CoinDesk Composite Market Rates Methodology

CoinDesk Indices

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1 Version History

Version	Date	Details
1	27-Nov-2023	Initial version
2	11-Dec-2023	Added subsubsection 5.3.3.
3	04-Mar-2026	Added Data Filteringsubsection 4.4. Added Quote Quantity in definitionssection 3. Modified subsection 4.5 and subsubsection 5.3.2
4	21-Aug-2026	Renamed CADLI to CCMR. Removed Discretion Regarding the Use of Input Data section. Added Index Governance section.

2 Introduction

2.1 Index Description

CoinDesk Composite Market Rates ("CCMR"[1]) for a given digital asset refer to the real-time calculation methodology, the purpose of which is to provide a representative market average estimation that can be used for price discovery. CCMR is one of CoinDesk's proprietary rates calculation methodologies for digital assets, based on 24-hour volume-weighted average calculation, time-penalty factor, and outlier methodology. It aggregates transaction data for a single digital asset over different Markets on approximately 300 Exchanges and returns a unified USD price for more than 10,000 digital assets. CCMR prices can also be converted and returned in other currencies different to USD (see subsection 5.4).

2.2 Index Properties

Dissemination	Real-time and historical
Day close	12:00 am UTC
Methodology	24-hour volume-weighted average with time penalty and outlier adjustment
Calculation days	Every day of the week including business holidays
Markets	All digital assets

[1]Previously called CADLI. Renamed on the 1st of September of 2026.

3 Definitions

24 Hour Volume means, with respect to a Market and a point in time, the sum of the volume traded on the Market over the last 23 calendar hours and the cumulative volume of the current calendar hour, in units of the base digital asset.

API stands for Application Programming Interface.

Calculation Date means any day for which a CCMR is published.

CCMR means, with respect to a digital asset, the CoinDesk Composite Market Rate.

CCMR Converted Price means the CCMR converted to other quote currencies different than USD Dollars (see subsection 5.4).

Conversion Pair means with respect to the Market, the CCMR used as the exchange rate to convert the final index price to US Dollars.

Dynamic Index means the version of CCMR that is subject to retrospective backfilling in the event of a failure to retrieve exchange data in a timely manner.

Exchange means an exchange that trades digital assets and is part of our constituent exchange universe.

Market means every combination of Exchange and Pair where the digital asset is trading at. For example, for the digital asset Bitcoin, Binance BTC-USDT, Coinbase BTC-USD and Coinbase BTC-USDT are 3 separate markets.

Pair means a pair of:

- digital assets, or
- a digital asset and a fiat currency

Quote Quantity is the value of a trade expressed in the quote currency.

Outlier Detection Factor means a factor used for penalising a price deemed to be an outlier in the CCMR calculation and is determined in accordance with Equation 4.

Static Index means the immutable version of CCMR, which does not account for missed trades.

Time Penalty Factor means a factor used for penalising outdated prices in the CCMR calculation and is determined in accordance with Equation 8.

UTC stands for Coordinated Universal Time.

4 Data Collection

4.1 Data Source

Transactional data (historical trades) is collected from each Exchange via public REST API polled every 1-120 seconds (depending on the Market's liquidity) and WebSocket endpoints. All collected data will be standardized internally, stored and backed up in servers.

Exchanges that do not meet the technical requirements (available API for transactional data) cannot be added to the data collection. Unlike many data providers, who use snapshot data, CCMR approach of using transactional data enables auditability and replicability.

4.2 Data Format

The collected data consists of:

- Trade ID: string or numerical
- Timestamp: Unix timestamp in seconds
- Price: numerical
- Amount: numerical
- Position: buy/sell

4.3 Data Validation

Each trade is validated for the following:

- Each field has the correct data format
- Price and amount is positive
- Timestamp is not in the future
- Trades are not duplicated

4.4 Data Filtering

Each trade is subject to an Outlier Price Impact test designed to filter out potentially manipulative or erroneous trades that have an outsized price impact relative to their volume.
The test is applied only where a trade has a Quote Quantity below the Minimum Quote Volume Threshold [2], and if the absolute difference between the Trade Price and the CCMR price exceeds the price deviation threshold [3].

