



# Coinbase Index

## Construction and Methodology

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# Table of Contents

1. Introduction	2
Coinbase Index	2
About Coinbase	2
2. Index Construction	3
Constituent Assets	3
Weighting	3
Price	4
Supply	4
Divisor and Base Value	5
Publication	5
3. Methodology	6
Calculating the Index Level	6
Reconstituting the Index	6
4. Current Constituent Assets and Data Sources	8
5. Divisor History	8
6. Coinbase Index (Fixed Supply)	9
An Alternative Methodology for an Investable Index	9
Methodology	9
Calculating the Fixed Supply	10
Annual Rebalancing	10
7. Index Committee Oversight	11
Membership	11
Responsibilities	11
Changes to Index Methodology	12
8. License and Use	13

# 1 Introduction

## Coinbase Index

- 1.1 Coinbase Index (“CBI”) tracks the combined financial performance of all of the digital assets listed on Coinbase’s Exchange, GDAX<sup>1</sup>. The components of CBI are weighted by market capitalization, defined as price multiplied by supply<sup>2</sup>.
- 1.2 CBI is designed to be a benchmark for the overall performance of its constituent assets. The index level for CBI takes into account the latest price and supply of each of its constituent assets.
- 1.3 Due to ongoing supply increases<sup>3</sup>, a passive investment in the constituent assets would not be able to accurately track CBI. For an investable version of the index, investors should use Coinbase Index (Fixed Supply)<sup>4</sup>.

## About Coinbase

- 1.4 Founded in June of 2012, Coinbase, Inc. is a digital currency exchange platform where consumers and investors can easily buy, sell and hold digital currencies. Coinbase, Inc. operates GDAX, a central-limit order book exchange for digital assets, which is the source of the price data for CBI.

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<sup>1</sup> CBI does not track the overall performance of cryptocurrencies or digital assets, or any specific cryptocurrency or digital asset.

<sup>2</sup> Refer to section 2.8.

<sup>3</sup> Refer to section 2.9.

<sup>4</sup> Refer to section 6.

## 2 Index Construction

### Constituent Assets

- 2.1 The constituent assets of CBI are all the assets listed on GDAX. The criteria for assets to be listed on GDAX can be found in the GDAX Digital Asset Framework<sup>5</sup>.
- 2.2 New digital assets created through blockchain forks<sup>6</sup> or airdrops<sup>7</sup> will not be added to the index unless and until they are listed on GDAX. Each new asset must, in its own right, satisfy the criteria in the GDAX Digital Asset Framework<sup>8</sup> and be listed on GDAX in order to become a constituent asset of CBI.

### Weighting

- 2.3 CBI constituent assets are weighted by their relative USD market capitalizations (sometimes referred to as ‘total network value’ in the context of digital assets). The weighting of a constituent asset in the index is its USD market capitalization divided by the aggregate of the USD market capitalizations of all the constituent assets<sup>9</sup>.
- 2.4 The market capitalization of each constituent asset is calculated as the price<sup>10</sup> of the asset multiplied by the supply<sup>11</sup> of the asset.
- 2.5 CBI is weighted by market capitalization because it is the most objective overall measure of the financial performance of each of the constituent assets. Market capitalization represents the total value attributed to an asset by the digital asset market as a whole. It is the best available objective standard to compare the financial performance of digital assets<sup>12</sup>.

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<sup>5</sup> <https://www.gdax.com/static/digital-asset-framework-2017-11.pdf>

<sup>6</sup> A change to a digital asset’s blockchain protocol that creates two separate digital assets on two separate versions of the blockchain with a shared history.

<sup>7</sup> A distribution of a new digital asset to all hodlers of an existing digital asset at no cost.

<sup>8</sup> <https://www.gdax.com/static/digital-asset-framework-2017-11.pdf>

<sup>9</sup> Refer to section 3.1.

<sup>10</sup> Refer to sections 2.6 and 2.7.

<sup>11</sup> Refer to sections 2.8 to 2.10.

<sup>12</sup> For some digital assets, market capitalization may not be an accurate measure. For example, where there is a very small number of currently issued units relative to total units to be issued in the

## Price

- 2.6 The price for each constituent asset is the last trade price on the GDAX USD order book.
- 2.7 If trading is suspended for any reason, CBI will continue to be calculated based on the last trade price before trading was suspended<sup>13</sup>. CBI will be calculated based on new trade prices once trading commences again.

