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CME CF Cryptocurrency Reference Rates

Methodology Guide

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1 Version History

Version	Version Date	Changes to Previous
1.0	10th November 2016	N/A
2.0	6th March 2017	Added description of treatment of erroneous data.
3.0	14th May 2018	Generalised methodology to support multiple reference rates.
3.1	24th September 2018	Changed ETH_RR_USD ticker symbol to ETHUSD_RR
4.0	4th January 2019	Parameterisation of Rule 5.3 for different Reference Rates
5.0	16th July 2019	Rebrand to CF Benchmarks
6.0	11th September 2019	Update legal text with BMR registration
7.0	10th February 2020	Change to potentially erroneous data parameter
8.0	20th May 2020	Update copyright year
9.0	31st July 2020	Addition of: • Underlying Economic Reality in Section 2 • Expert Judgement in Section 5 • Methodology Review and Change Section 8
10.0	30th July 2021	Addition of • Section 5.4 – Delayed Calculation & Publication • Section 6 – Republishing & Restatement • Section 7 – Market Failure Events
11.0	28th February 2022	Addition of New York variants: • Section 8 – Reference Rate Parameters • Section 9 – Reference Rate Specifications
12.0	25th April 2022	Addition of Relevant Pairs • Cardano – U.S. Dollar • Solana – U.S. Dollar • Stellar Lumens – U.S. Dollar • Algorand – U.S. Dollar • Bitcoin Cash – U.S. Dollar • Litecoin – U.S. Dollar • Chainlink – U.S. Dollar • Cosmos – U.S. Dollar • Stellar Lumens – U.S. Dollar • Uniswap – U.S. Dollar

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		• Polkadot – U.S. Dollar
13.0	6th June 2022	Addition of Relevant Pairs • Bitcoin - Euro • Ether - Euro
14.0	13th July 2022	Addition of definition and references to Accepted Assets.
15.0	31st October 2022	Addition of Relevant Pairs • Avalanche – U.S. Dollar • Filecoin – U.S. Dollar • Tezos - U.S. Dollar
15.1	19th December 2022	Addition of Relevant Pairs • Aave – U.S. Dollar • Curve – U.S. Dollar • Synthetix - U.S. Dollar
15.2	30th January 2023	Addition of Relevant Pairs • Axie Infinity – U.S. Dollar • Chiliz – U.S. Dollar • Decentraland – U.S. Dollar
15.3	09th May 2023	Update to Contact Information Updates to Dissemination Precision: • CME CF Axie Infinity – Dollar Reference Rate • CME CF Polkadot – Dollar Reference Rate • CME CF Filecoin – Dollar Reference Rate • CME CF Chainlink – Dollar Reference Rate • CME CF Polygon – Dollar Reference Rate • CME CF Uniswap – Dollar Reference Rate
15.4	06th September 2023	Updates to Dissemination Precision: • CME CF Aave-Dollar Reference Rate • CME CF Avalanche-Dollar Reference Rate • CME CF Bitcoin Cash-Dollar Reference Rate • CME CF Litecoin-Dollar Reference Rate • CME CF Polkadot-Dollar Reference Rate • CME CF Filecoin-Dollar Reference Rate • CME CF Synthetix-Dollar Reference Rate • CME CF Solana-Dollar Reference Rate • CME CF Uniswap-Dollar Reference Rate • CME CF Cardano-Dollar Reference Rate • CME CF Chainlink-Dollar Reference Rate • CME CF Decentraland-Dollar Reference Rate • CME CF Tezos-Dollar Reference Rate

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		• CME CF Chiliz-Dollar Reference Rate • CME CF Algorand-Dollar Reference Rate • CME CF Stellar Lumens-Dollar Reference Rate Update to the copyright date
15.5	11th September 2023	Addition of Asia Pacific variants: • Section 8 – Reference Rate Parameters • Section 9 – Reference Rate Specifications
15.6	13th November 2023	Update to logo & format
15.7	20th November 2023	Updated logo (AKC v2)
15.8	08th February 2024	Updates to the Administrator communication procedures for Delayed Calculation & Publication; Calculation Failure; Restatement & Republishing and Market Failure Events
15.9	11th June 2024	Updates to: • Section 8 Potentially Erroneous Data Parameter amended from 10% to 5% • Section 6.1 Restatement & Republishing materiality threshold amended from 0.20% to 0.10%
16.0	17th June 2024	Addition of CME CF Ether – Bitcoin Reference Rate
16.1	29th July 2024	Addition of Relevant Pairs • XRP – U.S. Dollar • Internet Computer – U.S. Dollar
16.2	16th September 2024	Addition of New York variants: • Section 8 – Reference Rate Parameters • Section 9 – Reference Rate Specifications
16.3	04th November 2024	Changes to Tickers for CME CF Polygon-Dollar Reference Rate Update to the copyright date Update to Notice and Disclaimer
16.4	09th December 2024	Addition of a New York variant: • Section 8 – Reference Rate Parameters • Section 9 – Reference Rate Specifications Renamed Ripple to XRP

16.5	14th April 2025	Addition of a New York and Asia Pacific variants:
		• Section 8 – Reference Rate Parameters
		• Section 9 – Reference Rate Specifications
		  ○ CME CF Litecoin-Dollar Reference Rate – New York Variant
		  ○ CME CF Litecoin-Dollar Reference Rate – Asia Pacific Variant

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		○ CME CF Solana-Dollar Reference Rate – Asia Pacific Variant ○ CME CF Cardano-Dollar Reference Rate – Asia Pacific Variant ○ CME CF Chainlink-Dollar Reference Rate – Asia Pacific Variant ○ CME CF XRP-Dollar Reference Rate – Asia Pacific Variant
16.6	09th June 2025	Addition of a new asset pairs and time variants ● Section 8 – Reference Rate Parameters ● Section 9 – Reference Rate Specifications ○ CME CF CME CF Ondo Finance-Dollar Reference Rate ○ CME CF Ondo Finance- Dollar Reference Rate – New York Variant ○ CME CF SUI-Dollar Reference Rate ○ CME CF SUI-Dollar Reference Rate – New York Variant ○ CME CF Arbitrum-Dollar Reference Rate ○ CME CF NEAR-Dollar Reference Rate ○ CME CF Polkadot-Dollar Reference Rate – Asia Pacific Variant
16.7	23rd June 2025	Addition of a new asset pairs and time variants ● Section 8 – Reference Rate Parameters ● Section 9 – Reference Rate Specifications ○ CME CF Bitcoin Cash-Dollar Reference Rate – New York Variant ○ CME CF Avalanche-Dollar Reference Rate – New York Variant ○ CME CF Cardano-Dollar Reference Rate – New York Variant ○ CME CF NEAR-Dollar Reference Rate – New York Variant ○ CME CF Arbitrum-Dollar Reference Rate – New York Variant
16.8	14th July 2025	Updates to Section 8 Potentially Erroneous Data Parameter amended from 25% to 10% to the CME CF Chiliz – Dollar Reference Rate
16.9	01st October 2025	Updates added to Accepted Asset details
17.0	29th December 2025	Addition of a new asset pairs and time variants ● Section 8 – Reference Rate Parameters ● Section 9 – Reference Rate Specifications ○ CME CF Hedera-Dollar Reference Rate

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		○ CME CF Hedera-Dollar Reference Rate – New York ○ CME CF Hedera-Dollar Reference Rate – Asia Pacific Variant ○ CME CF Bittensor-Dollar Reference Rate ○ CME CF Bittensor-Dollar Reference Rate – New York ○ CME CF Bittensor-Dollar Reference Rate – Asia Pacific Variant ○ CME CF Aptos-Dollar Reference Rate ○ CME CF Aptos-Dollar Reference Rate – New York ○ CME CF Aptos-Dollar Reference Rate – Asia Pacific Variant
17.1	22nd February 2026	CF Benchmarks Logo Update
17.2	12th January 2026	Addition of the CME CF Uniswap-Dollar Reference Rate - New York Variant ● Section 8 – Reference Rate Parameters ● Section 9 – Reference Rate Specifications
17.3	08th June 2026	Amendment of the Potentially Erroneous Data Parameter from 25% to 10% for: ● CME CF Near Protocol-Dollar Reference Rate (NEARUSD_RR) ● CME CF NEAR Protocol-Dollar Reference Rate - New York Variant (NEARUSD_NY)
14.4	24th July 2026	Addition of Relevant Pairs ● CME CF Ethena-Dollar Reference Rate - Asia Pacific Variant (ENAUSD_AP) ● CME CF Ethena-Dollar Reference Rate – New York Variant (ENAUSD_NY) ● CME CF Ethena-Dollar Reference Rate (ENAUSD_RR)

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2 Overview

Responding to the need for enhanced pricing information on the rapidly growing cryptocurrency asset class, CME Group and CF Benchmarks have developed standardized cryptocurrency reference rates and real time indices.

