CF Mid-Price Spot Rates

Methodology Guide

Version:

1.0

Version Date:

14th April 2026

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1 Version History

Version	Version Date	Changes to Previous
1.0	14 Apr 2026	Initial publication

2 Overview

The CF Mid-Price Spot Rates have been specifically designed to serve as a transparent and representative indicator of the mid-market price of a digital asset for the purposes of funding rate marking for perpetual swap contracts and related financial instruments. No further applications of the CF Mid-Price Spot Rates have been taken into consideration in their design.

This document covers the methodology for calculating the CF Mid-Price Spot Rates. A summary of specifications is provided in Section 7.

Underlying Economic Reality

The CF Mid-Price Spot 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 top-of-book order data 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 CF Constituent Exchange Criteria. In all cases, data from Coinbase is expressly excluded from the calculation of the CF Mid-Price Spot Rates.

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 jurisdictions such as the US, UK and EU. Accepted Assets are subject to the approval of the CF Cryptocurrency Index Family Oversight Function ("the Function" or "the Oversight Function") in accordance with the CF Cryptocurrency Index Family Oversight Function Specifications.

Accepted Asset List:

Name	Ticker Symbol
Tether	USDT

API: Application programming interface.

Calculation Time: Any time as of which a CF Mid-Price Spot Rate is calculated internally. The CF Mid-Price Spot Rate is calculated once per second for every second of each day for the entire year including weekends and holidays.

Publication Time: The Calculation Time at which a CF Mid-Price Spot Rate is disseminated externally. The CF Mid-Price Spot Rate is published once per second for every second of each day for the entire year, including weekends and holidays.

Constituent Exchange: A cryptocurrency trading venue approved by CF management to serve as a pricing source for the calculation of a CF Mid-Price Spot Rates, excluding Coinbase.

Relevant Pair: The cryptocurrency versus cryptocurrency or legal tender pair referenced by a CF Mid-Price Spot Rates, as defined in Section 7.

Top-of-Book Order: The highest-priced unmatched bid order and the lowest-priced unmatched ask order in the Relevant Order Book of a Constituent Exchange at a given Calculation Time, together with their respective sizes.

Relevant Order Book: The universe of the currently unmatched limit orders to buy or sell a unit of cryptocurrency versus cryptocurrency or legal tender on a Constituent Exchange in the Relevant Pair, aggregated by price, that is reported through its API to the Calculation Agent.

Retrieval Time: The time, as given by the server clock of the Calculation Agent, which the Relevant Order Book of a Constituent Exchange corresponds to. When obtained from a request/response API such as a REST API, this would be the time of the request made by the Calculation Agent through the API of the Constituent Exchange. When obtained from a real-time feed such as a WebSocket API, this would be the most recent time as of which the Calculation Agent has a valid Order Book from an unbroken connection.

4 Methodology and Rules

4.1 Qualitative Description

The CF Mid-Price Spot Rates are calculated in real time based on the Top-of-Book Orders of all Constituent Exchanges. The top-of-book represents the best available prices in the Relevant Order Book at any given instant: the highest bid price at which a market participant is willing to buy, and the lowest ask price at which a market participant is willing to sell. The mid-market price is defined as the average of these two prices.

Calculation steps at each Calculation Time T are as follows:

1. At the Calculation Time T, the Top-of-Book bid and ask orders of each Constituent Exchange are retrieved.

2. For each Constituent Exchange, the top-of-book mid price, bid-side notional, ask-side notional, and percentage spread are computed from the Top-of-Book Order.

3. Each Constituent Exchange is assessed against the Top-of-Book Eligibility Criteria. A Constituent Exchange whose bid-side notional is below the Minimum Bid Notional parameter, whose ask-side notional is below the Minimum Ask Notional parameter, or whose percentage spread exceeds the Maximum Spread parameter is disregarded from the calculation at that Calculation Time.