## Supply

- 2.8 The supply of each constituent asset is defined as the total number of units that have been created since the first block on the asset's blockchain. Supply is measured directly by querying a full node running on the blockchain of each constituent asset, maintained by Coinbase.
- 2.9 The supply of most digital assets increases on an ongoing basis, as defined by each asset's blockchain protocol. These supply increases are usually referred to as block rewards or miner<sup>14</sup> rewards — new units of the asset that are programmatically issued as a reward to network validators. These increases in supply have the potential to increase the market capitalization of the asset. CBI recognizes the effect of these increases by using the most recent supply figure for each asset in calculating the index level.
- 2.10 CBI does not make any adjustment for units of an asset that have been lost or sent to provably unspendable addresses<sup>15</sup>, or use a free float adjustment<sup>16</sup>. Unlike traditional assets, for digital assets it is difficult to objectively determine the number of units actually available for purchase by investors, because there is no record of

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future, or where very low trading volumes mean it is not possible to buy or sell a substantial amount of the asset at the current market price. However, given the criteria in sections 4, 5 and 6 of the GDAX Digital Asset Framework, these issues are not expected for assets listed on GDAX.

<sup>13</sup> Refer to section 7.4 about extended unavailability of a data source.

<sup>14</sup> The validators on a proof-of-work blockchain are usually referred to as miners.

<sup>15</sup> On most blockchains it is possible to send units of the asset to public addresses that cannot be spent, taking them out of circulation permanently. This is sometimes referred to as 'burning coins'.

<sup>16</sup> An adjustment to exclude shares that are not available for purchase by investors.

identity of the owners or holders of each asset. Therefore, it is difficult to determine whether or not any particular unit of an asset is held ready for trading on the market. For example, the private keys corresponding to the public address of those units could be lost or destroyed, meaning that these units are not available for trading. Therefore CBI reflects total current supply, without adjustment.

### Divisor and Base Value

- 2.11 The Divisor is the USD market capitalization of all constituent assets as at January 1st, 2015, subject to all previous divisor adjustments<sup>17</sup>.
- 2.12 The index start date is January 1st, 2015. This date represents the launch of GDAX. Because Bitcoin was the only constituent asset as at January 1st, 2015, the base value is equal to the market capitalization of Bitcoin at that time (USD \$4,337,808,289) meaning that the index level on that date was 100.

### Publication

- 2.13 CBI will be calculated and published at <https://am.coinbase.com/index>.
- 2.14 The historical CBI daily level (as at 5pm Pacific Time each day) starting from January 1st, 2015 will be also available at <https://am.coinbase.com/index>.

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<sup>17</sup> Refer to Sections 3.2 to 3.4 and the full Divisor History in Section 5.

## 3 Methodology

### Calculating the Index Level

- 3.1 The index level for CBI is calculated by dividing the sum of the current USD market capitalizations of all constituent assets by the Divisor and multiplying the result by 100. This calculation can be expressed as follows:

$$CBI = \left( \frac{\sum_i (P_i \times Q_i)}{D} \right) \times 100$$

Where:

- $i, ii, \dots$  = Each constituent asset
- $P$  = Last trade price on the GDAX USD order book for the asset
- $Q$  = Total number of units of the asset that have been created on the asset's blockchain since the first block
- $D$  = The base value, after adjustment for all previous reconstitutions<sup>18</sup>

### Reconstituting the Index

- 3.2 CBI will be reconstituted each time that a new asset is listed on GDAX, in order to allocate the correct weight to each constituent asset and to prevent an artificial increase in the index level. Each reconstitution will occur at 5pm Pacific Time on the fifth day that the new asset is traded on GDAX. This is designed to reduce the effect of any temporary price volatility in the new asset in the first few trading days after its listing.

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<sup>18</sup> Refer to sections 2.11, 2.12, 3.2 and 3.3

- 3.3 The index level can be calculated upon reconstitution by including the new asset when calculating the index level (see above), and updating the Divisor according to the following formula:

$$D_{t+1} = D_t \left( 1 + \frac{VWAP_x \times Q_x}{\sum_i (P_i \times Q_i)} \right)$$

Where:

- $i, ii, \dots$  = Each constituent asset before the reconstitution
- $x$  = The new asset
- $P$  = Last trade price on GDAX USD order book for the asset
- $VWAP$  = Volume-weighted average price on the GDAX USD order book for the asset for the 120 hours ending immediately prior to reconstitution
- $Q$  = Total number of units of the asset that have been created on the asset's blockchain since the first block
- $D_t$  = Existing Divisor
- $D(t+1)$  = New Divisor

- 3.4 If an asset is delisted by GDAX, the Divisor will be reduced by the same proportion that the market capitalization of the delisted asset bore to the numerator immediately before the asset was delisted.



## 4 Current Constituent Assets and Data Sources

Asset	Ticker	Price Data	Supply Data
Bitcoin	BTC	BTC:USD last trade price	Bitcoin blockchain
Ethereum	ETH	ETH:USD last trade price	Ethereum blockchain
Litecoin	LTC	LTC:USD last trade price	Litecoin blockchain
Bitcoin Cash	BCH	BCH:USD last trade price	Bitcoin Cash blockchain

## 5 Divisor History

Asset	Ticker	Date Added	Divisor adjustment	New Divisor
Bitcoin	BTC	January 1, 2015	N/A	\$4,337,808,289
Ethereum	ETH	May 24, 2016	1.149787677	\$4,987,558,516
Litecoin	LTC	August 23, 2016	1.019350493	\$5,084,070,232
Bitcoin Cash	BCH	December 24, 2017	1.165351982	\$5,924,731,322