Each reference rate and real time index represent transparent indicators with independent governance and oversight and build on our experience to accelerate the professionalization of cryptocurrency trading.

This document covers the CME CF Cryptocurrency Reference Rates. A summary of specifications is provided in Section 9.

Underlying Economic Reality

The CME CF Reference Rates are intended to measure the underlying economic reality of the exchange of the base asset for the quote asset and vice versa. This is accomplished by the use of transactional input from markets that facilitate the trading of the base asset for the quote asset, markets where the quote asset is made fungible with Accepted Assets by the Constituent Exchange as a means of transacting for the base asset including markets where the quote asset is fungible with Accepted Assets on a 1:1 basis, the criteria for eligibility for which are available in the CME CF Constituent Exchange Criteria.

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3 Definitions

Accepted Asset: A digital asset that is a fully reserve backed digital token, commonly referred to as a "stablecoin", that seeks to peg its value to that of the quote asset, where the stablecoin issuer operates a 1:1 redemption facility that is accessible to all Accepted Asset holders. Furthermore, only digital assets that solely hold reserve assets that are In line with the prevailing regulations enforced for government security money market funds in major jurisdiction such as the US, UK and EU. Accepted Assets are subject to the approval of the CME CF Cryptocurrency Oversight Committee in accordance with the CME CF Cryptocurrency Committee Founding Charter.

Accepted Asset List:

Name	Ticker Symbol
USD Coin	USDC

API: Application programming interface.

Calculation Day: Any day for which a CME CF Cryptocurrency Reference Rate is published.

Constituent Exchange: A cryptocurrency trading venue approved by the CME CF Cryptocurrency Indices Oversight Committee to serve as pricing source for the calculation of a CME CF Cryptocurrency Reference Rate.[1]

Relevant Pair: The cryptocurrency base asset versus quote asset pair referenced by a CME CF Cryptocurrency Reference Rate, as defined in Section 8.

Relevant Transaction: Any cryptocurrency base asset versus quote asset spot trade that occurs during[2] the TWAP Period on a Constituent Exchange in the Relevant Pair that is reported through its API to the Calculation Agent.

Retrieval Time: One minute after the end of the TWAP Period on a given Calculation Day, as given by the server clock of the Calculation Agent.

TWAP Period: A period of time equal to the TWAP Period Length leading up to the Effective Time, as defined in Section 8.

[1] Constituent Exchanges and the criteria for inclusion are published on the Administrator's website https://www.cfbenchmarks.com.

[2] Exclusive of start time but inclusive of end time when truncated to millisecond precision

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4 Methodology and Rules

4.1 Methodology

4.1.1 Qualitative Description

CME CF Cryptocurrency Reference Rates are calculated based on the Relevant Transactions of all Constituent Exchanges. Calculation steps on any given Calculation Day are as follows:

1. All Relevant Transactions are added to a joint list, recording the trade price and size for each transaction.
2. The list is partitioned[3] into a number of equally-sized time intervals, as specified in Section 8.
3. For each partition separately, the volume-weighted median trade price is calculated from the trade prices and sizes of all Relevant Transactions, i.e. across all Constituent Exchanges. A volume-weighted median differs from a standard median in that a weighting factor, in this case trade size, is factored into the calculation.
4. The CME CF Cryptocurrency Reference Rate is then given by the equally-weighted average of the volume-weighted medians of all partitions.

4.1.2 Mathematical Representation

The following table shows the symbols used in the mathematical representation of CME CF Cryptocurrency Reference Rates.

Symbol	Name	Description	Type

[3] Trades are added to a partition exclusive of partition start time and inclusive of partition end time when truncated to millisecond precision.

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$\boldsymbol{T}$	Effective time	The time as of which a CME CF Cryptocurrency Reference Rate is calculated	Parameter, see Section 8
$\boldsymbol{\tau}$	TWAP period length	The length of the time-period prior to the effective time during which transaction data is collected	Parameter, see Section 8
$\hat{\boldsymbol{\tau}}$ with $\hat{\tau} \leq \tau$ and $\hat{\tau} \mid \tau$	Partition length	The length of the time periods into which the TWAP period length is partitioned	Parameter, see Section 8
$\boldsymbol{K}$	Number of partitions	The number of partitions, given by $K = \tau/\hat{\tau}$	Output
$\boldsymbol{k}$ with $k \in (1, \ldots, K)$	Partition	The kth partition	Output
$\boldsymbol{X_k}$ for $k \in (1, \ldots, K)$	TWAP period trades	The price-ordered collection of price / size trade pairs observed in the Relevant Pair on all Constituent Exchanges in the kth partition, i.e. between times $T - \tau + (k-1)$ and $T - \tau + k$	Input
$\boldsymbol{I_k}$	TWAP period trades count	The number of trades in the kth partition	Output
$x_{k,i}$ with $x_{k,i} = (p_{k,i}, s_{k,i})$ and $x_{k,i} \in X_k$	TWAP period trade	The ith price / size trade pair of the kth partition	Input
$\boldsymbol{p_{k,i}}$	TWAP period trade price	The price of the ith price/size trade pair of the kth partition	Input
$\boldsymbol{s_{k,i}}$	TWAP period trade size	The size of the ith price/size trade pair of $the\ kth\ partition$	Input
$\boldsymbol{WM_k}$	Weighted median	The weighted median trade price of the kth partition	Output
$\boldsymbol{CCRR_T}$	CCRR	The CME CF Cryptocurrency Reference Rate at time T	Output

For each partition k, the volume-weighted median trade prices WM_k across all Relevant Transactions is calculated as:

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$$WM_k = p_{k,j} \text{ where } j \text{ satisfies } \sum_{i=1}^{j-1} s_{k,i} < \frac{1}{2}\sum_{i=1}^{I_k} s_{k,i} \text{ and } \sum_{i=j+1}^{I_k} s_{k,i} \leq \frac{1}{2}\sum_{i=1}^{I_k} s_{k,i}$$

$$\text{If } s_{k,1} \geq \frac{1}{2}\sum_{i=1}^{I_k} s_{k,i} \text{ then } WM_k = p_{k,1}$$

$$\text{If } \sum_{i=j+1}^{I_k} s_{k,i} = \frac{1}{2}\sum_{i=1}^{I_k} s_{k,i}, \text{ then } WM_k = \frac{p_{k,j} + p_{k,j+1}}{2}$$

Eq. 1

The CME CF Cryptocurrency Reference Rate as of the effective time T, $CCRR_T$, is then given by:

$$CCRR_T = \frac{1}{K}\sum_{k=1}^{K} WM_k$$

Eq. 2

4.2 A Note on Properties

The calculation methodology immunizes CME CF Cryptocurrency Reference Rates to a high degree against price anomalies, while being replicable though spot trading on Constituent Exchanges. This is achieved through the following design choices:

Partitions

CME CF Cryptocurrency Reference Rates are calculated as the equally-weighted average of the intermediate calculation steps for the K partitions. A single large trade or cluster of trades occurring in any one partition will therefore only have a limited effect on CME CF Cryptocurrency Reference Rates.

Weighting of Partitions

Partitions are equally-weighted (as opposed to volume-weighted) to facilitate replication of CME CF Cryptocurrency Reference Rates through trading on Constituent Exchanges. Assuming K partitions, a trader aiming to transact Y units of the relevant cryptocurrency at the CME CF Cryptocurrency Reference Rates can do so with little tracking error by transacting Y/K units of the cryptocurrency during each partition.

Medians

Spot prices have historically varied considerably across trading venues, in particular during times of high volatility. The use of medians to calculate the weighted median trade price for each partition (as opposed to averages) greatly reduces CME CF Cryptocurrency Reference Rates' susceptibility to price extremes on one or more Constituent Exchanges.