4. Each remaining Constituent Exchange is assessed against the Potentially Erroneous Data criterion. A Constituent Exchange whose top-of-book mid price deviates from the median of all mid prices by more than the Potentially Erroneous Data Parameter is disregarded from the calculation at that Calculation Time (see Section 5.3).

5. The CF Mid-Price Spot Rates is calculated as the median of the top-of-book mid prices of all remaining Constituent Exchanges.

4.2 Mathematical Representation

The following table shows the symbols used in the mathematical representation of the CF Mid-Price Spot Rates.

Symbol	Name	Description	Type
T	Effective time	The time at which a CF Mid-Price Spot Rates is calculated	Parameter, see Section 6
E	Constituent Exchange set	The set of all Constituent Exchanges approved for the relevant index	Input
bp(T,e)	Best bid price	The highest bid price in the Relevant Order Book of exchange e at time T	Input
bs(T,e)	Best bid size	The size associated with the best bid price of exchange e at time T, denominated in the base asset	Input
ap(T,e)	Best ask price	The lowest ask price in the Relevant Order Book of exchange e at time T	Input
as(T,e)	Best ask size	The size associated with the best ask price of exchange e at time T, denominated in the base asset	Input
N_bid	Minimum bid notional	The minimum USD notional required at the best bid level for an exchange to be eligible	Parameter, see Section 6
N_ask	Minimum ask notional	The minimum USD notional required at the best ask level for an exchange to be eligible	Parameter, see Section 6
S_max	Maximum spread	The maximum permissible percentage spread at the top of book for an exchange to be eligible	Parameter, see Section 6
D	Potentially Erroneous Data Parameter	The maximum permissible absolute percentage deviation of the top-of-book mid price of a Constituent Exchange from the cross-exchange median mid price	Parameter, see Section 6

Symbol	Name	Description	Type
E*(T)	TOB-eligible exchange set	The subset of E passing the TOB Eligibility Criteria at time T	Internal variable
E**(T)	Contributing exchange set	The subset of E*(T) remaining after the Potentially Erroneous Data filter at time T	Internal variable
CFMID_T	CF Mid-Price Spot Rates	The CF Mid-Price Spot Rates at time T	Output

4.2.1 Top-of-Book Mid Price

For each Constituent Exchange $e \in E$ at effective time T, the top-of-book mid price is defined as:

$$\mathrm{Mid}(T,e) = (\ \mathrm{bp}(T,e) + \mathrm{ap}(T,e)\ )\ /\ 2 \qquad (1)$$

4.2.2 TOB Notional and Spread

The bid-side notional, ask-side notional, and percentage spread at the top of book are defined as:

$$\mathrm{BidNotional}(T,e) = \mathrm{bs}(T,e) \times \mathrm{bp}(T,e) \qquad (2)$$

$$\mathrm{AskNotional}(T,e) = \mathrm{as}(T,e) \times \mathrm{ap}(T,e) \qquad (3)$$

$$\mathrm{Spread}(T,e) = (\ \mathrm{ap}(T,e) - \mathrm{bp}(T,e)\ )\ /\ \mathrm{Mid}(T,e) \qquad (4)$$

4.2.3 TOB Eligibility Filter

The TOB-eligible exchange set E*(T) is defined as the set of Constituent Exchanges satisfying all three of the following conditions simultaneously:

$$E^*(T) = \{\ e \in E : \mathrm{BidNotional}(T,e) \geq N\_bid \wedge \mathrm{AskNotional}(T,e) \geq N\_ask \wedge \mathrm{Spread}(T,e) \leq S\_max\ \} \qquad (5)$$

Any Constituent Exchange $e \notin E^*(T)$ is disregarded in the calculation of the CF Mid-Price Spot Rates at time T.

4.2.4 Potentially Erroneous Data Filter

The Potentially Erroneous Data filter is applied to $E^*(T)$ in accordance with the rules set out in Section 5.3. The contributing exchange set $E^{**}(T)$ denotes the subset of $E^*(T)$ that remains after this filter has been applied.

