CryptoCompare

CCCAGG Aggregate Index Validation
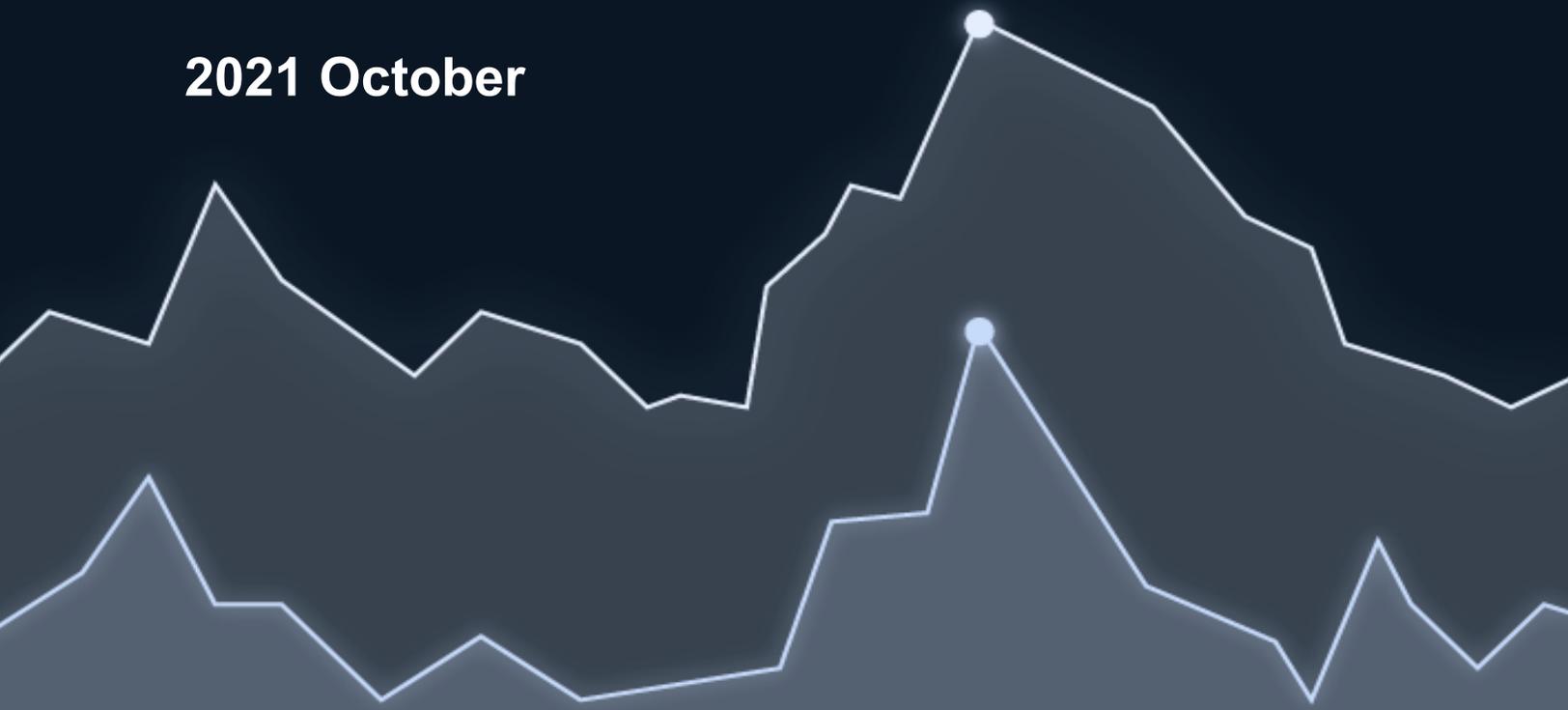
2021 October

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Introduction

The Crypto Coin Comparison Aggregated Index ("CCCAGG") refers to the real-time index calculation methodology, the purpose of which is to show the best price estimation for cryptocurrency traders and investors to value their portfolio at any time. 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. It aggregates transaction data of more than 250 exchanges, using a 24 hour volume weighted average. The CCCAGG is calculated for each cryptocurrency in each market it is trading in (example: CCCAGG BTC-USD).

Find the full methodology here:

https://data.cryptocompare.com/reports/cryptocompare-aggregate-index-methodology-jan-2021

Goal of the report

The goal of this report is to show that the CCCAGG index is representative and replicable by conducting a series of tests and benchmarking.

