

CME CF Bitcoin Volatility Index - Settlement (BVXS)

Version: 1.5

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1 Version History

Version	Date Issued	Summary of Change	Owner
V1.0	9 Apr 2024	N/A	CF Benchmarks Management
V1.1	23 Apr 2024	Updated Potentially Erroneous Data criteria	CF Benchmarks Management
V1.2	16 May 2024	Updated naming conventions Updated the Administrator communication procedures for Delayed Calculation & Publication; Calculation Failure; Restatement & Republishing and Market Failure Events Added Section 8 Methodology Review and Changes Updated Notice and Disclaimer	CF Benchmarks Compliance
V1.3	23 Apr 2025	Updated Section 6 Restatement & Republishing example	CF Benchmarks Management
V1.4	24 Oct 2025	Rebranded to CME CF Bitcoin Volatility Index - Settlement	CF Benchmarks Management
V1.5	9 Mar 2026	Updated Section 5.3 Potentially Erroneous Data; added Regime Switch Minimum Confirmation Count and Maximum Re-seeds per Partition to Section 7	CF Benchmarks Management

2 Overview

The CME CF Bitcoin Volatility Index - Settlement (BVXS) represents a daily measure of implied volatility in the CME Bitcoin Options market. It is a forward-looking measure, indicating how dispersed price movements in the underlying asset may be over a given time horizon. Volatility indices in this class are often referred to as fear gauges given how they capture the stress embedded in options markets based on what market participants price into options contracts.

BVXS is constructed using published data from the CME CF Bitcoin Volatility Index - Real Time (BVX_RTI) and is published once a day.

The design and implementation of the BVXS lends itself to be used as a reference rate for derived financial instruments such as volatility futures and options.

Underlying Economic Reality

The CME CF Bitcoin Volatility Index - Settlement is intended to measure the underlying economic reality of creating a weighted portfolio of CME Bitcoin options contracts with a view to replicating the payoff of a Bitcoin volatility swap. A volatility swap is an OTC traded financial instrument that allows an investor to gain direct linear exposure to Bitcoin volatility over a given time horizon, priced relative to a fair volatility strike defined at inception of the trade. The fair volatility strike is calculated by combining option contracts of different strike prices to produce a constant vega (volatility) exposure in the overall portfolio. This calculation is accomplished by the use of order input data from the CME that facilitate the trading of said options contracts

3 Definitions

API: Application programming interface.

Front Contract: CME Bitcoin Futures contract which is closest to its expiry date.

Next Contract: CME Bitcoin Futures contract with expiry date after the Front Contract expiry date.

Next+1 Contract: CME Bitcoin Futures contract with expiry date immediately following the Next Contract expiry date.

Expiry Day: The last Friday of the Front Contract's month. If this is not either a UK or a U.S. business day, the contract expiry day will take place on the immediately preceding business day which is either a UK or a U.S. business day.

Expiry Datetime: 4:00 pm London on the Expiry Day.

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 7.

Relevant Real Time Index Data: CME CF Bitcoin Volatility Index - Real Time data (values and volumes) retrieved on or before the Retrieval Time.

4 Methodology

4.1 Qualitative Description

The CME CF Bitcoin Volatility Index - Settlement is calculated based on CME CF Bitcoin Volatility Real Time Index values (see Real Time Index Methodology [here](#)) calculated and published during the TWAP Period as specified in Section 7. The calculation steps are as follows:

1. All Relevant CME CF Bitcoin Volatility Index - Real Time values and associate volumes are added to a joint list.
2. The list of CME CF Bitcoin Volatility Index - Real Time values is partitioned¹ into a number of equally-sized time intervals, also specified in Section 7.
3. For each partition separately, the volume-weighted average index value is calculated from the Real Time Index values and volumes.
4. The CME CF Bitcoin Volatility Index - Settlement is then given by the equally-weighted average of the volume-weighted averages of all partitions.

4.2 Mathematical Representation

The following table shows the symbols used in the mathematical representation of the CME CF Bitcoin Volatility Index - Settlement.

Symbol	Name	Description	Type
t	Effective Time	The time as of which a CME CF Bitcoin Volatility Index - Settlement is calculated.	Parameter, see Section 7
τ	TWAP Period Length	The length of the time period prior to the effective time during which CME CF Bitcoin Volatility Index - Real Time data is collected.	Parameter, see Section 7
\hat{t} , with $\hat{t} \leq \tau$ and $\hat{t} \tau$	Partition Length	The length of the time periods into which the TWAP Period Length is partitioned.	Parameter, see Section 7
K	Number of Partitions	The number of partitions, given by $K = \tau / \hat{t}$.	Output

¹CME CF Bitcoin Volatility Index - Real Time values are added to a partition exclusive of partition start time and inclusive of partition end time when truncated to millisecond precision.