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Volume-Weighting of Medians

Trading is driven to some extent by automated algorithms that may execute a high number of small trades. The use of volume-weighted medians to calculate the weighted median trade price for each partition (as opposed to simple medians) assures that CME CF Cryptocurrency Reference Rates appropriately reflect large trades and that whether an order is executed in parts or in full has no effect on calculation results.

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5 Contingency Calculation Rules

5.1 Delayed Data and Missing Data

Delayed data and missing data are treated according to the following rules:

1. Any Relevant Transaction for a given Calculation Day that is not available from a Constituent Exchange's API by the Retrieval Time is disregarded in the calculation of the CME CF Cryptocurrency Reference Rate for that Calculation Day.

2. If no Relevant Transaction occurs on a Constituent Exchange on a given Calculation Day or one or more Relevant Transactions occur but for any reason cannot be retrieved by the Calculation Agent, the Constituent Exchange is disregarded in the calculation of the CME CF Cryptocurrency Reference Rate for that Calculation Day.

3. If, for any of the K partitions of the TWAP Period, no Relevant Transaction occurs on any Constituent Exchange or one or more Relevant Transactions occur but for any reason cannot be retrieved by the Calculation Agent, the partition remains empty and will be disregarded in the calculation of the CME CF Cryptocurrency Reference Rate for that Calculation Day. The denominator in Eq. 2 will then be decremented by the number of empty partitions.

4. If one or more Relevant Transactions occur but for any reason no Relevant Transaction can be retrieved from any Constituent Exchange API by the Calculation Agent, a CME CF Cryptocurrency Reference Rate calculation failure occurs for that Calculation Day (see Section 5.6).

5. If no Relevant Transactions occur on any Constituent Exchange on a given Calculation Day then a CME CF Cryptocurrency Reference Rate Market Failure Event will be deemed to have occurred (see Section 7)

5.2 Erroneous Data

All Relevant Transactions retrieved by the Calculation Agent for a given Calculation Day are subject to an automated screening for erroneous data according to the following rules:

1. If a Relevant Transaction shows a non-numeric or non-positive trade price or trade size, it is flagged as erroneous.

2. If a Relevant Transaction is reported in a format that deviates from the expected format such that it cannot be parsed, it is flagged as erroneous.

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3. If a Relevant Transaction shows an execution time more than one minute in the future of the Calculation Agent's clock, it is flagged as erroneous.

Relevant Transactions flagged as erroneous for a given Calculation Day are disregarded in the calculation of the CME CF Cryptocurrency Reference Rate for that Calculation Day.

If all Relevant Transactions of all Constituent Exchanges are flagged as erroneous for a given Calculation Day, a CME CF Cryptocurrency Reference Rate calculation failure occurs for that Calculation Day (see Section 5.6).

5.3 Potentially Erroneous Data

All Relevant Transactions retrieved by the Calculation Agent for a given Calculation Day are subject to an automated screening for potentially erroneous data according to the following rules:

1. For each Constituent Exchange individually, the volume-weighted median trade price across all Relevant Transactions of that Constituent Exchange is calculated.

2. For each Constituent Exchange, the absolute percentage deviation of the volume-weighted median trade price, as calculated in the previous step, from the median of the volume-weighted median trade prices of all Constituent Exchanges is calculated.

3. If for any Constituent Exchange the absolute percentage deviation, as calculated in the previous step, exceeds the Potentially Erroneous Data Parameter for the respective Reference Rate represented in Reference Rate Parameters (see section 6) then all Relevant Transactions of that Constituent Exchange for the affected Reference Rate are flagged as potentially erroneous.

Relevant Transactions flagged as potentially erroneous for a given Calculation Day are disregarded in the calculation of the CME CF Cryptocurrency Reference Rate for that Calculation Day. The occurrence of any such flag is reported to the Oversight Committee.

If all Relevant Transactions of all Constituent Exchanges are flagged as potentially erroneous for a given Calculation Day, a CME CF Cryptocurrency Reference Rate calculation failure occurs for that Calculation Day (see Section 5.6).

5.4 Delayed Calculation & Publication

Where for any reason the Administrator is not able to calculate and publish a CME CF Cryptocurrency Reference Rate within the Dissemination Time on any given Calculation Day then the Administrator shall clearly communicate to all licensees via Statuspage that calculation and publication has been delayed. The Administrator will seek to publish the

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CME CF Cryptocurrency Reference Rate for that Calculation Day as soon as it is able to. Should the Administrator not be able to calculate and publish a CME CF Cryptocurrency Reference Rate by 23:59:59 London time then the provisions of Rule 5.6 shall come into effect.

5.5 Expert Judgement

The Administrator does not utilise expert judgment in the day-to-day calculation of the Reference Rates. In extraordinary circumstances Expert Judgement may be exercised by the Administrator in accordance with its codified policies and processes which are available upon request.

5.6 Calculation Failure

If a CME CF Cryptocurrency Reference Rate cannot be calculated for a given Calculation Day before 23:59:59 London time, for instance because:

- no Relevant Transaction occurs on any Constituent Exchange on that Calculation Day, or
- one or more Relevant Transactions occur but for any reason cannot be retrieved by the Calculation Agent, or
- all Relevant Transactions retrieved by the Calculation Agent are flagged as erroneous or potentially erroneous (see Section 5.2); or
- any or all of the Reference Rates utilised in the calculation of a Ratio Reference Rate (a Ratio Reference Rate being a Reference Rate that is calculated as the ratio of two other Reference Rates) cannot be calculated, or
- any other reason or circumstance that prevents the orderly calculation of a CME CF Cryptocurrency Reference Rate,

then the CME CF Cryptocurrency Reference Rate for that Calculation Day is given by the CME CF Cryptocurrency Reference Rate published on the previous Calculation Day and this Reference Rate value shall be published with a marker of (*)

The occurrence of any CME CF Cryptocurrency Reference Rate calculation failure is reported to the Oversight Committee. Any Calculation Failure events will be clearly communicated to all licensees via Statuspage.

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6 Restatement & Republishing

The CME CF Cryptocurrency Reference are subject to restatement and republishing before 23:59:59 London time of any given Calculation Day due to errors made by the Calculation Agent or its systems. CME CF Cryptocurrency Reference Rates will not be subject to republishing after this time.

6.1 Restatement of a CME CF Cryptocurrency Reference Rate Value with a Replacement CME CF Cryptocurrency Reference Rate Value

The Administrator shall only Restate and Republish CME CF Cryptocurrency Reference Rate if both the below conditions are met:

1. **Timeliness** – where the Administrator can **RESTATE** and **REPUBLISH** a CME Cryptocurrency Reference Rate value before 23:59:59 of the given Calculation Day

2. **Materiality** – where the **RESTATED** CME CF Cryptocurrency Reference Rate has an absolute variance greater than **0.10%** for the respective CME CF Cryptocurrency Reference Rate for the given Calculation Day

Example:

- A CME CF Cryptocurrency Reference Rate on a given Calculation Day is published as **1234.56**

- A CME CF Cryptocurrency Reference Rate will only be **RESTATED** if it is:
    - Greater than **1235.79**

    OR

    - Less than **1233.33**

Where the above conditions are met the Administrator shall clearly communicate to all licensees via Statuspage that a restatement and republishing of the CME CF Cryptocurrency Reference Rate will take place for that Calculation Day.

The Administrator shall restate the impacted CME CF Cryptocurrency Reference Rate as soon as possible and shall do so by overwriting the previously published CME CF Cryptocurrency Reference Rate. This restated CME CF Cryptocurrency Reference Rate will carry no mark when published and will be final and not subject to any further change or republication.

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7 Market Failure Event

Where a Market Failure Event has occurred, this shall be clearly communicated to all licensees via Statuspage. The CME CF Cryptocurrency Reference Rate on a day where a Market Failure Event has occurred shall be given by the CME CF Cryptocurrency Reference Rate published for the previous Calculation Day. Any CME CF Cryptocurrency Reference Rate published on a day when a Market Failure Event has occurred shall be marked by a maker (*).