4.2.5 CF Mid-Price Spot Rates

The CF Mid-Price Spot Rates at effective time T is given by:

$$CFMID\_T = \mathrm{Median}\{ \mathrm{Mid}(T,e) : e \in E^{**}(T) \} \quad (6)$$

where the median of a set of n values is defined as the middle value when n is odd, or the arithmetic mean of the two middle values when n is even.

4.3 Quote Asset Normalisation

For Constituent Exchanges where the Relevant Pair is denominated in an Accepted Asset (e.g. USDT), the Top-of-Book bid and ask prices shall be converted into U.S. Dollars prior to the calculation of the CF Mid-Price Spot Rates.

This conversion is performed using the Accepted Asset to U.S. Dollar exchange rate as determined by the relevant CF Spot Rate at the applicable Calculation Time.

Following this conversion, all prices and notionals used in the calculation are expressed in U.S. Dollars and are therefore directly comparable across Constituent Exchanges, irrespective of whether the underlying market is quoted in U.S. Dollars or an Accepted Asset.

All subsequent calculations described in Sections 4.2.1 to 4.2.5 are performed on the converted U.S. Dollar values.

5 Contingency Calculation Rules

5.1 Delayed Data

Delayed data is treated according to the following rules:

1. If the Retrieval Time of the Relevant Order Book of a Constituent Exchange is at least 30 seconds older than the Calculation Time, the Constituent Exchange is disregarded in the calculation of the CF Mid-Price Spot Rates for that Calculation Time.

If the Retrieval Times of the Relevant Order Books of all Constituent Exchanges are each at least 30 seconds older than the Calculation Time, a CF Mid-Price Spot Rates calculation failure occurs for that Calculation Time (see Section 5.5).

5.2 Erroneous Data

5.2.1 Erroneous Books

All Relevant Order Books are subject to an automated screening for erroneous data according to the following rules:

1. If the format of a Relevant Order Book deviates from the expected format such that it cannot be parsed, it is flagged as erroneous.

2. If the Relevant Order Book contains no bid orders or no ask orders, it is flagged as erroneous.

3. If the Relevant Order Book crosses (i.e. the best bid price is greater than or equal to the best ask price), it is flagged as erroneous.

Relevant Order Books flagged as erroneous for a given Calculation Time are disregarded in the calculation of the CF Mid-Price Spot Rates for that Calculation Time.

If the Relevant Order Books of all Constituent Exchanges are flagged as erroneous for a given Calculation Time, a CF Mid-Price Spot Rates calculation failure occurs for that Calculation Time (see Section 5.5).

5.2.2 Erroneous Prices and Sizes

All Relevant Order Books are subject to an automated filtering process according to the following rules:

1. If a Relevant Order Book contains any entries with a non-numeric or non-positive limit price or size, then any such entries are flagged as erroneous.

All entries in a Relevant Order Book which are flagged as erroneous for a given Calculation Time are disregarded in the calculation of the CF Mid-Price Spot Rates for that Calculation Time.

5.3 Potentially Erroneous Data

All Top-of-Book Orders that have passed the TOB Eligibility Filter (Section 4) are subject to an automated screening for potentially erroneous data according to the following rules:

1. For each Constituent Exchange individually, the top-of-book mid price is calculated as the average of the best bid price and the best ask price of the Top-of-Book Order.

2. The median of the top-of-book mid prices across all TOB-eligible Constituent Exchanges is calculated.

3. For each Constituent Exchange, the absolute percentage deviation of its top-of-book mid price, as calculated in step 1, from the cross-exchange median mid price, as calculated in step 2, is calculated.

4. If for any Constituent Exchange the absolute percentage deviation, as calculated in step 3, exceeds the Potentially Erroneous Data Parameter for the respective CF Mid-Price Spot Rate as represented in the Index Parameters (Section 6), then the Top-of-Book Order of that Constituent Exchange for the affected rate is flagged as potentially erroneous.

