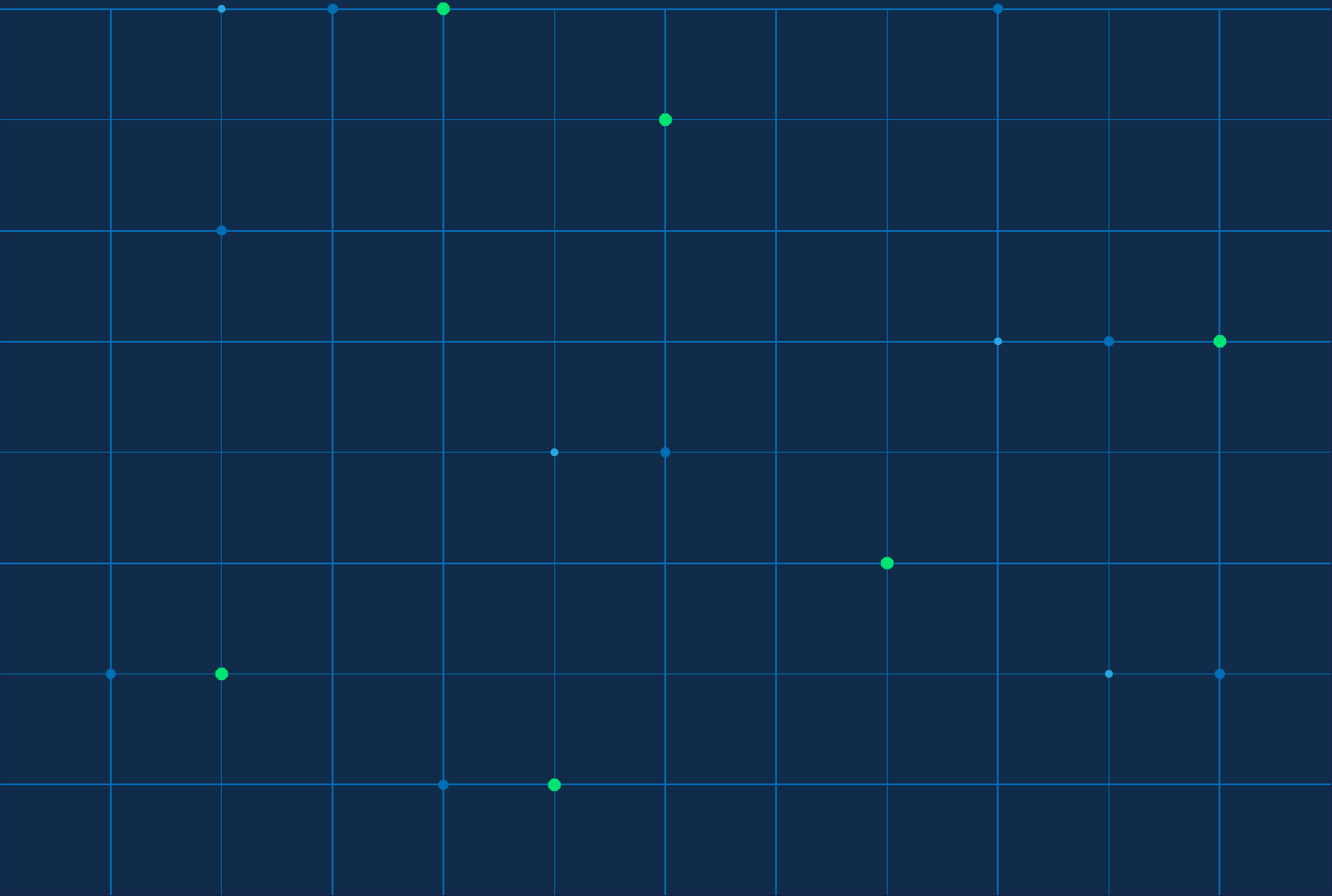


CME EBS FX Benchmarks Benchmark Methodology

CME Group Benchmark Administration Limited

Version 1.0

Approval Date: February 9th, 2022



Version Control

VERSION	KEY CHANGES	APPROVAL DATE
1.0	Creation of the “benchmark family”	February 9 th , 2022

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1. Introduction

CME EBS FX Benchmarks are a family of benchmarks administered by CME Group Benchmark Administration Limited (“CBA” or the “Administrator”) and intended to represent snapshots of the exchange rate of currency pairs, taken at regular times.

