JST through QUICK, an information vendor. (See 1.3 Description of TORF.)

It is also distributed to other information vendors through QUICK.

(1) It is available on the QUICK services with the following codes.

➤ Real time (additional fee required)

Screen service: TORF@

1 month: MJPY#TORF.1/QBS

3 months: MJPY#TORF.3/QBS

6 months: MJPY#TORF.6/QBS

➤ 24-hour delay

Screen service: TORF@D

1 month: MJPY#TORF.1/QBSD

3 months: MJPY#TORF.3/QBSD

6 months: MJPY#TORF.6/QBSD

Publication time: Around 17:00 JST on a Tokyo business day

(2) It is also published in the morning edition of the Nihon Keizai Shimbun (Nikkei newspaper) the next day.

(3) It is available on the QUICK Money World website as well with a 24-hour delay.

If QBS determines that publication by QUICK or its successor companies (information vendors) is difficult, QBS will publish the TORF rates on the QBS website and take steps to enable external parties to confirm the fact that an emergency has occurred as well as the status of QBS's response. As soon as publication by the information vendors becomes possible, the publication will be performed by the information vendors sequentially.

5.2 Delay in Publication

If for some reason, such as a system failure or widespread network failure at the reporting broker, the number of reporting brokers is less than the lower limit (2 companies), QBS may delay the publication until up to 18:30 JST.

5.3 Revision Policy

When there is a significant impact on the level of official rates (The threshold is set at 2bp (0.02%) as a result of inappropriate calculation identified by 18:00 JST of the current business day, official rates may be revised based on the determination of the Board of Directors.

In the event that QBS revises the official rates, etc., QBS shall announce such revision on the QBS website by 19:00 JST on the same business day, and shall also distribute and publish the revised official rates through the information vendors. In this case, the official rates, etc. shall be the revised rates as of 17:00 JST on the same business day.

5.4 Temporary Suspension of Publication

If it is deemed necessary to temporarily suspend the TORF publication due to unavoidable circumstances caused by disasters affecting broad areas or other emergencies, QBS may temporarily suspend the publication, upon a decision by the President of QBS, in accordance with the Contingency Plan. In the above case, the previous business day's official rates are used as the current day's TORF.

5.5 Continued Suspension of Publication

QBS shall consider continuous suspension of TORF publication if it is determined that TORF has lost its representativeness as benchmark interest rate (usefulness as a benchmark to be referred to in determining interest rates). This consideration shall, to the utmost extent, reflect an objective of continuously calculating and publishing TORF under the framework of financial benchmark administration, taking into account the effect of such suspension on the stability of the financial economy, the scope of contracts referring to TORF, and the degree of the impact of such suspension on the contracts.

In addition, QBS shall seek public comment and hold discussions with the relevant authorities. In seeking public comment, QBS shall allow a sufficient period so that stakeholders, such as users, can make full discussions, and QBS shall consider carrying out an impact analysis of such change, as appropriate.

When QBS suspends the TORF publication on a continuous basis, it shall announce the timing of the suspension, the reasons for the suspension, the comments received in the public comments, etc., as described in the preceding paragraph, and the details of consultations with commenters based on those comments, etc., at least six months prior to the suspension.

6 Review and Change of TORF Calculation Method, etc.

6.1 Review of Calculation Methods, Operational Framework, etc.

QBS will assess and review the definition and calculation method of TORF and other overall benchmark administration at least once a year. If, as a result of the assessment and review, it is determined that the TORF may lose its representativeness as benchmark interest rate, changes to the definition and calculation methods, etc. of TORF shall be considered.

In the assessment and review, the ratio of transactions accounted for by reporting brokers in the Japanese yen OIS market, the conditions of the Japanese yen OIS market and other interest rate derivatives markets, and other factors shall be taken into consideration, as well as opinions received from outside QBS.

6.2 Change of Calculation Methods

If, due to structural changes in the Japanese yen OIS market or other Japanese yen interest rate derivatives markets, it is determined that the TORF may lose its representativeness as benchmark interest rate, QBS shall consider changes to the definition and calculation methods, etc. of TORF.