Thus this report is focused on the following key areas:

- CCCAGG methodology validation
    - Price consistency
    - Price stability
- Backtesting results
    - Recalculate daily CCCAGG values using raw trade data for the last 3 months
- Constituent exchange review
    - Summary of changes for this month's review
    - CCCAGG behaviour vs constituent exchanges behaviour

Executive summary

In the October 2021 validation report, these are the main takeaways:

Price consistency

- For almost 90% of a total of 704 pairs the daily CCCAGG price is less than 0.5% away from the median market price on average for the last 3 months, which is an indication of price consistency. This is a decrease of 1 percentage point from the August report.

Price stability

- When comparing the volatility of CCCAGG to the volatility of individual exchanges, 66% of the 704 pairs included in this test had a negative difference; meaning CCCAGG was less volatile than the average of the individual exchanges across the last 3 months. This is a decrease of just over 3 percentage points from the September report..

- Of the 34% that had a positive difference, 86% of the CCCAGG pairs were less than 1% more volatile than the individual exchange average.

Backtesting

- 99% of the 200 pairs where CCCAGG was replicated had less than a 0.5% average difference from the real time price over the 90 day period. This is a decrease of half a percentage point from last month's report. Any differences may be a result of backfilled or late trades that were excluded from the real time calculation.

Constituent review

- On average, 345 million USD in volume was added to CCCAGG per day through the review of constituent exchanges. This caused a 0.20% change in the price on average for all reviewed pairs.

Data

CCCAGG covers over 10,000 pairs but this validation report focuses on a subset of more liquid pairs, which are defined as the following:

- Have traded volume during the last 90 days
- Have more than 3 constituent exchanges

The report includes a total of 704 pairs for the October 2021 review.

Data used to create this report consists of:
- Historical daily, hourly and minute OHLC for all exchanges and CCCAGG
- Raw trades from all exchanges

The full review result dataset is downloadable in CSV form upon request.

Methodology validation

CCCAGG methodology ensures that the index is robust to outliers. The following methodology features help achieve this goal:
- 24 hour volume weighting:
  - Ensures CCCAGG gives greater weight to liquid market prices, and price impact of illiquid (and therefore more volatile) markets are negligible.
- Time penalty factor
  - Ensures that exchanges that suspend trading or trade infrequently have an expiring price impact.
- Outlier Detection
 - Excludes trades that deviate significantly from the previous index price

Thus, it is expected that:
- CCCAGG follows the market median price closely
- CCCAGG is less volatile than each individual exchange

Price consistency

We measure price consistency by comparing daily CCCAGG values for the last 3 months with the median market price of the constituent exchanges. We are expecting the CCCAGG price to be close to the market median, but there may be bigger deviations for illiquid markets.

Average difference CCCAGG vs median - last 3 months
% of total pairs
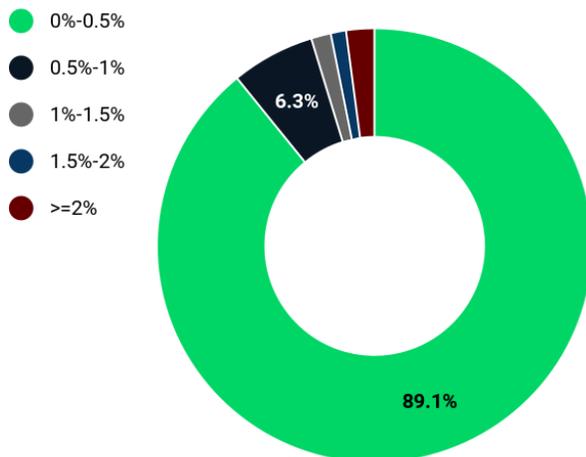
Max difference for each pair - last 3 months
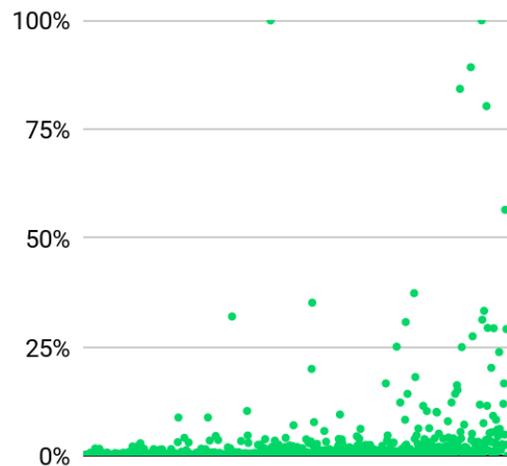
Left chart: Pie chart depicting the average difference between CCCAGG price and the median price of all constituent exchanges for the last 3 months. Right chart: Scatterplot depicting maximum difference between CCCAGG price and the median price of all constituent exchanges for the last 3 months.