These benchmarks are registered as a “Benchmark Family” under UK Benchmark Regulation (“BMR”).

1.1. CME Group and CME Group Benchmark Administration Limited

As a leading and diverse derivatives market operator, CME Group is the parent of four U.S.-based designated contract markets (“DCMs”): Chicago Mercantile Exchange Inc. (“CME”), Board of Trade of the City of Chicago, Inc. (“CBOT”), New York Mercantile Exchange, Inc. (“NYMEX”), and the Commodity Exchange, Inc. (“COMEX”) (collectively, the “CME Group Exchanges”). These exchanges offer a wide range of products available across all major asset classes, including: futures and options based on interest rates, equity indexes, foreign exchange, energy, metals, and agricultural commodities. CME Group offers futures trading through the CME Globex® electronic trading platform (“Globex”), fixed income trading via BrokerTec, foreign exchange trading on the EBS platform, and central counterparty clearing services at CME Clearing, a division of CME. CBA capitalizes on CME Group’s wealth of electronic transaction-based data in the calculation of its indices and benchmarks. CBA is registered under UK Benchmark Regulation and is authorized and regulated by the UK Financial Conduct Authority (“FCA”).

CBA is the administrator of the CME EBS FX Benchmarks, with CME Inc. providing calculation agent and distribution services.

1.2. EBS Market

EBS offers access to one of the largest and most liquid FX markets in the world, facilitating international trade and risk management.

EBS Market is a central limit order book trading platform. Spot FX trading on EBS Market is provided by the dealing service operated by EBS Service Company Limited, incorporated in Switzerland.

1.3. Regulatory and IOSCO Compliance

The CME EBS FX Benchmarks is a family of benchmarks, designed on the basis of industry best practices and the IOSCO Principles for Financial Benchmarks. This will include but not be limited to the creation of an oversight committee and a published methodology. Material changes to the methodology will be announced via public consultation and any changes such as a re-balancing of the constituent components would be announced with a notice period of at least one month.

CME EBS FX Benchmarks are available for use under the UK Benchmark Regulation (BMR)¹.

¹ <https://www.fca.org.uk/markets/benchmarks/regulation>

2. CME EBS FX Benchmarks

CME EBS FX Benchmarks are spot rate fixings for a set of currency pairs, calculated four times a day:

Currency Pairs	Times (Local)
EUR/USD	
USD/JPY	London 13:30 UTC
USD/CNH	New York 16:00 ET
USD/CHF	Tokyo 15:00 JST
EUR/JPY	Beijing 16:30 CST
EUR/CHF	

A Volume Weighted Average Price (VWAP) or a Time Weighted Average Price (TWAP) is calculated according to a waterfall methodology based on the following hierarchy, as observed during the last 10 minutes (observation window) prior to the above fixing times:

- trades executed on EBS Market
- executable orders readily available on EBS Market
- indicative prices from Morningstar

3. EBS CNH Benchmark (USD/CNH)

CME EBS CNH Benchmark is a spot rate fixing for USD/CNH published daily, in line with the onshore USD/CNY fixing, providing a direct comparison between the two currency pairs.

Calculation is based on input data collected during a 5 (five) minute observation window, starting at 14:57:30 CST and ending at 15:02:30 CST; the index value is disseminated as soon as available after calculation.

4. Calculation Methodology

The CME EBS FX Benchmarks are calculated using the following waterfall methodology, based on availability of input data during the observation windows.

4.1. Input Data

A waterfall of executed trades, executable orders and indicative quotes is used to calculate the CME EBS FX Benchmarks, according to the following hierarchy:

1. Trades executed in the eligible currency pair, during the observation window, sourced from EBS Market.
2. Best Bid-Offer of the Executable Orders book from EBS Market, taken every 500ms during the observation window, with the following exclusions:
 - Executable Orders where Bid > Offer
 - Executable Orders where: (Offer – Bid) / Bid > 0.05 (to exclude stale/outliers quotes)
3. Aggregated third party data provided by Morningstar combined data feeds.