[2] The Minimum Quote Volume Threshold is set to 100.
[3] The price deviation threshold is the constant A used to compute the Outlier Detection Factor according to Equation 5.

Under this test, if the Volume Adjusted Price Impact Factor exceeds the Price Impact Factor Threshold [4], the trade is excluded from the calculation.
The Volume Adjusted Price Impact Factor is calculated as follows:

$$vpf_t^m = \frac{|\frac{p_t^m}{P_t} - 1|}{v_t^m} \tag{1}$$

Where:

vpf_t^m is, with respect to Market m and time t, the Volume Adjusted Price Impact Factor for the trade condisered for exclusion.

p_t^m is, with respect to Market m and time t, the price of the trade considered for exclusion.

v_t^m is, with respect to Market m and time t, the quote quantity of the trade considered for exclusion.

4.5 Failure of Data Retrieval

In the event of a failure to retrieve data from a Market (due to service outage of the Exchange API service), per design of the CCMR, the last price of the respective Market will expire over time (its weighting will decrease to zero). As long as the digital asset is trading on other Markets, the CCMR calculation is uninterrupted.

If the missed data is recoverable, CoinDesk makes its best effort to retrospectively backfill the data to ensure historical accuracy. This may result in the recalculation of certain CCMR pairs.

Further details on the Recalculation Policy can be found in the CoinDesk Digital Asset Indices Policy & Methodology.

[4] The Price Impact Factor Threshold is set to 1000.

5 Index Calculation Methodology

5.1 Input Data

CCMR is calculated using as an input the last transaction received from each Market per second. A new CCMR value is broadcasted for every constituent Market transaction, which can result in multiple updates per second. The following input data is needed from each transaction:

- Trade price
- Trade amount
- Trade timestamp
- Market where the transaction was executed

5.2 Constituent Exchanges and Markets

CCMR is calculated using every Market where the digital asset is traded. Every time a new Market is listed it will be automatically added to the calculation, subject to the availability of the CCMR Conversion Pair. If the CCMR Conversion Pair is not available or stale [5] the Market will not be included in the CCMR calculation.

For Stablecoins the eligible Market universe is reduced to only direct USD and USDT Markets. This is because, Stablecoins are primarily used as CCMR Conversion Pairs, and CoinDesk aims to avoid introducing any additional premiums or discounts to the prices associated with the conversion process.

Additionally, CoinDesk reserves the right to remove any Markets at its own discretion if they impact CCMR's price inaccurately.

5.3 Index Calculation

5.3.1 Mathematical Representation

We use the notation $|\cdot|$ to represent size of sets. What follows is the calculation of each relevant variable.

For a pre-specified digital asset, the CCMR is a volume-weighted average (last trade) price calculated as follows:

$$P_t = \sum_{e \in E_t} w_t^m \cdot p_t^m \cdot FX_t^q \tag{2}$$

Where:

[5] A CCMR Conversion Pair is considered stale if it has not traded in the last 24 hours.

t denotes a point in time, where the integer value represents seconds in unix timestamps [6]

P_t is the CCMR price at time t

m denotes a Market in set M_t

q denotes Market m quote's currency

M_t is the set of all Markets used in the calculation of CCMR at time t

w_t^m is the weight assigned to Market m at time t and is calculated in accordance with Equation 3

p_t^m is, with respect to Market m and time t, the price of the last trade to contribute to CCMR

FX_t^q is, with respect to the quote currency q, the FX Conversion value at time t for the relevant q-USD Pair calculated as follows:

- FX_t^q corresponds to the CCMR Conversion Pair when q is a digital asset, calculated in accordance with Equation 2;
- FX_t^q corresponds to the FX rate taken from openexchangerates[7] when q is a fiat currency;

The weight of Market m at time t is calculated as follows:

$$w_t^m = \frac{\mathbb{1}_t^m \cdot V_t^m \cdot \gamma_t^m}{\sum_{x \in M_t} \mathbb{1}_t^x \cdot V_t^x \cdot \gamma_t^x} \tag{3}$$

Where:

x denotes a Market (including Exchange m) in set M_t

$\mathbb{1}_t^m$ is, with respect to Market m and time t, the Outlier Detection Factor determined in accordance with Equation 4

V_t^m is, with respect to Market m and time t, the 24 Hour Volume calculated in accordance with Equation 6

γ_t^m is, with respect to Market m and time t, the Time Penalty Factor determined in accordance with Equation 8

The Outlier Detection Factor, with respect to Market m and time t, is determined as follows:

$$\mathbb{1}_t^m = \begin{cases} 0 & \text{if } |M_t| > 2 \text{ and } (p_t^m > A \cdot P_{l_t} \text{ or } A \cdot p_t^m < P_{l_t}) \\ 1 & \text{otherwise} \end{cases} \tag{4}$$

[6] Therefore 0 represents 00:00:00 on January 1st, 1970 UTC.

[7] `https://openexchangerates.org/`

Where:

M_t and p_t^m are as defined above

A is a constant that denotes the price deviation threshold; it is currently set to:

$$A = \begin{cases} 1.05 & \text{if } |M_t| \geq 15, \\ 1.10 & \text{if } 10 \leq |M_t| < 15, \\ 1.15 & \text{otherwise} \end{cases} \tag{5}$$

l_t is, with respect to t, the time of the last trade from any Exchange to contribute to CCMR [8]

P_{l_t} is the CCMR price at time l_t

The 24 Hour Volume, as defined in this document, with respect to Market m and time t, is calculated as follows:

$$V_t^m = \sum_{h_t \leq s < t} v_s^m \tag{6}$$

Where:

h_t is, with respect to time t, the timestamp of the last calendar hour in UTC in the previous 24-hour period determined as follows:

$$h_t = t - (23 \cdot 3600 + c) \tag{7}$$

Where:

c is the number of seconds past in the current hour

s denotes a point in time between h_t (inclusive) and t (exclusive) for which there was a trade on Market m

v_s^m is the quantity traded on Market m at time s [9]

The Time Penalty Factor, with respect to Market m and time t, is determined as follows:

$$\gamma_t^m = \begin{cases} \gamma_{\min} & \text{if } \tau_t^m < \tau_{\min}, \\ \gamma_{\max} & \text{if } \tau_t^m \geq \tau_{\max}, \\ \gamma_{\min} + \frac{(\gamma_{\max} - \gamma_{\min})}{(\tau_{\max} - \tau_{\min})} \cdot (\tau_t^m - \tau_{\min}) & \text{otherwise} \end{cases} \tag{8}$$

[8] This would be the last time that the CCMR was calculated.

[9] Note we do not include the volumes of trades deemed to be outliers.

Where:

$\gamma_{\min}$ is the minimum penalty factor, which is currently set to 1

$\gamma_{\max}$ is the maximum penalty factor, which is currently set to 0.001

$\tau_{\min}$ is the number of seconds at which the minimum penalty factor applies, which is currently set to 60 (1 minute)

$\tau_{\max}$ is the number of seconds after which the maximum penalty factor applies, which is currently set to 1,500 (25 minutes)

τ_t^m is, with respect to Market m and time t, the length of time in seconds since the last trade on Market m calculated as follows:

$$\tau_t^m = t - l_t^e \tag{9}$$

Where:

l_t^m is, with respect to Market m and time t, the time of the last trade on such Market m to contribute to CCMR