k with $k \in (1, \dots, K)$	Partition	The k th partition.	Output
X_k for $k \in (1, \dots, K)$	TWAP Period Index Data	The collection of CME CF Bitcoin Volatility Index - Real Time value / volume data pairs observed in the k th partition, i.e. between times $T_1 - \tau + (k - 1)$ and $T_1 - \tau + k$.	Input
I_k	TWAP Period Data Count	The number of data points in the k th 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 i th CME CF Bitcoin Volatility Index - Real Time value / volume data pair of the k th partition.	Input
$p_{k,i}$	TWAP Period CME CF Bitcoin Volatility Index - Real Time Value	The CME CF Bitcoin Volatility Index - Real Time value of the i th index/volume data pair of the k th partition.	Input
$s_{k,i}$	TWAP Period CME CF Bitcoin Volatility Index - Real Time Volume	The volume of the i th index/volume data pair of the k th partition. The volume per CME CF Bitcoin Volatility Index - Real Time publication is calculated as a 30-day interpolated measure based on the per-expiration-date equally weighted average of the calculated utilized depth. See here for more details on utilized depth calculation for Spot Rates.	Input

$VolSpread_{k,i}$	Volatility Spread	The top-of-book, mid-ask implied volatility spread of the ATM (at-the-money) option strike associated with the i th index/volume data pair of the k th partition. Calculated as the difference between the ask implied volatility and the mid implied volatility for the relevant ATM option strike.	Input
$DVOLfilter_{k,i}$	DVOL Filter	The DVOL filter is set to 0 if $VolSpread_{k,i} > DVOL$ and is set to 1 otherwise.	Output
VWA_k	Volume-Weighted Average	The volume-weighted average index value of the k th partition.	Output
$BVXS_t$	BVXS	The CME CF Bitcoin Volatility Index - Settlement at time t .	Output

For each partition k , the volume-weighted average index values VWA_k are calculated as:

$$VWA_k = \frac{\sum_{i=1}^{I_k} p_{k,i} \cdot s_{k,i} \cdot DVOLfilter_{k,i}}{\sum_{i=1}^{I_k} s_{k,i} \cdot DVOLfilter_{k,i}} \quad (1)$$

The CME CF Bitcoin Volatility Index - Settlement as of the effective time t , $BVXS_t$, is then given by:

$$BVXS_t = \frac{1}{K} \sum_{k=1}^K VWA_k \quad (2)$$

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 Real Time Index Data for a given Calculation Day that is not available by the Retrieval Time is disregarded in the calculation of the CME CF Bitcoin Volatility Index - Settlement for that Calculation Day.
2. If, for any of the K partitions of the TWAP Period, no Relevant Real Time Index Data is available or one or more Relevant Real Time Index Data points are available 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 Bitcoin Volatility Index - Settlement for that Calculation Day. The denominator in Eq. 2 will then be decremented by the number of empty partitions.
3. If one or more Relevant Real Time Index Data points occur but for any reason no Relevant Real Time Index Data can be retrieved by the Calculation Agent, a CME CF Bitcoin Volatility Index - Settlement calculation failure occurs for that Calculation Day (see Section 5.6).
4. If no Relevant Real Time Index Data is available on a given Calculation Day then a CME CF Bitcoin Volatility Index - Settlement calculation failure occurs for that Calculation Day (see Section 5.6).

5.2 Delayed Data and Missing Data

All Relevant Real Time Index Data 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 any Relevant Real Time Index Data shows a non-numeric or non-positive index value or index volume, it is flagged as erroneous.
2. If any Relevant Real Time Index Data is reported in a format that deviates from the expected format such that it cannot be parsed, it is flagged as erroneous.

Relevant Real Time Index Data flagged as erroneous for a given Calculation Day is disregarded in the calculation of the CME CF Bitcoin Volatility Index - Settlement for that Calculation Day.

If all Relevant Real Time Index Data of all Constituent Exchanges is flagged as erroneous for a given Calculation Day, a CME CF Bitcoin Volatility Index - Settlement calculation failure occurs for that Calculation Day (see Section 5.6).