4.2. Waterfall Calculation Methodology

The following waterfall calculation methodology is applied for the calculation of CME EBS FX Benchmarks.

Level 1

Level 1 calculation requires at least 1 (one) executed trade during the relevant observation window; a VWAP of the entire trades population is calculated as per the following formulae:

$$VWAP = \frac{\sum price_i \times volume_i}{\sum volume_i}$$

Where $price_i$ and $volume_i$ are the executed prices and the notional of eligible trades.

Level 2

If a Level 1 VWAP cannot be calculated due to the lack of trades for the specified currency pair during the observation window, available order data are used to calculate a TWAP.

The weighting at the beginning of the observation window is zero; during the observation window the time weight is calculated according to the following steps:

1. Count the units of time for each time slice (a time slice is a collection of half second intervals) before and up to the effective time starting from the beginning of the observation window as:

$$n = 0, 1, 2, 3, \dots, N - 1, N$$

2. Calculate the total counts before the effective time

$$C_{Total} = \frac{N * (N + 1)}{2}$$

3. The unit weight is calculated as

$$w_u = \frac{1}{C_{Total}}$$

4. The weight of each slice for the period before the effective time will be

$$w_n = n * w_u \quad (n = 0, 1, 2, 3, \dots, N)$$

5. The TWAP is calculated as

$$TWAP = \sum_{n=0}^N price_n \times w_n$$

Where:

n = time slice within interval

w_u = unit weight

w_n = weight at time slice n

$price_n$ = price at time slice n

Level 3

If the currency pair lacks executed transactions and the order book has no executable quotes, indicative data provided by Morningstar's aggregated data feeds are applied to the TWAP methodology as in Level 2.

5. Validation Checks

Calculation values of EBS FX Benchmarks are subject to validation checks to assess the quality of the input data.

Each calculated VWAP or TWAP day-on-day change is assessed for breaches of either of:

1. A change in excess of 5%
2. A change outside the 99.5% confidence interval ($Abs(Rtn-Avg) > 2.576 \times Stdev$), based on 180 days history, including the current day.

The calculation agent provides the Administrator with a daily report of any breaches of the values above, for further consideration.

6. Publication

CME EBS FX Benchmarks are calculated and published every business day, at the times specified in Section 2 and Section 3 of this Methodology, with the following exceptions:

Date	Publication
24 th December	No publication after 21:00UTC
25 th December	No publication until 23:00UTC
31 st December	No publication after 21:00UTC
1 st January	No publication until 23:00UTC

Benchmarks are published to the following decimal precision:

Currency pair	Decimals
EUR/USD	5
USD/JPY	3
USD/CNH	4
USD/CHF	5
EUR/JPY	3
EUR/CHF	5

If any CME EBS FX Benchmark cannot be calculated due to complete lack of executed trades, executable orders and Morningstars indicative quotes, the last valid publication remains valid.

In the event of a calculation error or a breach of the above [Validation Checks](#), there is no re-publication of the benchmark.

However, in the event that there is an error in the publication that requires a republication of the benchmark, users will be informed.

7. Governance

The Administrator operates under a comprehensive Risk and Control Framework, providing clear policies on Governance, Oversight, Benchmark Design and Calculation, Outsourcing, Operations, Reporting of Infractions and Business Continuity.

CBA has in place a "Three Lines of Defence" model, enabling close cross-monitoring of the governance process - this being business, compliance and audit who all have a key role in ensuring that CBA meets its regulatory requirements.

7.1. Oversight Committee

An Oversight Committee is appointed by the Administrator to review the integrity of the benchmark, in accordance with the CBA Terms of Reference for the Oversight Committees.

The Oversight Committee will provide independent oversight of, and challenge, to the Administrator on all aspects of the Benchmark determination process. The minutes of the Oversight Committee are made available on the Administrator's website.

