



CryptoCompare Aggregate Index Constituent Review



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VERSION HISTORY

Version	Date	Reviewed by	Details
1	2019-09-27	Ajay Pethani	Initial version in CCCAGG methodology
2	2020-03-31	Quynh Tran-Thanh	Updated methodology with liquid vs illiquid groups

INTRODUCTION

CryptoCompare Aggregate Index (CCCAGG)

CCCAGG is CryptoCompare's proprietary index calculation methodology for digital assets, based on 24-hour volume weighted average calculation, time-penalty factor and outlier methodology. CCCAGG is aggregated across multiple exchanges for each trading pairs. Currently CryptoCompare calculates more than 10,000 CCCAGG price indices across 180 exchanges, aggregating more than 50,000 data feeds.

One crucial part of the methodology is the constituent exchange selection process, whereby each exchange is tested for eligibility requirements to be included in the aggregation. The selection methodology consists of a qualitative part, using the CryptoCompare Exchange Benchmark, and a quantitative part, looking at historical price movements. This document explains the exchange inclusion and exclusion process.

Scope and goal

The goal of the Constituent Review Methodology (Review) is to maintain integrity for the CCCAGG indices, and allow for the best price discovery. Each price index will be assessed individually. The scope of this review is currently for spot exchange pairs only.

Exchange Benchmark

The CryptoCompare Exchange Benchmark seeks to bring clarity to the digital asset exchange sector by providing a framework for assessing risk, bringing transparency and accountability to a complex and rapidly evolving market. This is approached in several dimensions using a comprehensive data set, covering 160 exchanges across 8 categories of evaluation:

- Legal/Regulation
- Data Provision
- Security
- Team/Exchange
- Investment
- Trade Monitoring
- Market Quality
- Negative Events Penalty

The output of the Exchange Benchmark framework is a rating system, whereby each exchange gets a grade from AA (best quality) to F (lowest quality). This framework will be used as a qualitative assessment for the eligibility review.

Benchmark results are updated quarterly and published on cryptocompare.com. The full methodology can be found here: data.cryptocompare.com/research.

Constituent Review Methodology

When assessing the eligibility of an exchange to be included/excluded in each CCCAGG index, CryptoCompare differentiates between the most liquid pairs (liquid pairs) and other pairs. This is due to the fact that for liquid pairs the main goal is to maintain price integrity, while for illiquid pairs the goal is to give the best price discovery. The difference in incentives means that the eligibility rules also differ.

While the review will take the Benchmark grades into consideration, a top grade does not automatically determine inclusion. Historical prices are used to assess the price differences for each trading pair by calculating differences to median price. Moreover, further metrics will be used for the assessment, such as impact and liquidity factors.

Review Process

The Review is conducted each month at the end of the month and implemented in the first week of the month. The Review is fully transparent, calculations and results will be published on data.cryptocompare.com/research. The Review is signed off by the CCCAGG Review Committee.

DEFINITIONS

Top-tier exchanges

Exchanges with grade AA, A or B, based on the Exchange Benchmark results. Grades can be found on cryptocompare.com.

Liquid pairs

Pairs with both base and quote market trading above 1 million USD a day in average for the last 30 days aggregated across CCCAGG markets, or above 5 million USD a day aggregated across all markets.

Price difference

To assess the price difference of an exchange pair compared to the rest of the exchanges trading the same pair, one will calculate a median price of all markets for a certain day. The price difference is the difference between an exchange's price and the median price in percentage terms. The assumption is that for a trading pair with multiple exchanges, most liquid exchanges will cluster around the median. This metric is preferred over a simple average, as it can detect outliers without skewing the metric for the whole sample.

In the following example, we looked at BTC-USD close prices on 29th March 2020 across 48 trading venues, as shown on Chart 1. The median price on this day was 5906.785, meaning that an exchange that quoted BTC-USD at 6688 had price difference of 13% compared to the market median.

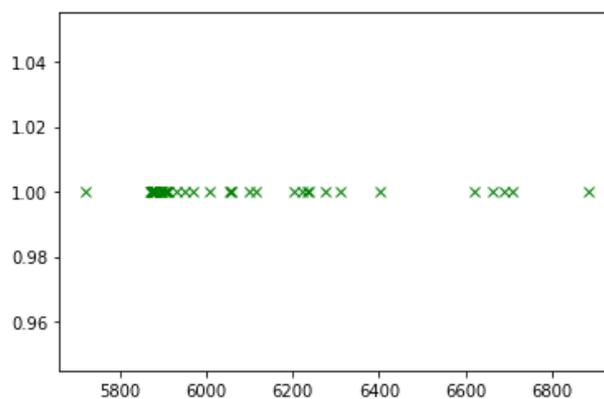


Chart 1: BTC-USD prices across different exchanges on 29 March 2020. Most liquid markets are assumed to cluster around the

Price impact

Price impact is a metric to assess how much of the price difference defined above will materialise when added to the CCCAGG index. If we assume CCCAGG price to be close to median, the price impact will be a volume weighted price difference as follows:

$$price_impact_e = price_d \frac{avg_day_vol_e}{avg_day_vol_{cccagg}}$$

This is an important metric as a higher price difference on a low-volume exchange will materialise less. in certain cases, than a lower price difference price feed on a high-volume exchange. This is due to the fact that CCCAGG is using 24 hour volume weighted average calculation.