5.3 Potentially Erroneous Data

All Relevant Real Time Index Data retrieved by the Administrator for a given Calculation Day is subject to automated screening for potentially erroneous data according to the following rules:

1. The first two BVX Real Time Index values in any partition are marked as potentially erroneous if either of those index values differ by more than the Potentially Erroneous Data Threshold from the median of the two index values. In that event, the first index value is discarded and the next index value in the partition is evaluated until a first viable index value pair is found. The index value immediately following the first viable index value pair is potentially erroneous if it deviates from the second index value in that pair by more than the Potentially Erroneous Data Threshold.
2. Beyond the first viable index value pair in a partition, an index value that differs from the previous index value not marked as potentially erroneous by more than the Potentially Erroneous Data Threshold is flagged as erroneous. Any index value that triggers the provisions of this rule 5.3 will be discarded from consideration in assessing any subsequent Relevant Real Time Index values for this rule 5.3, except for the purpose of applying rules 5.3(3) and 5.3(4).
3. Following the identification of a first viable index value pair in a partition, if one or more consecutive index values are flagged as erroneous under rule 5.3(2), a regime switch within that partition is confirmed if the consecutive flagged index values contain a first viable index value pair (determined by applying the test in rule 5.3(1) to such consecutive flagged index values) and the number of index values in such consecutive flagged sequence beginning with the first index value in that viable index value pair and ending with the most recent index value in that consecutive flagged sequence is not less than (i) the Regime Switch Minimum Confirmation Count and (ii) the number of index values in that partition that have not been flagged as erroneous since the most recently established viable index value pair (including the two index values in that pair).
4. Where a regime switch is confirmed under rule 5.3(3), the first viable index value pair identified under rule 5.3(3) becomes the reference pair for purposes of rule 5.3(2), and rule 5.3(2) shall thereafter be applied using that reference pair. Index values in the consecutive flagged sequence described in rule 5.3(3) from that viable index value pair onwards that are not flagged as erroneous when assessed under rule 5.3(2) using that reference pair are not treated as potentially erroneous and are reinstated for inclusion in the calculation of the partition's volume-weighted average; any index values in that sequence that are flagged as erroneous under such assessment remain potentially erroneous and are not reinstated. No more than the Maximum Re-seeds per Partition may be applied within any single partition.

Relevant Real Time Index Data flagged as potentially erroneous for a given Calculation

Day and not reinstated under rules 5.3(3) and 5.3(4) are disregarded in the calculation of the CF Bitcoin Volatility Index Settlement Rate for that Calculation Day. The occurrence of any such flag is reported to the Oversight Function.

If all Relevant Real Time Index Data are flagged as potentially erroneous for a given Calculation Day and not reinstated under rules 5.3(3) and 5.3(4), a CF Bitcoin Volatility Index Settlement 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 Bitcoin Volatility 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 CME CF Bitcoin Volatility Index - Settlement for that Calculation Day as soon as it is able to. Should the Administrator not be able to calculate and publish a CME CF Bitcoin Volatility Index - Settlement by 23:59:59 London time then the provisions of Rule 5.6 shall come into effect.

5.5 Expert Judgment

The Administrator does not utilise Expert Judgement 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 Bitcoin Volatility Index - Settlement cannot be calculated for a given Calculation Day before 23:59:59 London time, for instance because:

- no Relevant Real Time Index Data is published on that Calculation Day, or
- Relevant Real Time Index Data is published but for any reason cannot be retrieved by the Calculation Agent, or
- all Relevant Real Time Index Data retrieved by the Calculation Agent are flagged as erroneous or potentially erroneous (see Section 5.2); or any other reason or circumstance that prevents the orderly calculation of a CF Bitcoin Volatility Index Settlement Rate,

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

The occurrence of any CME CF Bitcoin Volatility Index - Settlement calculation failure is reported to the Oversight Function. Any Calculation Failure events will be clearly communicated to all licensees via Statuspage.

6 Restatement & Republishing

The Administrator may restate and republish the index value where the published value is found to be incorrect. This will only occur if both the below conditions are met:

1. Timeliness – where the Administrator can RESTATE and REPUBLISH a CF Staking Series Index value before 23:59:59 of the given Calculation Day
2. Materiality – where the RESTATED Index value has an absolute variance greater than 0.20% for the Index for the given Calculation Day

Example:

- The index on a given Calculation Day is published as 50%
- The index will only be RESTATED if it is:
 - Greater than 50.21%
 - OR
 - Less than 49.79%

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

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

7 Parameters

Rounding	2 decimals
Effective Time (t)	4:00 pm London Time
Publication Time	Between 4:00 pm and 4:30 pm London Time on all CME Trading Days
TWAP Period Length (τ)	30 minutes
TWAP Period	3:30 pm to 4:00 pm London Time
Partition Length (\hat{t})	5 minutes
Number of Partitions (K)	6
Volatility Spread (DVOL)	0.05 (also known as 5 implied vols)
Potentially Erroneous Data Threshold	10%
Regime Switch Minimum Confirmation Count	20
Maximum Re-seeds per Partition	10

8 Methodology Review and Changes

This methodology is subject to internal review by the Administrator and the CF Cryptocurrency Index Family Oversight Function (“Oversight Function”) at least annually.

Any changes to this methodology are overseen by the Oversight Function, 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 Oversight Function.

Should the Administrator deem it necessary to cease providing the Index 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.

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