The changes shall, to the utmost extent, reflect an objective of continuously calculating and publishing TORF under the framework of financial benchmark administration, taking into account the effect of such suspension on the stability of the financial economy, the scope of contracts referring to TORF, and the degree of the impact of such suspension on the contracts.

In addition, if such changes are deemed to be significant, QBS shall seek public comment.

When changing the definitions or calculation methods of TORF, QBS shall disclose, at least three months prior to the effective date, the details of the change, the reason, the effective date, etc.

7 Governance Framework

7.1 About QBS

As the company that calculates and publishes TORF, QBS shall collect the necessary reporting data for TORF, calculate and publish TORF, and handle the whole administration of TORF including monitoring, governance, and compliance.

7.2 Board of Directors

The Board of Directors is the decision-making body of QBS, and under it are the Oversight Committee as well as the Administration and Planning Committee.

Outside directors will be added to the Board of Directors. In addition, in order to ensure transparency in the administration of TORF, prior confirmation and approval by the Oversight Committee shall be required for any Board of Directors' resolution relevant to the calculation and publication.

Executives and employees of financial institutions and reporting brokers cannot be appointed as directors.

7.3 Oversight Committee

The Oversight Committee shall confirm and approve the appropriateness of matters related to the calculation and publication of TORF, and make recommendations to the Board of Directors regarding improvement measures.

The Oversight Committee shall consist of persons with expertise in laws and regulations related to the calculation of financial benchmarks, accounting, auditing, corporate governance, etc., and the majority of the members shall be non-QUICK executives and employees. Executives and employees of financial institutions and reporting brokers cannot serve on the Oversight Committee.

7.4 Reception of complaints and consultations

QBS shall set up a liaison office for complaints and consultation in the Oversight Committee Office, and in its operation, QBS shall publish the contact information on its website and accept complaints by e-mail for the convenience of users.

The Oversight Committee Office and the department in charge shall work together to review and implement the response of complaints and consultations, and the status of response is regularly reported to the Oversight Committee.

The Oversight Committee shall confirm the status of the response and make recommendations to the Board of Directors as necessary. When the Board of Directors receives a recommendation, it instructs the department in charge and the Oversight Committee Office to take appropriate measures.

7.5 Internal Whistle-blowing Framework

QBS will establish a helpline counter in the Internal Audit Office to accept reports and consultations from QBS employees and administrative contractors in order to detect unauthorized operations and misconduct related to TORF at an early time.

The Internal Audit Office shall periodically report to the Oversight Committee on the status of reception and response at the helpline counter, and the Oversight Committee shall recommend necessary actions to the Board of Directors.

8 Rules to be Complied by Reporting Brokers

8.1 Establishment of the Code of Conduct

QBS shall formulate the Code of Conduct, with which reporting brokers should comply, QBS shall also require reporting brokers to establish internal frameworks listed in the following paragraph.

8.2 Rules to be Complied by Reporting Brokers

Reporting brokers shall comply with the following rules pertaining to reporting rates for TORF purposes. Except for the rules related to obligations for notification or reporting to QBS, items (ii) to (x) set out guidelines on standard processes which are recommended to be put in place by reporting brokers. Reporting brokers shall give due regard to these guidelines and put in place processes and controls which will ensure appropriate and sound reporting rates, in an appropriate manner.

- (i) Reporting rates based on definition
- (ii) Establishment of processes and frameworks for appropriate rate reporting
- (iii) Establishment of processes and frameworks for management of Conflict of Interest in relation to rate reporting
- (iv) Prohibition of information sharing, coordination and similar behaviors without justifiable reason regarding the content of report
- (v) Establishment of processes to enable post-reporting explanations on the ground of reporting rates
- (vi) Keeping records of communications relating to rate reporting
- (vii) Conducting internal audits and reporting the audit results
- (viii) Establishment of reporting process to QBS in the event of incidents
- (ix) In-house training
- (x) Cooperation with inquiries/inspections regarding reporting rates from QBS
- (xi) Checking of compliance with the Code of Conduct
- (xii) Establishment of Internal Rules

9 Inquiries

9.1 Inquiries about the Outline of TORF Calculation and Publication

Please contact us at the QBS liaison office at the following e-mail address.

Email: corporate@torf.co.jp