5.3.2 Outlier Detection

The outlier detection algorithm removes exchange prices that deviate significantly from the consolidated market price as defined in Equation 4.
If prices from multiple constituent exchanges subsequently converge toward the previously excluded price level, those prices will be treated as valid observations for subsequent calculation intervals.
Outlier filtering decisions are applied on an interval-by-interval basis and are not subject to retrospective adjustment. Accordingly, CoinDesk does not recalculate previously published CCMR values due solely to automated outlier filtering.
Trade exclusions outside the automated process defined in Equation 4 are governed by the CoinDesk Digital Asset Indices Policy & Methodology under the section Errors and Recalculation.

5.3.3 New additions

When adding a new digital asset to CCMR's universe the initial CCMR value is calculated in accordance to Equation 2.

If none of the digital asset Markets has traded in the last 24 hours and all $w_t^m = 0$, the most recent Market price traded is assigned as CCMR's initial value for that digital asset.

5.4 CCMR Converted Price

In accordance with Equation 2, CCMR is calculated using all Markets for a specific digital asset and converting them into USD. However, CCMR can also be converted to other quote currencies. For example, the user can query BTC-GBP and the CoinDesk API will return CCMR BTC-USD converted into GBP, determined as follows:

$$PC_t = P_t \cdot FX_t^{USD-q} \tag{10}$$

Where:

PC_t is the CCMR Converted Price a time t

P_t is the CCMR price at time t

FX_t^{USD-q} is, with respect to the quote currency q, the FX Conversion value at time t for the relevant USD-q Pair calculated as follows:

- FX_t^{USD-q} corresponds to the inverse of the CCMR Conversion Pair when q is a digital asset, calculated in accordance with Equation 2;
- FX_t^{USD-q} corresponds to the FX rate taken from openexchangerates[10] when q is a fiat currency;

The historical quote volumes associated with CCMR Converted Prices on CoinDesk API are estimated by multiplying the CCMR base currency volume by the average price of the period (instead of using the last price at time t).

$$VC_i^q = V_i \cdot PA_i^q \tag{11}$$

Where:

i denotes the period (i.e. day, month).

q denotes the conversion quote currency

VC_i^q denotes the CCMR Converted Prices traded volume measured in units of the conversion quote currency for period i

V_i denotes the traded volume associated with the CCMR digital asset price measured in units of the digital asset for period i

PA_i^q denotes the digital asset average price in quote currency for period i, calculated as the average CCMR price of the period divided by the quote-USD average price of the period:

$$PA_i^q = \frac{PA_i}{PA_i^{q-USD}} = \frac{V_i^{USD}/V_i}{V_i^{q-USD}/V_i^q} \tag{12}$$

[10] `https://openexchangerates.org/`

Where:

PA_i denotes the digital asset average USD price for period i

PA_i^{q-USD} denotes the quote-USD average price for period i

V_i^{USD} denotes the CCMR traded volume measured in USD

V_i denotes the traded volume associated with the CCMR digital asset price measured in units of the digital asset for period i

V_i^{q-USD} denotes the traded volume associated with the CCMR quote price measured in USD for period i

V_i^q denotes the traded volume associated with the CCMR quote price measured in units of the quote currency i

5.5 Auditability and Replicability

CCMR is auditable and replicable since its calculation is based on transaction data retrieved from Exchanges via public API. Anyone who has access to this data can recreate the CCMR.

5.6 Index Governance

CoinDesk Indices is regulated by the FCA through its affiliate, CC Data Limited ("CCData"), though the CCMR rates do not form part of the FCA benchmark family.

The CoinDesk Technical Committee provides ongoing oversight of the Index and its Methodology. For further detail on the Index Technical Committee, please refer to the Index Governance section of the CoinDesk Digital Asset Indices Policy Methodology.

6 Dissemination

CCMR is disseminated via REST API and Websocket API. The relevant API endpoint can be found here: `https://developers.coindesk.com/documentation`.

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