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For around 90% of a total of 704 pairs the daily CCCAGG price is less than 0.5% away from the median market price, on average over the last 3 months. The scatter plot shows a few pairs out of the range - these are illiquid pairs where we prioritise price discovery and, thus, we allow more volatility.

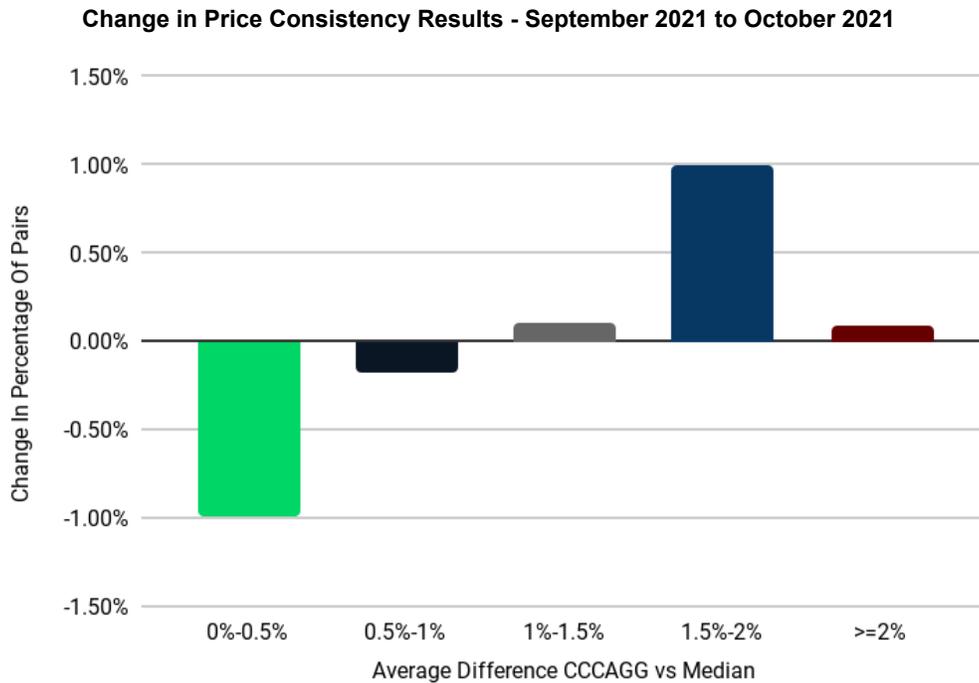**Change in Price Consistency Results - September 2021 to October 2021**

Chart showing the changes in the percentage of pairs that fall into each bracket of difference between CCCAGG price and the median market price, from the September 2021 to October 2021 report.

Compared to last month's report the number of CCCAGG pairs whose price was less than 0.5% away from the market median decreased by 1%. This was counter-acted by a 1% rise in the percentage of pairs with between a 1.5 and 2% difference.

Price stability

Price stability is measured by comparing daily CCCAGG volatility to market volatility in the last 3 months. In this report we measure volatility as the ratio of the high and low price during each day. We compare the CCCAGG volatility with the average market volatility across the past 3 months. A negative difference means CCCAGG is less volatile than the average of the individual exchanges in the market.

On the 7th October Kraken sent some erroneous trades through their api which made their way into our system. The CCCAGG prices were not affected, due to the outlier detection built into the CCCAGG methodology which detected and removed these trades. However, Kraken prices do distort the market's average volatility. To avoid this, Kraken was removed from the dataset used to calculate the market volatility, on only the dates affected (the 7th and 8th of October).