5. Upon a Top-of-Book Order of a Constituent Exchange having been disregarded in the calculation as described in step 4, its Top-of-Book Order shall continue to be disregarded from the calculation of the affected index until the absolute percentage deviation of its top-of-book mid price, as calculated in step 3, is less than 50% of the Potentially Erroneous Data Parameter. At this point it shall be re-instated to the calculation for that Calculation Time and all subsequent Calculation Times, unless it is removed from the calculation for any of the reasons described in this Section 5.

Top-of-Book Orders flagged as potentially erroneous for a given Calculation Time are disregarded in the calculation of the CF Mid-Price Spot Rate for that Calculation Time. The occurrence of any such flag is reported to the Oversight Function.

If the Top-of-Book Orders of all Constituent Exchanges are flagged as potentially erroneous for a given Calculation Time, a CF Mid-Price Spot Rate calculation failure occurs for that Calculation Time (see Section 5.5).

5.4 Expert Judgement

The Administrator does not utilise expert judgement in the day-to-day calculation of the CF Mid-Price Spot 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.

5.5 Calculation Failure

If a CF Mid-Price Spot Rates cannot be calculated for a given Calculation Time, for instance because:

- the Retrieval Times of the Relevant Order Books of all Constituent Exchanges are each at least 30 seconds older than the Calculation Time; or
- all Relevant Order Books are flagged as erroneous or potentially erroneous (see Sections 5.1–5.3); or
- any other reason or circumstance that prevents the orderly calculation of a CF Mid-Price Spot Rates,

then the CF Mid-Price Spot Rates for that Calculation Time is not published. The occurrence of any CF Mid-Price Spot Rates calculation failure is reported to CF management and persistent failure will lead to a review of the methodology.

6 Index Parameters

6.1 Constants

Parameter	Value
Effective Time (T)	Approximately every second of each day for the entire year including weekends and holidays.
Publication Time	Every second of each day for the entire year, including weekends and holidays.

6.2 Index-Level Parameters

The following table summarises the parameters for the currently supported CF Mid-Price Spot Rates. The Minimum Bid Notional (N_bid) and Minimum Ask Notional (N_ask) are expressed in USD. The Maximum Spread (S_max) and the Potentially Erroneous Data Parameter (D) are expressed as a percentage of the top-of-book mid price.

Parameter values are determined empirically from the distribution of historical top-of-book data across all Constituent Exchanges for each index, with reference to observed notional depth and spread characteristics over the preceding three-year period. Parameter values are subject to periodic review in accordance with Section 8.

Index	Min Bid Notional N_bid (USD)	Min Ask Notional N_ask (USD)	Max Spread S_max	PED Parameter D
CF Bitcoin Mid-Price Spot Rates	$1000	$1000	0.5%	10%
CF Ether Mid-Price Spot Rates	$100	$100	1%	10%
CF Solana Mid-Price Spot Rates	$20	$20	1%	10%

Index	Min Bid Notional N_bid (USD)	Min Ask Notional N_ask (USD)	Max Spread S_max	PED Parameter D
CF XRP Mid-Price Spot Rates	$5	$5	1%	10%
CF Cardano Mid-Price Spot Rates	$100	$100	1%	10%
CF Chainlink Mid-Price Spot Rates	$5	$5	1%	10%
CF Stellar Mid-Price Spot Rates	$5	$5	1%	10%
CF Dogecoin Mid-Price Spot Rates	$5	$5	1%	10%
CF Litecoin Mid-Price Spot Rates	$20	$20	1%	10%
CF Polkadot Mid-Price Spot Rates	$20	$20	1%	10%
CF Bitcoin Cash Mid-Price Spot Rates	$100	$100	1%	10%
CF Hedera Mid-Price Spot Rates	$10	$10	10%	10%
CF Avalanche Mid-Price Spot Rates	$5	$5	1%	10%
CF Shiba Inu Mid-Price Spot Rates	$20	$20	2%	25%
CF Aave Mid-Price Spot Rates	$20	$20	1%	10%
CF PAX Gold Mid-Price Spot Rates	$100	$100	2%	10%
CF Tezos Mid-Price Spot Rates	$5	$5	1%	10%