Liquidity factor

Liquidity factor is calculated as the fraction of exchange average daily volume compared to the CCCAGG average daily volume. This number can be greater than 100%. This metric shows how much liquidity it will contribute to the CCCAGG index, which will be a key metric for selecting constituents for illiquid pairs.

Average daily volumes

Average daily volumes for each pair are calculated on daily historical data, all converted into USD at the day's CCCAGG USD rate.

CONSTITUENT REVIEW METHODOLOGY

Overview

The Review is divided into two main parts: review of liquid pairs and review of illiquid pairs. This is an important distinction, as the incentives of review for the two groups are different. For the liquid pairs, the review prioritizes price integrity, so top-tier exchanges are preferred with strict rules for inclusion. For other pairs, the incentive is to provide the best price discovery, therefore eligibility rules will be more relaxed.

The Review is conducted once every calendar month, aggregating the data of the last 30 days.

Liquid pairs

Liquid pairs are calculated based on average daily volumes for of each base and quote asset that reach a certain threshold. As of date of writing this methodology, CryptoCompare counts 175 base assets, 31 quote assets, combined together into 1149 liquid pairs, aggregating 6638 exchange pairs. This means, on average, a liquid pair has 6 difference exchanges.

The following reviews are done on the pair-by-pair basis: top-tier exchanges to include, all exchanges to exclude and other exchanges to include.

TOP-TIER EXCHANGES TO INCLUDE

For inclusion review of top-tier exchanges that have not been included in certain markets, CryptoCompare uses 30-day average price difference metric and 30-day average price impact. Exchanges with low price difference and low price impact will be added to the index. Both of the following thresholds need to be reached for the inclusion as show in Table 1:

Table 1: Top-tier exchange inclusion thresholds for liquid pairs

Metric	Threshold
30-day average price difference (absolute)	2%
30-day average price impact (absolute)	10%

EXCHANGES TO EXCLUDE

Exclusion tests are done with all exchanges including top-tier exchanges. This is important for liquid pairs as the goal is to maintain price integrity. The metrics used for the exclusion test are 30-day average price difference metric and 30-day average price impact. Exchanges with high price difference and high price impact will be excluded from the index as shown in Table 2:

Table 2: All exchange exclusion thresholds for liquid pairs

Metric	Threshold
30-day average price difference (absolute)	10%
30-day average price impact (absolute)	50%

Exclusion thresholds are higher than inclusion thresholds as we need to account for periodical differences due to the overall market liquidity seasonalities.

NON TOP-TIER EXCHANGES TO INCLUDE

All other exchanges that are non top-tier are also reviewed for inclusion. The metrics used for this review are 30-day average price difference metric, liquidity ratio, and daily average volume. First, exchange pairs need to meet a minimum trading activity threshold to avoid stale prices. Once that is met, the price difference needs to meet a certain level. It is also important that the liquidity ratio is reasonably high, adding price liquidity to the index.

Table 3: Non top-tier exchange exclusion thresholds for liquid pairs

Metric	Threshold
30-day average price difference (absolute)	10%
30-day average daily volume	5 million USD
Liquidity ratio	50%

Illiquid pairs

Any pair that is not in the list of liquid pairs are reviewed as 'illiquid pairs'. The main motivation for this review is to provide the best price discovery possible. These pairs are less liquid, therefore data sources are scarce. As of writing this report there are around 14 thousand other pairs from 30 thousand exchange pairs. This means in average an illiquid pair has 2 exchanges.

DRY PAIRS (LESS THAN 4 EXCHANGES)

Pairs with less than 4 exchanges are called 'dry pairs,' and will allow all price feeds to be included (up to 3 exchanges), unless price difference is an order of magnitude high (10x). The safety net for including all exchanges up to 3 exchanges is the CCCAGG outlier methodology which automatically excludes a 3x difference. A minimum of 3 exchanges is required for the outlier methodology to work.

TOP-TIER EXCHANGES TO INCLUDE

All top-tier exchanges are reviewed for illiquid pairs that are not dry pairs. Although top-tier exchanges are trusted for their data quality, they may have illiquid markets too as they launch new products. The following metrics are used for the review: 30-day average price difference and liquidity ratio.

Table 4: Top-tier exchange inclusion thresholds for illiquid pairs

Metric	Threshold
30-day average price difference (absolute)	5%
Liquidity ratio	50%

REVIEW RESULTS

Change report

Each month a Change Report will be published, that lists all exchange additions and removals for each CCCAGG index. The report consists of breakdown of liquid versus illiquid pair changes, top-tier and non top-tier exchange changes.

Implementation

The implementation of the changes is 5 business days after the Change Report publication. The implementation is done by the CryptoCompare software engineers, and tested by QA engineers.

Overview statistics

As of writing the report CCCAGG indices take 24% of total reported volumes into account as shown on Chart 2. Excluded markets are illiquid markets, markets from non top-tier exchanges, or markets with big price discrepancies. Only one third of CCCAGG trading volume is coming from liquid pairs as shown on Chart 3.

