CoinDesk Single Digital Asset Price Indices Methodology

March 2022
Table of Contents

CoinDesk Single Digital Asset Price Indices Methodology .......................................................1
  Introduction ..................................................................................................................................3
  Eligibility Criteria ......................................................................................................................4
    Exchange Eligibility ..................................................................................................................4
  Index Construction .....................................................................................................................5
    Constituent Selection ..............................................................................................................5
    Constituent Weighting .............................................................................................................5
    Index Calculation ....................................................................................................................5
    Calculation Formula ...............................................................................................................6
  Index Maintenance .....................................................................................................................7
    Index Reconstitution ...............................................................................................................7
    Deletions ..................................................................................................................................7
    Additions ..................................................................................................................................8
  Data Distribution .......................................................................................................................8
  Index Governance .......................................................................................................................8
  Appendix 1: Data sources ...........................................................................................................9
    Volume data .............................................................................................................................9
    Reconstitution Data ..................................................................................................................9
  Appendix 2: Methodology Changes ............................................................................................10
  Appendix 3: Document Revision History ...................................................................................11
  Disclaimer .................................................................................................................................. Error! Bookmark not defined.
Introduction

Index Objective

The CoinDesk Single Digital Asset Price Index series (the “Indices”) provide USD-denominated reference rates for spot prices for bitcoin and other digital asset tokens as defined in Table 1. The Indices leverage real-time prices from multiple exchanges to provide a representative spot price for each digital asset. Constituent exchanges are weighted proportional to their trailing 24-hour liquidity with adjustments for price variance and inactivity.

Additional Details

Given the potential for anomalies or manipulation at individual exchanges, constituent weights may dynamically adjust using CoinDesk Indices proprietary Constituent Weighting Adjustment Algorithm (CWAA). The algorithm is designed to calculate a real-time index which is an accurate and reliable reflection of the market price of each digital asset using multi-sourced spot prices and dynamically reduce the weights of individual exchanges with lower liquidity, inactivity and higher price variance. Please refer to the Index Calculation section for more details.

These indices were officially rebranded from TradeBlock to CoinDesk on April 20, 2021. There were no modifications to the index rules or historical data because of this rebranding.

This methodology was created by CoinDesk Indices (“CDI”) to achieve the Index Objective stated above. There may be circumstances or market events which require CDI, in its sole discretion, to deviate from these rules to ensure each Index continues to meet its Objective. This document should be read in conjunction with the CoinDesk Digital Asset Indices Policy Methodology.

Table 1: List of Price Indices

<table>
<thead>
<tr>
<th>Index Name</th>
<th>Ticker</th>
<th>Trading Pair</th>
<th>Launch Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>CoinDesk Bitcoin Price Index</td>
<td>XBX</td>
<td>XBT/USD</td>
<td>11/03/2014</td>
</tr>
<tr>
<td>CoinDesk Ether Price Index</td>
<td>ETX</td>
<td>ETH/USD</td>
<td>03/02/2018</td>
</tr>
<tr>
<td>CoinDesk Bitcoin Cash Price Index</td>
<td>BCX</td>
<td>BCH/USD</td>
<td>03/02/2018</td>
</tr>
<tr>
<td>CoinDesk Litecoin Price Index</td>
<td>LTX</td>
<td>LTC/USD</td>
<td>03/02/2018</td>
</tr>
<tr>
<td>CoinDesk Cardano Price Index</td>
<td>ADX</td>
<td>ADA/USD</td>
<td>06/30/2021</td>
</tr>
<tr>
<td>CoinDesk Basic Attention Token Price Index</td>
<td>BTX</td>
<td>BAT/USD</td>
<td>03/17/2021</td>
</tr>
<tr>
<td>CoinDesk Ether Classic Price Index</td>
<td>ECX</td>
<td>ETH/USD</td>
<td>04/10/2017</td>
</tr>
</tbody>
</table>
## Eligibility Criteria

### Exchange Eligibility

To be eligible, an exchange must first meet the Exchange Eligibility criteria outlined in the CoinDesk Digital Asset Policy Methodology. For each Price Index, the following additional criteria is used to establish eligible exchanges.