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8 Reference Rate Parameters

The following table summarizes the parameters for the currently supported CME CF Cryptocurrency Reference Rates:

	CME CF Bitcoin Reference Rate	CME CF Ether – Dollar Reference Rate	CME CF Bitcoin Reference Rate New York Variant	CME CF Ether – Dollar Reference Rate
Ticker Symbol	BRR	ETHUSD_RR	BRRNY	ETHUSD_NY
Relevant Pair	Bitcoin vs. U.S. Dollars	Ether vs. U.S. Dollars	Bitcoin vs. U.S. Dollars	Ether vs. U.S. Dollars
Effective Time (T)	4:00 p.m. London Time	4:00 p.m. London Time	4:00 p.m. New York Time	4:00 p.m. New York Time
TWAP Period Length (τ)	60 minutes	60 minutes	60 minutes	60 minutes
TWAP Period	3:00pm to 4:00 pm London time		3:00pm to 4:00 pm New York time	
Partition Length $(\hat{\tau})$	5 minutes	5 minutes	5 minutes	5 minutes
Number of Partitions (K)	12	12	12	12
Potentially Erroneous Data	5%	5%	5%	5%

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	CME CF Bitcoin Cash – Dollar Reference Rate	CME CF Litecoin – Dollar Reference Rate	CME CF Algorand – Dollar Reference Rate	CME CF Cardano – Dollar Reference Rate
Ticker Symbol	BCHUSD_RR	LTCUSD_RR	ALGOUSD_RR	ADAUSD_RR
Relevant Pair	Bitcoin Cash vs. U.S. Dollars	Litecoin vs. U.S. Dollars	Algorand vs. U.S. Dollars	Cardano vs. U.S. Dollars
Effective Time *(T)*	4:00 p.m. London time	4:00 p.m. London Time	4:00 p.m. London Time	4:00 p.m. London Time
TWAP Period Length *(τ)*	60 minutes	60 minutes	60 minutes	60 minutes
TWAP Period	3:00pm to 4:00 pm London time			
Partition Length *($\hat{\tau}$)*	5 minutes	5 minutes	5 minutes	5 minutes
Number of Partitions *(K)*	12	12	12	12
Potentially Erroneous Data	5%	5%	5%	5%

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	CME CF Solana – Dollar Reference Rate	CME CF Polkadot – Dollar Reference Rate	CME CF Chainlink – Dollar Reference Rate	CME CF Cosmos – Dollar Reference Rate
Ticker Symbol	SOLUSD_RR	DOTUSD_RR	LINKUSD_RR	ATOMUSD_RR
Relevant Pair	Bitcoin vs. U.S. Dollars	Polkadot vs. U.S. Dollars	Chainlink vs. U.S. Dollars	Cosmos vs. U.S. Dollars
Effective Time *(T)*	4:00 p.m. London time	4:00 p.m. London time	4:00 p.m. London Time	4:00 p.m. London time
TWAP Period Length *(τ)*	60 minutes	60 minutes	60 minutes	60 minutes
TWAP Period	3:00pm to 4:00 pm London time			
Partition Length *($\hat{\tau}$)*	5 minutes	5 minutes	5 minutes	5 minutes
Number of Partitions *(K)*	12	12	12	12
Potentially Erroneous Data	5%	5%	5%	5%

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	CME CF Uniswap – Dollar Reference Rate	CME CF Stellar Lumens – Dollar Reference Rate	CME CF Polygon – Dollar Reference Rate	CME CF Bitcoin – Euro Reference Rate
Ticker Symbol	UNIUSD_RR	XLMUSD_RR	POLUSD_RR	BTCEUR_RR
Relevant Pair	Uniswap vs. U.S. Dollars	Stellar Lumens vs. U.S. Dollars	Polygon vs. U.S. Dollars	Bitcoin vs. U.S. Euros
Effective Time *(T)*	4:00 p.m. London time	4:00 p.m. London time	4:00 p.m. London time	4:00 p.m. London Time
TWAP Period Length *(τ)*	60 minutes	60 minutes	60 minutes	60 minutes
TWAP Period	3:00pm to 4:00 pm London time			
Partition Length *($\hat{\tau}$)*	5 minutes	5 minutes	5 minutes	5 minutes
Number of Partitions *(K)*	12	12	12	12
Potentially Erroneous Data	5%	5%	5%	5%

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	CME CF Ether – Euro Reference Rate	CME CF Avalanche – Dollar Reference Rate	CME CF Filecoin – Dollar Reference Rate	CME CF Tezos – Dollar Reference Rate
Ticker Symbol	ETHEUR_RR	AVAXUSD_RR	FILUSD_RR	XTZUSD_RR
Relevant Pair	Ether vs. Euros	Avalanche vs. U.S. Dollars	Filecoin vs. U.S. Dollars	Tezos vs. U.S. Dollars
Effective Time *(T)*	4:00 p.m. London Time	4:00 p.m. London time	4:00 p.m. London Time	4:00 p.m. London Time
TWAP Period Length *(τ)*	60 minutes	60 minutes	60 minutes	60 minutes
TWAP Period	3:00pm to 4:00 pm London time			
Partition Length *($\hat{\tau}$)*	5 minutes	5 minutes	5 minutes	5 minutes
Number of Partitions *(K)*	12	12	12	12
Potentially Erroneous Data	5%	5%	5%	5%

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	CME CF Aave – Dollar Reference Rate	CME CF Curve – Dollar Reference Rate	CME CF Synthetix – Dollar Reference Rate	CME CF Axie Infinity-Dollar Reference Rate
Ticker Symbol	AAVEUSD_RR	CRVUSD_RR	SNXUSD_RR	AXSUSD_RR
Relevant Pair	Aave vs. U.S. Dollars	Curve vs. U.S. Dollars	Synthetix vs. U.S. Dollars	Axie Infinity vs. U.S. Dollars
Effective Time *(T)*	4:00 p.m. London Time	4:00 p.m. London time	4:00 p.m. London Time	4:00 p.m. London Time
TWAP Period Length *(τ)*	60 minutes	60 minutes	60 minutes	60 minutes
TWAP Period	3:00pm to 4:00 pm London time			
Partition Length *($\hat{\tau}$)*	5 minutes	5 minutes	5 minutes	5 minutes
Number of Partitions *(K)*	12	12	12	12
Potentially Erroneous Data	5%	5%	5%	5%

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	CME CF Chiliz – Dollar Reference Rate	CME CF Decentraland - Dollar Reference Rate	CME CF Bitcoin Reference Rate - Asia Pacific Variant	CME CF Ether – Dollar Reference Rate - Asia Pacific Variant	CME CF Ether – Bitcoin Reference Rate
Ticker Symbol	CHZUSD_RR	MANAUSD_RR	BRRAP	ETHUSD_AP	ETHBTC_USDRR
Relevant Pair	Chiliz vs. U.S. Dollars	Decentraland vs. U.S. Dollars	Bitcoin vs. U.S. Dollars	Ether vs. U.S. Dollars	Ether vs. Bitcoin
Effective Time *(T)*	4:00 p.m. London Time	4:00 p.m. London Time	4:00 p.m. Hong Kong Time	4:00 p.m. Hong Kong Time	4:00 p.m. London Time
TWAP Period Length *(τ)*	60 minutes	60 minutes	60 minutes	60 minutes	Calculated as the ratio of the CME CF Ether-Dollar Reference Rate and the CME CF Bitcoin Reference Rate
TWAP Period	3:00pm to 4:00 pm London time		3:00pm to 4:00 pm Hong Kong time		
Partition Length *($\hat{\tau}$)*	5 minutes	5 minutes	5 minutes	5 minutes	
Number of Partitions *(K)*	12	12	12	12	
Potentially Erroneous Data	10%	5%	5%	5%	

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	CME CF Litecoin-Dollar Reference Rate – New York Variant	CME CF XRP-Dollar Reference Rate	CME CF Internet Computer-Dollar Reference Rate
Ticker Symbol	LTCUSD_NY	XRPUSD_RR	ICPUSD_RR
Relevant Pair	Litecoin vs. U.S. Dollars	XRP vs. U.S. Dollars	Internet Computer vs. U.S. Dollars
Effective Time (T)	4:00 p.m. New York time	4:00 p.m. London Time	4:00 p.m. London Time
TWAP Period Length (τ)	60 minutes	60 minutes	60 minutes
TWAP Period	3:00pm to 4:00 pm New York time	3:00pm to 4:00 pm London time	
Partition Length $(\hat{\tau})$	5 minutes	5 minutes	5 minutes
Number of Partitions (K)	12	12	12
Potentially Erroneous Data	5%	10%	10%