The Oversight Committee will escalate to the CBA Board if required.

7.2. Review of the Methodology

The Administrator constantly monitors the Benchmark Methodology and its consistency with the stated objectives. The Benchmark Methodology is reviewed annually by the Administrator and the Oversight Committee.

The Oversight Committee approves proposed changes to the Benchmark Methodology including, but not limited to, the structure of the Benchmark, input data used and all aspects of the Calculation Methodology.

The Oversight Committee may direct the Administrator to consult on any changes to the methodology with Stakeholders and the wider market.

7.3. Consultation Process

The Administrator will engage relevant stakeholders and end-users on material changes to the Benchmark Methodology, if required by regulation or where the Oversight Committee requests such consultation.

Changes to the Methodology are deemed material on the basis of an assessment conducted by the Administrator and submitted to the Oversight Committee for advice and feedback.

The Administrator will publish notice of the consultation on its website, inviting feedback from stakeholders and the wider market. Notice of a consultation will be posted at least 1 (one) month prior to the deadline for responses. The notice will include the details of the proposed material change, the timeline and the rationale for the change.

Findings of the consultation process and proposed changes to the Benchmark Methodology, recommended as a result of the consultation, will be presented by the Administrator to the Oversight Committee for its consideration.

Feedback to a consultation is considered confidential, however the Administrator will publish an anonymized summary with its conclusions, as soon as it is practical, but before implementation of any changes.

7.4. Cessation

The Administrator constantly monitors the representativeness of the Benchmark. If the Benchmark is deemed to be unrepresentative of the underlying economic reality due to paucity of input data or systemic changes in the related markets, the Administrator will engage the Oversight Committee at the earliest opportunity. These cessation arrangements are designed to mitigate cessation and transition risks.

The Oversight Committee may direct the Administrator to consult with Stakeholders as described in the [Consultation Process section](#).

As a last resort, if no alternative arrangements are feasible, the Oversight Committee may advise the Administrator to discontinue the Benchmark, providing Stakeholders at least 6 (six) months' notice and assistance to explore alternative reference instruments.

The Administrator will endeavour to identify alternative benchmarks; however, this might not always be possible due to regulation, market conditions or suitable alternatives.

Users of the benchmark are recommended to ensure that they have adequate fallback policies and procedures in the event of the Benchmark becoming unrepresentative of its economic interest.

7.5. Records Retention

The Administrator has in place policies for the retention of any relevant evidence and documentation related to the determination and dissemination of the Benchmark, either in paper or in electronic format, for at least the mandatory term of 5 (five) years.

7.6. Auditing

An internal audit process is undertaken regularly, to ensure adherence to the stated Methodology, the IOSCO principles and regulatory requirements.

External audits can be requested at any time by the Administrator's Board, the Oversight Committee or the internal audit function.

7.7. Data Licensing and Distribution

The Benchmark is made available subject to execution of an Information License Agreement (ILA) together with the appropriate Schedules. Market participants that intend to subscribe to the benchmark should contact the Administrator at the following email address: datasales@cmegroup.com

7.8. Complaints Procedures

The [CME Group EMEA / APAC Complaints Procedures](#) set out details on the management of customer complaints to ensure that they are handed fairly and effectively, in a prompt and transparent manner and in accordance with applicable regulatory requirements.

Complaints will be dealt with by a senior member of staff not directly involved with the benchmark calculation and dissemination.

Information related to complaints will be stored in a restricted access area and kept for a period of at least 5 (five) years following the date when the complaint was first lodged. Complaints can be submitted at internationalcompliance@cmegroup.com

8. Appendix I – Key Terms & Definitions

TERM	DESCRIPTION
Administrator	CME Group Benchmark Administration Limited
BMR	UK Benchmark Regulation (Regulation (EU) 2016/2011, as retained in UK law under the EUWA)
CBA	CME Group Benchmark Administration Limited
OC	Oversight Committee
RTS	Regulatory Technical Standard (in the context of the EU BMR means Regulation (EU) 2018/1643)
TWAP	Time Weighted Average Price
VWAP	Volume Weighted Average Price