## 6 Coinbase Index (Fixed Supply)

### An Alternative Methodology for an Investable Index

- 6.1 As discussed above<sup>19</sup>, most digital assets have an ongoing, programmatic increase in supply built into their blockchain protocol. These supply increases are usually awarded to those who validate (e.g. mine or stake<sup>20</sup>), rather than to passive holders of the asset.
- 6.2 Investors who passively hold digital assets will notice that, over time, the USD value of their holdings actually decreases relative to the USD total market capitalization of the asset. This is a natural result of the ongoing supply increases. Because CBI is based on total market capitalization, a passive investment in its constituent assets will also fall short of the CBI level over time.
- 6.3 Therefore, investors should track an investable version of the index: Coinbase Index (Supply Adjusted) (“CBIFS”). CBIFS excludes the effect of ongoing increases in supply of its constituent assets. It uses a Fixed Supply for each asset, rebalancing once per year.

### Methodology

- 6.4 In calculating CBIFS, the following elements remain the same as CBI:
- Constituent Assets
  - Price
  - Base Value
- 6.5 When calculating CBIFS, the only change from CBI is: each time a calculation calls for the supply of a constituent asset, do not use the asset’s actual current supply, instead use the latest Fixed Supply.

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<sup>19</sup> Refer to section 2.9.

<sup>20</sup> Some blockchains may operate using proof-of-stake validation, allowing holders of the asset to act as validators by ‘staking’ their holdings, performing validation, and earning a share of the programmatic supply increase as a reward.

- 6.6 By fixing the supply in the calculation of the market capitalization for each asset, CBIFS removes the effect of programmatic supply increases. This means that CBIFS is investable — it can be tracked by buying and holding the constituent assets and rebalancing once annually.

### Calculating the Fixed Supply

- 6.7 Each asset's initial Fixed Supply figure is its supply as at 5pm Pacific Time on 1 January in the calendar year that the asset was added to GDAX.
- 6.8 To calculate the latest Fixed Supply figure for an asset, take the asset's most recent Fixed Supply and multiply it by the most recent Supply Adjustment for the asset.
- 6.9 The Supply Adjustment for an asset is calculated at 5pm Pacific Time on January 1st each year as the percentage by which its supply increased since the same date and time one year ago, divided by the average percentage increase in supply for all constituent assets over the same period.

### Annual Rebalancing

- 6.10 CBIFS rebalances annually, at 5pm Pacific Time on January 1st. Rebalancing occurs by calculating the updated Fixed Supply figure for each constituent asset, and then recalculating the level of CBIFS.
- 6.11 CBIFS is also reconstituted whenever an asset is added to or removed from GDAX, in the same way as CBI<sup>21</sup>, except using Fixed Supply instead of current supply for each asset.

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<sup>21</sup> Refer to sections 3.2 to 3.4.

# 7 Index Committee Oversight

## Membership

- 7.1 The Coinbase Index Committee consists of one member representing Coinbase, and two unaffiliated independent members who have experience in index creation and oversight. The independent members may be paid for their services on the Committee but must not have any direct or indirect financial interest in Coinbase.
- 7.2 The Coinbase Index Committee meets once per quarter (and additionally if required in exceptional circumstances). The minutes of these meetings will be published at [am.coinbase.com/index](https://am.coinbase.com/index).
- 7.3 Members of the Coinbase Index Committee must declare any potential conflicts of interest, including interests in entities or digital assets, that may arise in the course of their service on the Committee.

## Responsibilities

- 7.4 The Coinbase Index Committee is responsible for:
- Reviewing the accuracy and availability of data sources once per quarter.
  - Reviewing calculations of the index level for anomalies once per quarter.
  - Determining whether, in exceptional circumstances, the index level will be calculated or recalculated from different data sources. For example, if one or more data sources is unavailable for an extended period. In that case, the Committee will, if possible, use the US-based spot exchange with the most volume over the past 30 days on the USD order book for each constituent asset.
  - Determining whether, in exceptional circumstances, it is necessary to recalculate the index level for a particular period. For example, if one or more data sources is discovered to be inaccurate.
  - Determining whether, in exceptional circumstances, a change to the index methodology is required.

## Changes to Index Methodology

- 7.5 If the Coinbase Index Committee determines that a change to the index methodology is required, a detailed explanation of the reason for the determination, the date of change, and the updated index will be published at [am.coinbase.com/index](https://am.coinbase.com/index).

## 8 License and Use

- 8.1 The Coinbase trademark, Coinbase Index (which for the purposes of this section includes Coinbase Index - Fixed Supply) including the website at [am.coinbase.com/index](https://am.coinbase.com/index), and all related tickers, widgets and APIs and the contents of this document (and all information and data contained therein and herein) are proprietary property of Coinbase, Inc., Coinbase Asset Management, Inc. and other Coinbase affiliated entities and are provided for information purposes only.
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