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	CME CF Solana – Dollar Reference Rate – New York Variant	CME CF Chainlink – Dollar Reference Rate – New York Variant	CME CF Polygon – Dollar Reference Rate – New York Variant	CME CF XRP-Dollar Reference Rate – New York Variant	CME CF Polkadot – Dollar Reference Rate – New York Variant
Ticker Symbol	SOLUSD_NY	LINKUSD_NY	POLUSD_NY	XRPUSD_NY	DOTUSD_NY
Relevant Pair	Solana vs. U.S. Dollars	Chainlink vs. U.S. Dollars	Polygon vs. U.S. Dollars	XRP vs. U.S. Dollars	Polkadot vs. U.S. Dollars
Effective Time *(T)*	4:00 p.m. New York Time	4:00 p.m. New York Time	4:00 p.m. New York Time	4:00 p.m. New York Time	4:00 p.m. New York Time
TWAP Period Length *(τ)*	60 minutes	60 minutes	60 minutes	60 minutes	60 minutes
TWAP Period	3:00pm to 4:00 pm New York time				
Partition Length *($\hat{\tau}$)*	5 minutes	5 minutes	5 minutes	5 minutes	5 minutes
Number of Partitions *(K)*	12	12	12	12	12
Potentially Erroneous Data	5%	5%	5%	5%	5%

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	CME CF Litecoin-Dollar Reference Rate – Asia Pacific Variant	CME CF Solana -Dollar Reference Rate – Asia Pacific Variant	CME CF Cardano -Dollar Reference Rate – Asia Pacific Variant	CME CF Chainlink -Dollar Reference Rate – Asia Pacific Variant	CME CF XRP-Dollar Reference Rate – Asia Pacific Variant
Ticker Symbol	LTCUSD_AP	SOLUSD_AP	ADAUSD_AP	LINKUSD_AP	XRPUSD_AP
Relevant Pair	Solana vs. U.S. Litecoin	Solana vs. U.S. Dollars	Cardano vs. U.S. Dollars	Chainlink vs. U.S. Dollars	XRP vs. U.S. Dollars
Effective Time *(T)*	4:00 p.m. Hong Kong Time	4:00 p.m. Hong Kong Time	4:00 p.m. Hong Kong Time	44:00 p.m. Hong Kong Time	4:00 p.m. Hong Kong Time
TWAP Period Length *(τ)*	60 minutes	60 minutes	60 minutes	60 minutes	60 minutes
TWAP Period	3:00pm to 4:00 pm Hong Kong time				
Partition Length *($\hat{\tau}$)*	5 minutes	5 minutes	5 minutes	5 minutes	5 minutes
Number of Partitions *(K)*	12	12	12	12	12
Potentially Erroneous Data	5%	5%	5%	5%	5%

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	CME CF Polkadot-Dollar Reference Rate – Asia Pacific Variant	CME CF Ondo Finance- Dollar Reference Rate	CME CF Ondo Finance- Dollar Reference Rate – New York Variant	CME CF SUI-Dollar Reference Rate
Ticker Symbol	DOTUSD_AP	ONDOUSD_RR	ONDOUSD_NY	SUIUSD_RR
Relevant Pair	Polkadot vs. U.S. Dollars	Ondo Finance vs. U.S. Dollars	Ondo Finance vs. U.S. Dollars	SUI vs. U.S. Dollars
Effective Time *(T)*	4:00 p.m. Hong Kong time	4:00 p.m. London Time	4:00 p.m. New York time	4:00 p.m. London Time
TWAP Period Length *(τ)*	60 minutes	60 minutes	60 minutes	60 minutes
TWAP Period	3:00pm to 4:00 pm Hong Kong time	3:00pm to 4:00 pm London time	3:00pm to 4:00 pm New York time	3:00pm to 4:00 pm London time
Partition Length *($\hat{\tau}$)*	5 minutes	5 minutes	5 minutes	5 minutes
Number of Partitions *(K)*	12	12	12	12
Potentially Erroneous Data	5%	10%	10%	10%

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	CME CF SUI- Dollar Reference Rate – New York Variant	CME CF Arbitrum- Dollar Reference Rate	CME CF NEAR- Dollar Reference Rate
Ticker Symbol	SUIUSD_NY	ARBUSD_RR	NEARUSD_RR
Relevant Pair	SUI vs. U.S. Dollars	Arbitrum vs. U.S. Dollars	NEAR vs. U.S. Dollars
Effective Time *(T)*	4:00 p.m. New York time	4:00 p.m. London Time	4:00 p.m. London Time
TWAP Period Length *(τ)*	60 minutes	60 minutes	60 minutes
TWAP Period	3:00pm to 4:00 pm New York time	3:00pm to 4:00 pm London time	3:00pm to 4:00 pm London time
Partition Length *($\hat{\tau}$)*	5 minutes	5 minutes	5 minutes
Number of Partitions *(K)*	12	12	12
Potentially Erroneous Data	10%	10%	10%

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	CME CF Stellar Lumens-Dollar Reference Rate – New York Variant	CME CF Bitcoin Cash-Dollar Reference Rate – New York Variant	CME CF Avalanche-Dollar Reference Rate – New York Variant
Ticker Symbol	XLMUSD_NY	BCHUSD_NY	AVAXUSD_NY
Relevant Pair	Stellar Lumens vs. U.S. Dollars	Bitcoin Cash vs. U.S. Dollars	Avalanche vs. U.S. Dollars
Effective Time *(T)*	4:00 p.m. New York time	4:00 p.m. New York time	4:00 p.m. New York time
TWAP Period Length *(τ)*	60 minutes	60 minutes	60 minutes
TWAP Period	3:00pm to 4:00 pm New York time	3:00pm to 4:00 pm New York time	3:00pm to 4:00 pm New York time
Partition Length *($\hat{\tau}$)*	5 minutes	5 minutes	5 minutes
Number of Partitions *(K)*	12	12	12
Potentially Erroneous Data	5%	5%	5%

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	CME CF Cardano-Dollar Reference Rate – New York Variant	CME CF NEAR-Dollar Reference Rate – New York Variant	CME CF Arbitrum-Dollar Reference Rate – New York Variant
Ticker Symbol	ADAUSD_NY	NEARUSD_NY	ARBUSD_NY
Relevant Pair	Cardano vs. U.S. Dollars	NEAR vs. U.S. Dollars	Arbitrum vs. U.S. Dollars
Effective Time *(T)*	4:00 p.m. New York time	4:00 p.m. London Time	4:00 p.m. London Time
TWAP Period Length *(τ)*	60 minutes	60 minutes	60 minutes
TWAP Period	3:00pm to 4:00 pm New York time	3:00pm to 4:00 pm London time	3:00pm to 4:00 pm London time
Partition Length *($\hat{\tau}$)*	5 minutes	5 minutes	5 minutes
Number of Partitions *(K)*	12	12	12
Potentially Erroneous Data	5%	10%	25%

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	CME CF Hedera-Dollar Reference Rate	CME CF Hedera-Dollar Reference Rate – New York	CME CF Hedera-Dollar Reference Rate – Asia Pacific Variant
Ticker Symbol	HBARUSD_RR	HBARUSD_NY	HBARUSD_AP
Relevant Pair	Hedera vs. U.S. Dollars	Hedera vs. U.S. Dollars	Hedera vs. U.S. Dollars
Effective Time *(T)*	4:00 p.m. London time	4:00 p.m. New York time	4:00 p.m. Hong Kong time
TWAP Period Length *(τ)*	60 minutes	60 minutes	60 minutes
TWAP Period	3:00pm to 4:00 pm London time	3:00pm to 4:00 pm New York time	3:00pm to 4:00 pm Hong Kong time
Partition Length *($\hat{\tau}$)*	5 minutes	5 minutes	5 minutes
Number of Partitions *(K)*	12	12	12
Potentially Erroneous Data	10%	10%	10%