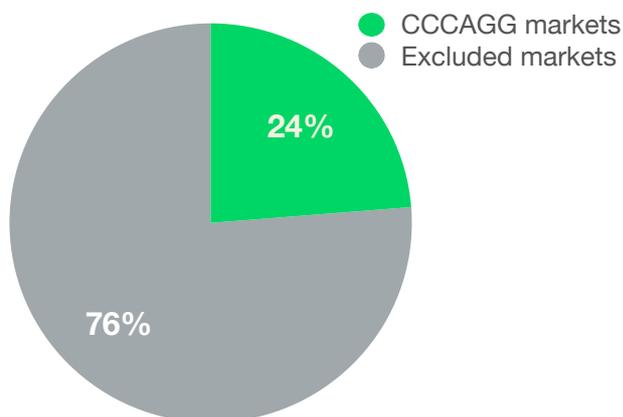


Chart 2: Average daily volume ratios for CCCAGG vs. Excluded markets

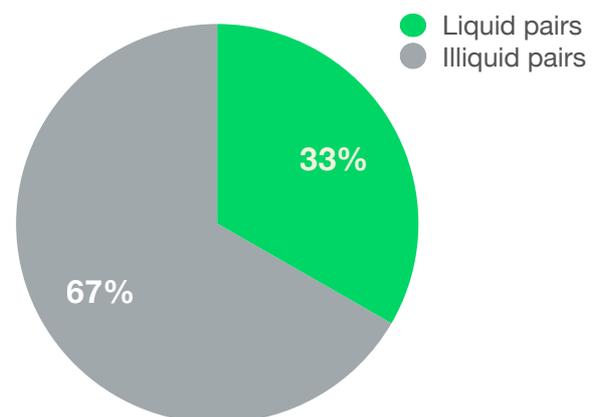


Chart 3: Average daily volume ratios for liquid vs. illiquid pairs that are included in CCCAGG

To have a high level view on price integrity, one can look at all percentage price differences from the market median, averaged over the last 30 days for top pairs. The average price difference for CCCAGG included pairs is at 0.7%, the distribution is shown on Chart 4. In many cases this value is as high as 50%, and the purpose of the review and to maintain this value as low as possible. This metric will be used as a proxy for price integrity in CCCAGG.

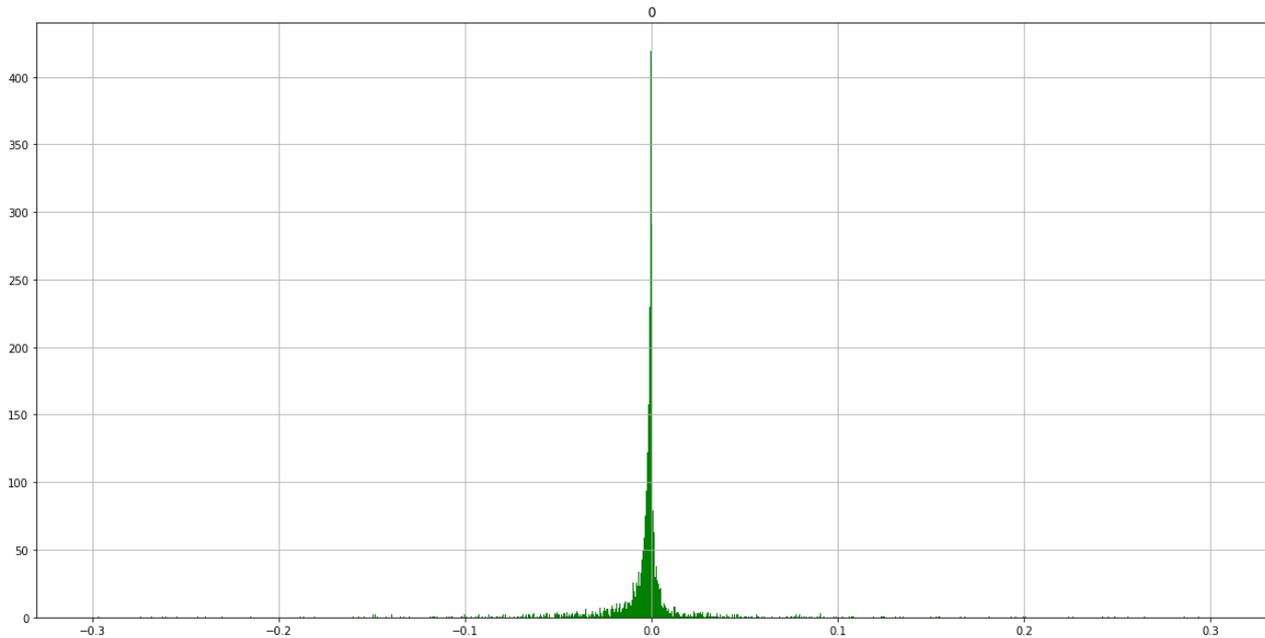


Chart 4: Distribution of price differences across all exchanges and pairs included in CCCAGG