6.3 Constituent Exchanges

Index	Constituent Exchanges
CF Bitcoin Mid-Price Spot Rates	Binance (USDT), Bitstamp (USD), Bullish (USD), Cryptodotcom (USD), Gemini (USD), Itbit (USD), Kraken (USD), Lmax (USD), OKX (USDT)
CF Ether Mid-Price Spot Rates	Binance (USDT), Bitstamp (USD), Bullish (USD), Cryptodotcom (USD), Gemini (USD), Itbit (USD), Kraken (USD), Lmax (USD), OKX (USDT)
CF Solana Mid-Price Spot Rates	Binance (USDT), Bitstamp (USD), Cryptodotcom (USD), Gemini (USD), Itbit (USD), Kraken (USD), Lmax (USD), OKX (USDT)
CF XRP Mid-Price Spot Rates	Binance (USDT), Bitstamp (USD), Cryptodotcom (USD), Gemini (USD), Kraken (USD), Lmax (USD), OKX (USDT)
CF Cardano Mid-Price Spot Rates	Binance (USDT), Bitstamp (USD), Cryptodotcom (USD), Kraken (USD), OKX (USDT)
CF Chainlink Mid-Price Spot Rates	Binance (USDT), Bitstamp (USD), Cryptodotcom (USD), Gemini (USD), Itbit (USD), Kraken (USD), Lmax (USD), OKX (USDT)
CF Stellar Mid-Price Spot Rates	Binance (USDT), Bitstamp (USD), Cryptodotcom (USD), Kraken (USD), OKX (USDT)
CF Dogecoin Mid-Price Spot Rates	Binance (USDT), Bitstamp (USD), Cryptodotcom (USD), Gemini (USD), Kraken (USD), Lmax (USD), OKX (USDT)
CF Litecoin Mid-Price Spot Rates	Binance (USDT), Bitstamp (USD), Cryptodotcom (USD), Gemini (USD), Itbit (USD), Kraken (USD), Lmax (USD), OKX (USDT)

Index	Constituent Exchanges
CF Polkadot Mid-Price Spot Rates	Binance (USDT), Bitstamp (USD), Cryptodotcom (USD), Gemini (USD), Kraken (USD), OKX (USDT)
CF Bitcoin Cash Mid-Price Spot Rates	Binance (USDT), Bitstamp (USD), Cryptodotcom (USD), Gemini (USD), Itbit (USD), Kraken (USD), Lmax (USD), OKX (USDT)
CF Hedera Mid-Price Spot Rates	Binance (USDT), Bitstamp (USD), Cryptodotcom (USD), Kraken (USD), OKX (USDT)
CF Avalanche Mid-Price Spot Rates	Binance (USDT), Bitstamp (USD), Cryptodotcom (USD), Gemini (USD), Kraken (USD), OKX (USDT)
CF Shiba Inu Mid-Price Spot Rates	Binance (USDT), Bitstamp (USD), Cryptodotcom (USD), Gemini (USD), Kraken (USD), OKX (USDT)
CF Aave Mid-Price Spot Rates	Binance (USDT), Bitstamp (USD), Cryptodotcom (USD), Gemini (USD), Itbit (USD), Kraken (USD), Lmax (USD), OKX (USDT)
CF PAX Gold Mid-Price Spot Rates	Binance (USDT), Cryptodotcom (USD), Gemini (USD), Itbit (USD), Kraken (USD), OKX (USDT)
CF Tezos Mid-Price Spot Rates	Binance (USDT), Cryptodotcom (USD), Gemini (USD), Kraken (USD), OKX (USDT)

7 Index Specifications

The following table summarises the specifications for the currently supported CF Mid-Price Spot Rates:

Administrator	CF Benchmarks Ltd
Calculation Agent	CF Benchmarks Ltd
Calculation Methodology	Real-time aggregation of top-of-book order data of Constituent Exchanges, excluding Coinbase
Calculation Frequency	Once per second
Dissemination Time	Once per second for every second of each day for the entire year including weekends and holidays
Exchange Eligibility	Spot markets of Constituent Exchanges, comprising CME CF Constituent Exchanges and additional trading venues, for the Relevant Pair, denominated in U.S. Dollars or Accepted Assets, excluding Coinbase. Where markets are denominated in Accepted Assets, prices are converted into U.S. Dollars in accordance with Section 4.3. Exchange composition may vary over time and is recorded in the index metadata.

Index	Ticker Symbol	Short Description	Dissemination Precision
CF Bitcoin Mid-Price Spot Rates	XBTUSD MID	U.S. Dollar mid-market price of one Bitcoin	0.01 U.S. Dollars
CF Ether Mid-Price Spot Rates	ETHUSD MID	U.S. Dollar mid-market price of one Ether	0.01 U.S. Dollars

Index	Ticker Symbol	Short Description	Dissemination Precision
CF Solana Mid-Price Spot Rates	SOLUSD MID	U.S. Dollar mid-market price of one Solana	0.001 U.S. Dollars
CF XRP Mid-Price Spot Rates	XRPUSD MID	U.S. Dollar mid-market price of one XRP	0.0001 U.S. Dollars
CF Cardano Mid-Price Spot Rates	ADAUSD MID	U.S. Dollar mid-market price of one Cardano	0.0001 U.S. Dollars
CF Chainlink Mid-Price Spot Rates	LINKUSD MID	U.S. Dollar mid-market price of one Chainlink	0.001 U.S. Dollars
CF Stellar Mid-Price Spot Rates	XLMUSD MID	U.S. Dollar mid-market price of one Stellar Lumen	0.00001 U.S. Dollars
CF Dogecoin Mid-Price Spot Rates	DOGEUSD MID	U.S. Dollar mid-market price of one Dogecoin	0.00001 U.S. Dollars
CF Litecoin Mid-Price Spot Rates	LTCUSD MID	U.S. Dollar mid-market price of one Litecoin	0.01 U.S. Dollars
CF Polkadot Mid-Price Spot Rates	DOTUSD MID	U.S. Dollar mid-market price of one Polkadot	0.001 U.S. Dollars
CF Bitcoin Cash Mid-Price Spot Rates	BCHUSD MID	U.S. Dollar mid-market price of one Bitcoin Cash	0.01 U.S. Dollars
CF Hedera Mid-Price Spot Rates	HBARUSD MID	U.S. Dollar mid-market price of one Hedera	0.00001 U.S. Dollars
CF Avalanche Mid-Price Spot Rates	AVAXUSD MID	U.S. Dollar mid-market price of one Avalanche	0.001 U.S. Dollars

Index	Ticker Symbol	Short Description	Dissemination Precision
CF Shiba Inu Mid-Price Spot Rates	SHIBUSD MID	U.S. Dollar mid-market price of one Shiba Inu	0.000000001 U.S. Dollars
CF Aave Mid-Price Spot Rates	AAVEUSD MID	U.S. Dollar mid-market price of one Aave	0.01 U.S. Dollars
CF PAX Gold Mid-Price Spot Rates	PAXGUSD MID	U.S. Dollar mid-market price of one PAX Gold token	0.01 U.S. Dollars
CF Tezos Mid-Price Spot Rates	XTZUSD MID	U.S. Dollar mid-market price of one Tezos	0.0001 U.S. Dollars

8 Methodology Review and Changes

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

Any changes to this methodology are overseen by the Oversight Function, and in accordance with EU 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 Oversight Function.

Should the Administrator deem it necessary to cease providing any of the CF Mid-Price Spot 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 Oversight Function.

Contact Information

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