Average difference CCCAGG vs market volatility

% of total pairs
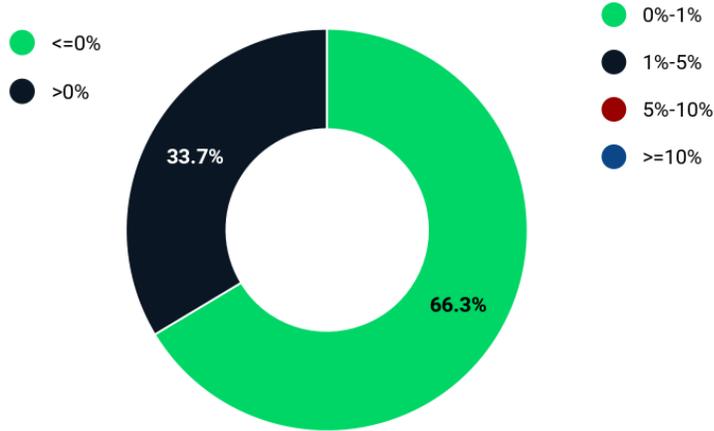
% of pairs with a positive difference
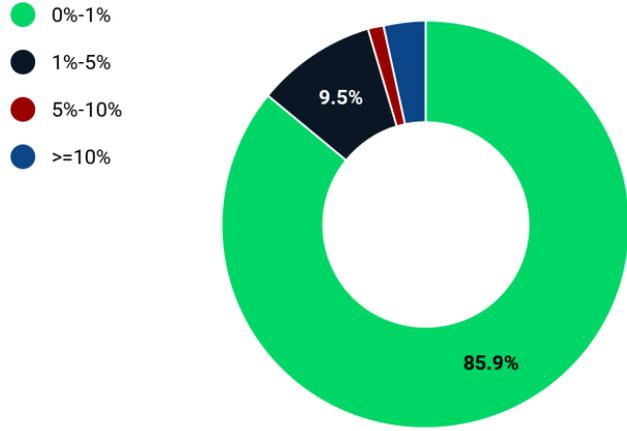
Left chart: Percentage of pairs that have either a positive or negative percentage difference between CCCAGG and market volatility. Right chart: Breakdown of the percentage difference of pairs which have a positive difference between CCCAGG and market volatility.

Of the 704 pairs included in this test, 66% had a negative difference, meaning CCCAGG was less volatile than the average of the individual exchanges across the last 3 months. Of the 34% that had a positive difference, 86% were less than 1% more volatile than the individual exchange average. This positive difference occurs generally on illiquid markets, where individual exchanges have infrequent updates, but add up to more frequent updates for the aggregate index.

Change in Price Stability Results - August 2021 to September 2021
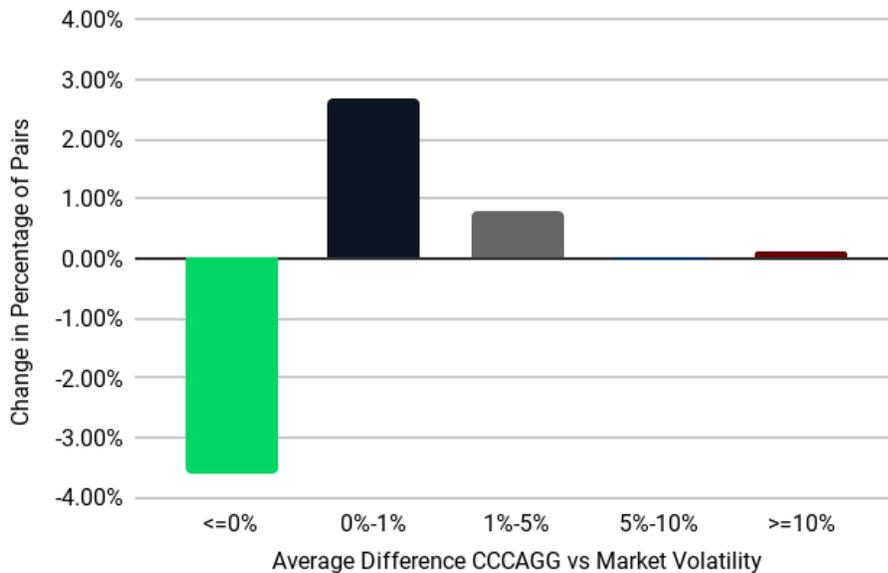

Chart showing the changes in the percentage of pairs that fall into each bracket of difference between CCCAGG volatility and the average market volatility, from the September 2021 to October 2021 report.