1. Prior three-month trading volume (as measured by base currency) on the exchange must represent a target minimum percentage of total trading volume across all eligible exchanges for the trading pair as follows:
   a. For constituent exchanges, the minimum percentage is 5%.
   b. Non-constituent exchanges with a minimum percentage of 5% will not be eligible for the current rebalance but will be placed on a watchlist to be considered for the next reconstitution.
   c. For exchanges on the watchlist, the minimum percentage is 6%. Watchlist exchanges that drop below 5% will be removed from the watchlist.

2. Must support USD-denominated trading for the single asset.

For each index, the list of exchanges that pass all eligibility criteria listed above form the Selection Universe.
Index Construction

Constituent Selection

All exchanges in the Selection Universe are included in the index subject to a minimum of three and maximum of five exchange constituents based on the following steps:

a. Rank exchanges in descending order by three-month trading volume
b. Select the highest ranked exchanges subject to a maximum of five exchanges
c. If Step 2 results in fewer than three exchanges, the three-month trading volume requirement is relaxed until three exchanges are selected.

Constituent Weighting

Constituent exchanges are weighted proportional to their trailing 24-hour liquidity with adjustments for price variance and inactivity as described in Index Calculation.

Index Calculation

The Indices utilize the most recently available trade data from constituent exchanges to calculate and publish a volume weighted-average index price approximately once every second.

Calculating single digital asset price indices represents unique challenges as various market participants do not adhere to regulatory oversight, market standards, or follow pre-set guidelines. This can lead to concerns around data integrity vis-à-vis exchange sources, including, but not limited to unintended errors, manipulated pricing feeds, and/or issues with reported trading volumes.

To account for potential data anomalies or lack of trading volume from an exchange, CDI’s Constituent Weighting Adjustment Algorithm (CWAA) is designed to calculate a volume weighted price for each constituent exchange as well as adjust constituent weights in real-time to minimize the impact of localized exchange issues on calculated index levels. The following are key steps employed by the algorithm:

1. **Data Cleansing**: Before applying the index algorithm to real-time market data, all inputs are cleaned for duplicates, relevancy, and appropriateness.
2. **Binning Ticks**: Certain exchanges often process several trades within a short span of time (one second), which may unduly influence the index value. By binning several ticks, the algorithm synthesizes the data into a single trade.
3. **Liquidity Weighting**: Exchanges with greater 24-hour liquidity are more heavily weighted in the index, increasing the ability to trade against the index. This also mitigates the impact of ‘trade bursts’ or movements during off-peak trading hours.

4. **Price Variance Weighting**: The index rate reflects data points that are discretely weighted in proportion to their variance from the mean. As the price at a particular exchange diverges from the rest of the data points, its influence on the index consequently decreases.

5. **Time-based coefficient**: The algorithm penalizes inactivity on an exchange. If an exchange does not have new trading data after a certain period, its weighting is gradually reduced, until it reaches 0%.

The result of these steps may cause a partial or total reduction in the weight of the impacted constituent exchange(s). If this happens, the total percent weight reduced will be proportionally redistributed to constituent exchanges not impacted. As normal activity and trading resumes on the impacted constituent exchange(s), weights of all constituent exchanges will return to normal levels.

In the event of a market stress event or unresponsive input data from constituent exchanges, the algorithm will incorporate at least one input to calculate a benchmark value. In the unlikely event of no input data from all constituent values, the index will default to the most recent value for which one or more inputs were present.

The Index Committee maintains discretion for re-evaluating and updating the algorithm based on market conditions to maintain the quality, reliability, and integrity of the indices.