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	CME CF Bittensor-Dollar Reference Rate	CME CF Bittensor-Dollar Reference Rate – New York	CME CF Bittensor-Dollar Reference Rate – Asia Pacific Variant
Ticker Symbol	TAOUSD_RR	TAOUSD_NY	TAOUSD_AP
Relevant Pair	Bittensor vs. U.S. Dollars	Bittensor vs. U.S. Dollars	Bittensor vs. U.S. Dollars
Effective Time *(T)*	4:00 p.m. New York Time	4:00 p.m. London Time	4:00 p.m. Hong Kong Time
TWAP Period Length *(τ)*	60 minutes	60 minutes	60 minutes
TWAP Period	3:00pm to 4:00 pm London time	3:00pm to 4:00 pm New York time	3:00pm to 4:00 pm Hong Kong time
Partition Length *($\hat{\tau}$)*	5 minutes	5 minutes	5 minutes
Number of Partitions *(K)*	12	12	12
Potentially Erroneous Data	10%	10%	10%

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	CME CF Aptos-Dollar Reference Rate	CME CF Aptos-Dollar Reference Rate – New York	CME CF Aptos-Dollar Reference Rate – Asia Pacific Variant	CME CF Uniswap-Dollar Reference Rate - New York Variant
Ticker Symbol	APTUSD_RR	APTUSD_NY	APTUSD_AP	UNIUSD_NY
Relevant Pair	Aptos vs. U.S. Dollars	Aptos vs. U.S. Dollars	Aptos vs. U.S. Dollars	Uniswap vs. U.S. Dollars
Effective Time *(T)*	4:00 p.m. London time	4:00 p.m. New York time	4:00 p.m. Hong Kong time	4:00 p.m. New York time
TWAP Period Length *(τ)*	60 minutes	60 minutes	60 minutes	60 minutes
TWAP Period	3:00pm to 4:00 pm London time	3:00pm to 4:00 pm New York time	3:00pm to 4:00 pm Hong Kong time	3:00pm to 4:00 pm New York time
Partition Length *($\hat{\tau}$)*	5 minutes	5 minutes	5 minutes	5 minutes
Number of Partitions *(K)*	12	12	12	12
Potentially Erroneous Data	10%	10%	10%	5%

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	CME CF Ethena-Dollar Reference Rate - Asia Pacific Variant	CME CF Ethena-Dollar Reference Rate – New York Variant	CME CF Ethena-Dollar Reference Rate
Ticker Symbol	ENAUSD_AP	ENAUSD_NY	ENAUSD_AP
Relevant Pair	Ethena vs. U.S. Dollars	Ethena vs. U.S. Dollars	Ethena vs. U.S. Dollars
Effective Time *(T)*	4:00 p.m. Hong Kong Time	4:00 p.m. New York Time	4:00 p.m. London Time
TWAP Period Length *(τ)*	60 minutes	60 minutes	60 minutes
TWAP Period	3:00pm to 4:00 pm Hong Kong time	3:00pm to 4:00 pm New York time	3:00pm to 4:00 pm London time
Partition Length *($\hat{\tau}$)*	5 minutes	5 minutes	5 minutes
Number of Partitions *(K)*	12	12	12
Potentially Erroneous Data	10%	10%	10%

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9 Reference Rate Specifications

	CME CF Bitcoin Reference Rate	CME CF Ether – Dollar Reference Rate	CME CF Bitcoin Reference Rate New York Variant	CME CF Ether – Dollar Reference Rate New York Variant
Administrator	CF Benchmarks Ltd			
Calculation Agent	CF Benchmarks Ltd			
Description	U.S. Dollar price of one Bitcoin as of 4:00 p.m. London time	U.S. Dollar price of one Ether as of 4:00 p.m. London time	U.S. Dollar price of one Bitcoin as of 4:00 p.m. New York time	U.S. Dollar price of one Ether as of 4:00 p.m. New York time
Calculation Methodology	Aggregation of trade executions occurring on Constituent Exchanges between during the TWAP period.			
Dissemination Time	Once per day, every day of the year including weekends and holidays, between 4:00 p.m. and 4:30 p.m. London time		Once per day, every day of the year including weekends and holidays, between 4:00 p.m. and 4:30 p.m. New York time	
Dissemination Precision	0.01 U.S. Dollars	0.01 U.S. Dollars	0.01 U.S. Dollars	0.01 U.S. Dollars

	CME CF Bitcoin Cash – Dollar Reference Rate	CME CF Litecoin – Dollar Reference Rate	CME CF Algorand – Dollar Reference Rate	CME CF Cardano – Dollar Reference Rate
Administrator	CF Benchmarks Ltd			
Calculation Agent	CF Benchmarks Ltd			
Description	U.S. Dollar price of one Bitcoin cash as of 4:00 p.m. London time	U.S. Dollar price of one Litecoin as of 4:00 p.m. London time	U.S. Dollar price of one Algorand as of 4:00 p.m. London time	U.S. Dollar price of one Cardano as of 4:00 p.m. Lonodn time
Calculation Methodology	Aggregation of trade executions occurring on Constituent Exchanges between during the TWAP period.			
Dissemination Time	Once per day, every day of the year including weekends and holidays, between 4:00 p.m. and 4:30 p.m. London time			
Dissemination Precision	0.001 U.S. Dollars	0.0001 U.S. Dollars	0.000001 U.S. Dollars	0.000001 U.S. Dollars

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	CME CF Solana – Dollar Reference Rate	CME CF Polkadot – Dollar Reference Rate	CME CF Chainlink – Dollar Reference Rate	CME CF Cosmos – Dollar Reference Rate
Administrator	CF Benchmarks Ltd			
Calculation Agent	CF Benchmarks Ltd			
Description	U.S. Dollar price of one Solana as of 4:00 p.m. London time	U.S. Dollar price of one Polkadot as of 4:00 p.m. London time	U.S. Dollar price of one Chainlink as of 4:00 p.m. London time	U.S. Dollar price of one Cosmos as of 4:00 p.m. London time
Calculation Methodology	Aggregation of trade executions occurring on Constituent Exchanges between during the TWAP period.			
Dissemination Time	Once per day, every day of the year including weekends and holidays, between 4:00 p.m. and 4:30 p.m. London time			
Dissemination Precision	0.0001 U.S. Dollars	0.00001 U.S. Dollars	0.00001 U.S. Dollars	0.001 U.S. Dollars

	CME CF Uniswap – Dollar Reference Rate	CME CF Stellar Lumens – Dollar Reference Rate	CME CF Polygon – Dollar Reference Rate	CME CF Bitcoin – Euro Reference Rate
Administrator	CF Benchmarks Ltd			
Calculation Agent	CF Benchmarks Ltd			
Description	U.S. Dollar price of one Uniswap as of 4:00 p.m. London time	U.S. Dollar price of one Stellar Lumens as of 4:00 p.m. London time	U.S. Dollar price of one Polygon as of 4:00 p.m. London time	Euro price of one Bitcoin as of 4:00 p.m. London time
Calculation Methodology	Aggregation of trade executions occurring on Constituent Exchanges between during the TWAP period.			
Dissemination Time	Once per day, every day of the year including weekends and holidays, between 4:00 p.m. and 4:30 p.m. London time			
Dissemination Precision	0.00001 U.S. Dollars	0.0000001 U.S. Dollars	0.0001 U.S. Dollars	0.01 Euros

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	CME CF Ether – Euro Reference Rate	CME CF Avalanche – Dollar Reference Rate	CME CF Filecoin – Dollar Reference Rate	CME CF Tezos – Dollar Reference Rate
Administrator	CF Benchmarks Ltd			
Calculation Agent	CF Benchmarks Ltd			
Description	Euro price of one Ether as of 4:00 p.m. London time	U.S. Dollar price of one Avalanche as of 4:00 p.m. London time	U.S. Dollar price of one Filecoin as of 4:00 p.m. London time	U.S. Dollar price of one Tezos as of 4:00 p.m. London time every day
Calculation Methodology	Aggregation of trade executions occurring on Constituent Exchanges between during the TWAP period.			
Dissemination Time	Once per day, every day of the year including weekends and holidays, between 4:00 p.m. and 4:30 p.m. London time			
Dissemination Precision	0.01 Euros	0.0001 U.S. Dollars	0.00001 U.S. Dollars	0.000001 U.S. Dollars