### Calculation Formula

\[ \text{IndexValue}_t = \sum_{i=1}^{N} P_{i,t} \times W_{i,t} \]

Where:

- \( \text{IndexValue}_t \) = Index Value at time \( t \)
- \( P_{i,t} \) = Price of trading pair (as calculated by the CWAA) on exchange \( i \) at time \( t \)
- \( W_{i,t} \) = Weight of constituent exchange \( i \) at time \( t \) as determined by the CWAA
- \( N \) = number of constituent exchanges
Index Maintenance

Index Reconstitution

Each index is reviewed on a quarterly basis during January, April, July and October and constituent exchanges are reselected based on the rules described above. Any index changes resulting from the quarterly review are announced two weeks in advance of the effective date and are phased in over a 24-hour implementation period. During the implementation period, the weights of additions will gradually increase from 0% to their target weight and any deletions will decrease from their current weight to 0%. Please see below for the reconstitution timeline including an example.

<table>
<thead>
<tr>
<th>Activity Description</th>
<th>Timing</th>
<th>Example Reconstitution Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference Date for Input Data</td>
<td>First Friday of Quarter</td>
<td>1/7/2022</td>
</tr>
<tr>
<td>Announcement Date</td>
<td>Second Friday of Quarter</td>
<td>1/14/2022</td>
</tr>
<tr>
<td>Implementation Begins</td>
<td>Saturday at 4PM following Fourth Friday</td>
<td>1/29/2022</td>
</tr>
<tr>
<td>Implementation Complete</td>
<td>Sunday at 4PM following Fourth Friday</td>
<td>1/30/2022</td>
</tr>
</tbody>
</table>

In addition to the quarterly process, exchange constituents are monitored daily for potential anomalies and trading disruptions. Out-of-review monitoring, which would require index modification, only applies in extraordinary circumstances. Incident types that would require one or more index modifications are outlined in the CoinDesk Digital Asset Indices Policy Methodology.

Deletions

If a constituent exchange is removed from an index outside of the schedule reconstitution process its weight will be set to zero on the removal effective date and it will no longer contribute to index returns. The impacted exchange will be considered for inclusion at the next scheduled reconstitution if it meets the Eligibility Criteria.
Additions

There will be no additions to the index between reconstitutions even if the constituent count drops below three exchanges. If the count drops below two exchanges, the Index Committee will review the eligible universe and determine the appropriate action.

Data Distribution

Index values are calculated 24x7 and follow UTC convention. Real-time index values are available publicly at https://tradeblock.com and/or https://coindesk.com/indices/ and are also available to subscribers via REST and WebSocket APIs, and via scheduled email updates.

Index Governance

The CoinDesk Index Committee provides ongoing oversight of the Indices and this Methodology. For more details on the Index Committee, please refer to the Index Governance section of the CoinDesk Digital Asset Indices Policy Methodology.
Appendix 1: Data sources

This section describes data sources used to reconstitute, maintain, and calculate the Index. If data is not available for any reason from the sources described in this appendix, other data sources may be used.

Price data

Prices used to calculate the Indices are sourced from eligible exchanges.

Volume data

Volume data used to weight constituents are sourced from eligible exchanges.

Reconstitution Data

Trading volume is sourced from eligible exchanges.
Appendix 2: Methodology Changes

The table below provides a summary of material changes to this Index Methodology.

<table>
<thead>
<tr>
<th>Effective Date</th>
<th>Prior Treatment</th>
<th>Updated Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>04/01/2022</td>
<td>Discretion by Index Committee for the addition of new exchanges when the 5% target trading volume was initially met.</td>
<td>Incorporated standard buffers and a seasoning period for 3-month target trading volume for new exchange constituents.</td>
</tr>
</tbody>
</table>
## Appendix 3: Document Revision History

<table>
<thead>
<tr>
<th>Description</th>
<th>Timing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Initial Version</td>
<td>March 11, 2022</td>
</tr>
</tbody>
</table>
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