	CME CF Aave – Dollar Reference Rate	CME CF Curve – Dollar Reference Rate	CME CF Synthetix – Dollar Reference Rate	CME CF Axie Infinity – Dollar Reference Rate
Administrator	CF Benchmarks Ltd			
Calculation Agent	CF Benchmarks Ltd			
Description	U.S. Dollar price of one Aave as of 4:00 p.m. London time	U.S. Dollar price of one Curve as of 4:00 p.m. London time	U.S. Dollar price of one Synthetix as of 4:00 p.m. London time every day	U.S. Dollar price of one Axie Infinity as of 4:00 p.m. London time every day
Calculation Methodology	Aggregation of trade executions occurring on Constituent Exchanges between during the TWAP period.			
Dissemination Time	Once per day, every day of the year including weekends and holidays, between 4:00 p.m. and 4:30 p.m. London time			
Dissemination Precision	0.0001 U.S. Dollars	0.001 U.S. Dollars	0.00001 U.S. Dollars	0.001 U.S. Dollars

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	CME CF Chiliz – Dollar Reference Rate	CME CF Decentraland – Dollar Reference Rate	CME CF Bitcoin Reference Rate - Asia Pacific Variant	CME CF Ether - Dollar Reference Rate - Asia Pacific Variant
Administrator	CF Benchmarks Ltd			
Calculation Agent	CF Benchmarks Ltd			
Description	U.S. Dollar price of one Chiliz as of 4:00 p.m. London time	U.S. Dollar price of one Decentraland as of 4:00 p.m. London time every day	U.S. Dollar price of one Bitcoin as of 4:00 p.m. Hong Kong time	U.S. Dollar price of one Bitcoin as of 4:00 p.m. Hong Kong time
Calculation Methodology	Aggregation of trade executions occurring on Constituent Exchanges between during the TWAP period.			
Dissemination Time	Once per day, every day of the year including weekends and holidays, between 4:00 p.m. and 4:30 p.m. London time		Once per day, every day of the year including weekends and holidays, between 4:00 p.m. and 4:30 p.m. Hong Kong time	
Dissemination Precision	0.0000001 U.S. Dollars	0.000001 U.S. Dollars	0.01 U.S. Dollars	0.01 U.S. Dollars

	CME CF Ether – Bitcoin Reference Rate
Administrator	CF Benchmarks Ltd
Calculation Agent	CF Benchmarks Ltd
Description	Bitcoin price of one Ether, as of 4:00 p.m. London time
Calculation Methodology	Ratio of the CME CF Ether-Dollar Reference Rate and the CME CF Bitcoin Reference Rate, resulting in the number of Bitcoins required to buy one unit of Ether.
Dissemination Time	Once per day, every day of the year including weekends and holidays, between 4:00 p.m. and 4:30 p.m. London time
Dissemination Precision	0.00001 Bitcoins

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	CME CF XRP-Dollar Reference Rate	CME CF Internet Computer-Dollar Reference Rate
Administrator	CF Benchmarks Ltd	CF Benchmarks Ltd
Calculation Agent	CF Benchmarks Ltd	CF Benchmarks Ltd
Description	U.S. Dollar price of one XRP as of 4:00 p.m. London time	U.S. Dollar price of one Internet Computer as of 4:00 p.m. London time
Calculation Methodology	Aggregation of trade executions occurring on Constituent Exchanges between during the TWAP period.	
Dissemination Time	Once per day, every day of the year including weekends and holidays, between 4:00 p.m. and 4:30 p.m. London time	Once per day, every day of the year including weekends and holidays, between 4:00 p.m. and 4:30 p.m. London time
Dissemination Precision	0.00001 U.S. Dollars	0.00001 U.S. Dollars

	CME CF Solana – Dollar Reference Rate – New York Variant	CME CF Chainlink – Dollar Reference Rate – New York Variant	CME CF Polygon – Dollar Reference Rate – New York Variant	CME CF XRP – Dollar Reference Rate – New York Variant
Administrator	CF Benchmarks Ltd			
Calculation Agent	CF Benchmarks Ltd			
Description	U.S. Dollar price of one Solana as of 4:00 p.m. New York time	U.S. Dollar price of one Chainlink as of 4:00 p.m. New York time	U.S. Dollar price of one Polygon as of 4:00 p.m. New York time	U.S. Dollar price of one XRP as of 4:00 p.m. New York time
Calculation Methodology	Aggregation of trade executions occurring on Constituent Exchanges between during the TWAP period.			
Dissemination Time	Once per day, every day of the year including weekends and holidays, between 4:00 p.m. and 4:30 p.m. New York time			
Dissemination Precision	0.0001 U.S. Dollars	0.00001 U.S. Dollars	0.0001 U.S. Dollars	0.00001 U.S. Dollars

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	CME CF Litecoin – Dollar Reference Rate – New York Variant	CME CF Polkadot – Dollar Reference Rate – New York Variant	CME CF Litecoin-Dollar Reference Rate – Asia Pacific Variant	CME CF Solana-Dollar Reference Rate – Asia Pacific Variant
Administrator	CF Benchmarks Ltd			
Calculation Agent	CF Benchmarks Ltd			
Description	U.S. Dollar price of one Litecoin as of 4:00 p.m. New York time	U.S. Dollar price of one Polkadot as of 4:00 p.m. New York time	U.S. Dollar price of one Litecoin as of 4:00 p.m. Hong Kong time	U.S. Dollar price of one Solana as of 4:00 p.m. Hong Kong time
Calculation Methodology	Aggregation of trade executions occurring on Constituent Exchanges between during the TWAP period.			
Dissemination Time	Once per day, every day of the year including weekends and holidays, between 4:00 p.m. and 4:30 p.m. New York time		Once per day, every day of the year including weekends and holidays, between 4:00 p.m. and 4:30 p.m. Hong Kong time	
Dissemination Precision	0.0001 U.S. Dollars	0.00001 U.S. Dollars	0.0001 U.S. Dollars	0.0001 U.S. Dollars

	CME CF Cardano-Dollar Reference Rate – Asia Pacific Variant	CME CF Chainlink-Dollar Reference Rate – Asia Pacific Variant	CME CF XRP-Dollar Reference Rate – Asia Pacific Variant	CME CF Polkadot-Dollar Reference Rate – Asia Pacific Variant
Administrator	CF Benchmarks Ltd			
Calculation Agent	CF Benchmarks Ltd			
Description	U.S. Dollar price of one Cardano as of 4:00 p.m. Hong Kong time	U.S. Dollar price of one Chainlink as of 4:00 p.m. Hong Kong time	U.S. Dollar price of one XRP as of 4:00 p.m. Hong Kong time	U.S. Dollar price of one Polkadot as of 4:00 p.m. Hong Kong time
Calculation Methodology	Aggregation of trade executions occurring on Constituent Exchanges between during the TWAP period.			
Dissemination Time	Once per day, every day of the year including weekends and holidays, between 4:00 p.m. and 4:30 p.m. Hong Kong time			
Dissemination Precision	0.000001 U.S. Dollars	0.00001 U.S. Dollars	0.00001 U.S. Dollars	0.00001 U.S. Dollars

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	CME CF Ondo Finance-Dollar Reference Rate	CME CF Ondo Finance-Dollar Reference Rate – New York Variant	CME CF SUI- Dollar Reference Rate
Administrator	CF Benchmarks Ltd		
Calculation Agent	CF Benchmarks Ltd		
Description	U.S. Dollar price of one Ondo Finance as of 4:00 p.m. London time	U.S. Dollar price of one Ondo Finance as of 4:00 p.m. New York time	U.S. Dollar price of one SUI as of 4:00 p.m. London time
Calculation Methodology	Aggregation of trade executions occurring on Constituent Exchanges between during the TWAP period.		
Dissemination Time	Once per day, every day of the year including weekends and holidays, between 4:00 p.m. and 4:30 p.m. London time	Once per day, every day of the year including weekends and holidays, between 4:00 p.m. and 4:30 p.m. New York time	Once per day, every day of the year including weekends and holidays, between 4:00 p.m. and 4:30 p.m. London time
Dissemination Precision	0.000001 U.S. Dollars	0.00001 U.S. Dollars	0.00001 U.S. Dollars

	CME CF SUI- Dollar Reference Rate – New York Variant	CME CF Arbitrum- Dollar Reference Rate	CME CF NEAR- Dollar Reference Rate
Administrator	CF Benchmarks Ltd		
Calculation Agent	CF Benchmarks Ltd		
Description	U.S. Dollar price of one SUI as of 4:00 p.m. New York time	U.S. Dollar price of one Arbitrum as of 4:00 p.m. London time	U.S. Dollar price of one NEAR as of 4:00 p.m. London time
Calculation Methodology	Aggregation of trade executions occurring on Constituent Exchanges between during the TWAP period.		
Dissemination Time	Once per day, every day of the year including weekends and holidays, between 4:00 p.m. and 4:30 p.m. New York time	Once per day, every day of the year including weekends and holidays, between 4:00 p.m. and 4:30 p.m. London time	Once per day, every day of the year including weekends and holidays, between 4:00 p.m. and 4:30 p.m. London time
Dissemination Precision	0.000001 U.S. Dollars	0.00001 U.S. Dollars	0.01 U.S. Dollars

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	ME CF Stellar Lumens-Dollar Reference Rate – New York Variant	CME CF Bitcoin Cash-Dollar Reference Rate – New York Variant	CME CF Avalanche-Dollar Reference Rate – New York Variant
Administrator	CF Benchmarks Ltd		
Calculation Agent	CF Benchmarks Ltd		
Description	U.S. Dollar price of one Stellar Lumens as of 4:00 p.m. New York time	U.S. Dollar price of one Bitcoin Cash as of 4:00 p.m. New York time	U.S. Dollar price of one Avalanche as of 4:00 p.m. New York time
Calculation Methodology	Aggregation of trade executions occurring on Constituent Exchanges between during the TWAP period.		
Dissemination Time	Once per day, every day of the year including weekends and holidays, between 4:00 p.m. and 4:30 p.m. New York time	Once per day, every day of the year including weekends and holidays, between 4:00 p.m. and 4:30 p.m. New York time	Once per day, every day of the year including weekends and holidays, between 4:00 p.m. and 4:30 p.m. New York time
Dissemination Precision	0.0000001 U.S. Dollars	0.001 U.S. Dollars	0.0001 U.S. Dollars

	CME CF Cardano-Dollar Reference Rate – New York Variant	CME CF NEAR-Dollar Reference Rate – New York Variant	CME CF Arbitrum-Dollar Reference Rate – New York Variant
Administrator	CF Benchmarks Ltd		
Calculation Agent	CF Benchmarks Ltd		
Description	U.S. Dollar price of one Cardano as of 4:00 p.m. New York time	U.S. Dollar price of one NEAR as of 4:00 p.m. London time	U.S. Dollar price of one Arbitrum as of 4:00 p.m. London time
Calculation Methodology	Aggregation of trade executions occurring on Constituent Exchanges between during the TWAP period.		
Dissemination Time	Once per day, every day of the year including weekends and holidays, between 4:00 p.m. and 4:30 p.m. New York time	Once per day, every day of the year including weekends and holidays, between 4:00 p.m. and 4:30 p.m. New York time	Once per day, every day of the year including weekends and holidays, between 4:00 p.m. and 4:30 p.m. New York time
Dissemination Precision	0.000001 U.S. Dollars	0.01 U.S. Dollars	0.00001 U.S. Dollars

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	CME CF Hedera-Dollar Reference Rate	CME CF Hedera-Dollar Reference Rate – New York	CME CF Hedera-Dollar Reference Rate – Asia Pacific Variant
Administrator	CF Benchmarks Ltd		
Calculation Agent	CF Benchmarks Ltd		
Description	U.S. Dollar price of one Hedera as of 4:00 p.m. London time	U.S. Dollar price of one Hedera as of 4:00 p.m. New York time	U.S. Dollar price of one Hedera as of 4:00 p.m. Hong Kong time
Calculation Methodology	Aggregation of trade executions occurring on Constituent Exchanges between during the TWAP period.		
Dissemination Time	Once per day, every day of the year including weekends and holidays, between 4:00 p.m. and 4:30 p.m. London time	Once per day, every day of the year including weekends and holidays, between 4:00 p.m. and 4:30 p.m. New York time	Once per day, every day of the year including weekends and holidays, between 4:00 p.m. and 4:30 p.m. Hong Kong time
Dissemination Precision	0.0000001 U.S. Dollars	0.0000001 U.S. Dollars	0.0000001 U.S. Dollars

	CME CF Bittensor-Dollar Reference Rate	CME CF Bittensor-Dollar Reference Rate – New York	CME CF Bittensor-Dollar Reference Rate – Asia Pacific Variant
Administrator	CF Benchmarks Ltd		
Calculation Agent	CF Benchmarks Ltd		
Description	U.S. Dollar price of one Bittensor as of 4:00 p.m. London time	U.S. Dollar price of one Bittensor as of 4:00 p.m. New York time	U.S. Dollar price of one Bittensor as of 4:00 p.m. Hong Kong time
Calculation Methodology	Aggregation of trade executions occurring on Constituent Exchanges between during the TWAP period.		
Dissemination Time	Once per day, every day of the year including weekends and holidays, between 4:00 p.m. and 4:30 p.m. London time	Once per day, every day of the year including weekends and holidays, between 4:00 p.m. and 4:30 p.m. New York time	Once per day, every day of the year including weekends and holidays, between 4:00 p.m. and 4:30 p.m. Hong Kong time
Dissemination Precision	0.000001 U.S. Dollars	0.000001 U.S. Dollars	0.000001 U.S. Dollars

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	CME CF Aptos-Dollar Reference Rate	CME CF Aptos-Dollar Reference Rate – New York	CME CF Aptos-Dollar Reference Rate – Asia Pacific Variant	CME CF Uniswap-Dollar Reference Rate - New York Variant
Administrator	CF Benchmarks Ltd			
Calculation Agent	CF Benchmarks Ltd			
Description	U.S. Dollar price of one Aptos as of 4:00 p.m. London time	U.S. Dollar price of one Aptos as of 4:00 p.m. New York time	U.S. Dollar price of one Aptos as of 4:00 p.m. Hong Kong time	U.S. Dollar price of one Uniswap as of 4:00 p.m. New York time
Calculation Methodology	Aggregation of trade executions occurring on Constituent Exchanges between during the TWAP period.			
Dissemination Time	Once per day, every day of the year including weekends and holidays, between 4:00 p.m. and 4:30 p.m. London time	Once per day, every day of the year including weekends and holidays, between 4:00 p.m. and 4:30 p.m. New York time	Once per day, every day of the year including weekends and holidays, between 4:00 p.m. and 4:30 p.m. Hong Kong time	Once per day, every day of the year including weekends and holidays, between 4:00 p.m. and 4:30 p.m. New York time
Dissemination Precision	0.0001 U.S. Dollars	0.0001 U.S. Dollars	0.0001 U.S. Dollars	0.00001 U.S. Dollars

	CME CF Ethena-Dollar Reference Rate - Asia Pacific Variant	**CME CF Ethena-Dollar Reference Rate – New York Variant**	**CME CF Ethena-Dollar Reference Rate**
Administrator	CF Benchmarks Ltd		
Calculation Agent	CF Benchmarks Ltd		
Description	U.S. Dollar price of one Ethena as of 4:00 p.m. Hong Kong time	U.S. Dollar price of one Ethena as of 4:00 p.m. New York time	U.S. Dollar price of one Ethena as of 4:00 p.m. London time
Calculation Methodology	Aggregation of trade executions occurring on Constituent Exchanges between during the TWAP period.		
Dissemination Time	Once per day, every day of the year including weekends and holidays, between 4:00 p.m. and 4:30 p.m. Hong Kong time	Once per day, every day of the year including weekends and holidays, between 4:00 p.m. and 4:30 p.m. New York time	Once per day, every day of the year including weekends and holidays, between 4:00 p.m. and 4:30 p.m. London time
Dissemination Precision	0.000001 U.S. Dollars	0.000001 U.S. Dollars	0.000001 U.S. Dollars

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10 Methodology Review and Changes

This methodology is subject to internal review by the Administrator and the CME CF Oversight Committee at least annually.

Any changes to this methodology are overseen by the CME CF Oversight Committee, and in accordance with UK BMR Article 13.

All *material* changes to the methodology shall only be implemented after a consultation process with users and relevant stakeholders that shall be conducted according to the Administrator's policies and overseen by the CME CF Oversight Committee.

Should the Administrator deem it necessary to cease providing any of the Reference Rates it shall only do so after a consultation process with users and relevant stakeholders that shall be conducted according to the Administrator's policies and overseen by the CME CF Oversight Committee.

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