Compared to last month's report we saw a decrease of around 3.5 percentage points in the number of pairs that have a negative difference, counter-acted by an increase in the percentage of pairs with a very small positive difference.
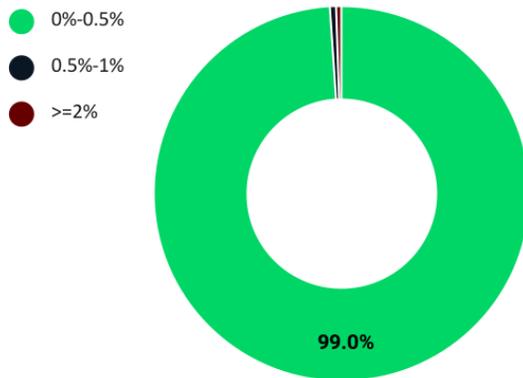
Backtesting results

CCCAGG should by nature be replicable as it is calculated from raw trade data. To demonstrate this the CCCAGG end of day value was re-calculated for the past 90 days, for the top 200 pairs by volume. This was done with an entirely separate script to the ones used to calculate CCCAGG in real time. The results from this were compared to the realtime CCCAGG calculation. Any differences might be due to:
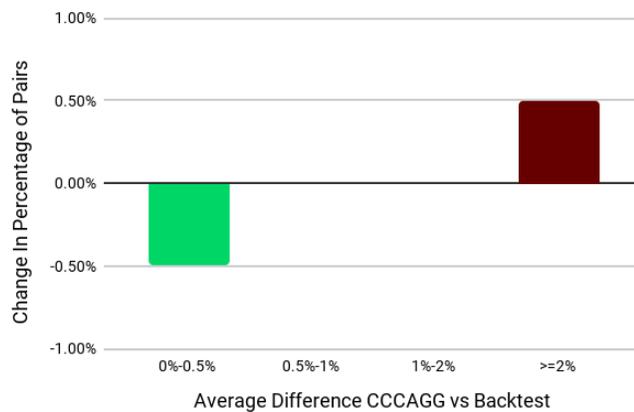- Backfilled trades
- Late trades not taken into account
- Internal latency

Average difference - CCCAGG real time vs backtest

Left Chart: average difference between CCCAGG real time values and backtesting for the top 200 pairs by volume. Right Chart: change in the results from the previous to the current report.

99% of the 200 pairs had less than a 0.5% average difference over the 90 day period. One pair had a difference between 0.5 and 1% and another pair had a difference of just over 2%. The 2% difference is caused by the exclusion of HitBTC from ETC-BTC CCCAGG calculation last month, as the prices on this exchange showed a higher volatility than the rest of the market.

Constituent exchange review

Each month the CCCAGG index constituents are reviewed, according to the Constituent Selection Criteria. Constituents are selected based on their Exchange Benchmark grade, trading volume and price stability. Read the full selection methodology under chapter 6 in the CCCAGG Index Methodology.

Volume and price impact of review

In this section we compare CCCAGG aggregate volumes and prices after the review against CCCAGG aggregate volumes and prices before the review (all volumes in USD). To do this we:
- Compute the total difference for the last 30 days (net volume we add or remove after the review)
- Calculate the average volume change each day
- Calculate the average price change each day

After the October review, we added on average 345 million USD a day in volume to CCCAGG.
Find the full list of removed and added constituents here:
https://www.cryptocompare.com/media/38553967/cccagg-review-2021-october-results.pdf

Values in millions of USD	July	August	September	October
Average volume added	284	95	184	359
Average volume removed	(2)	(1)	(9)	(14)
Average change in volume	282	94	175	345
% volume change	*5.0%*	*5.3%*	*3.3%*	*0.97%*

On average for all reviewed pairs the CCCAGG prices changed 0.20% after the exchanges review. For the top 20 pairs the change is 0.18% on average.

Average difference CCCAGG price - last 30 days
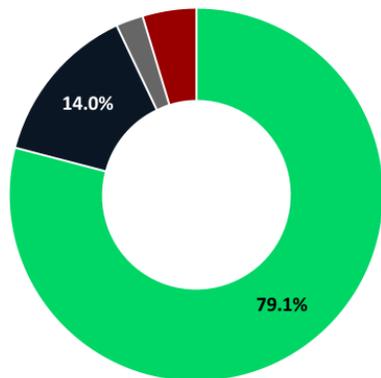% of total pairs

Chart depicting the average difference between CCCAGG price before the review and CCCAGG price after the review during the last 30 days.

CCCAGG Behaviour vs Constituent Exchange Behaviour

In this section we chart the CCCAGG price vs constituent exchange prices for the top 5 pairs traded in USD across the last 30 days. The goal is to show how CCCAGG price is affected by any major price movements in any of the constituent exchanges during the time period. It is expected that CCCAGG is not significantly affected by unusual price changes in the constituent markets.

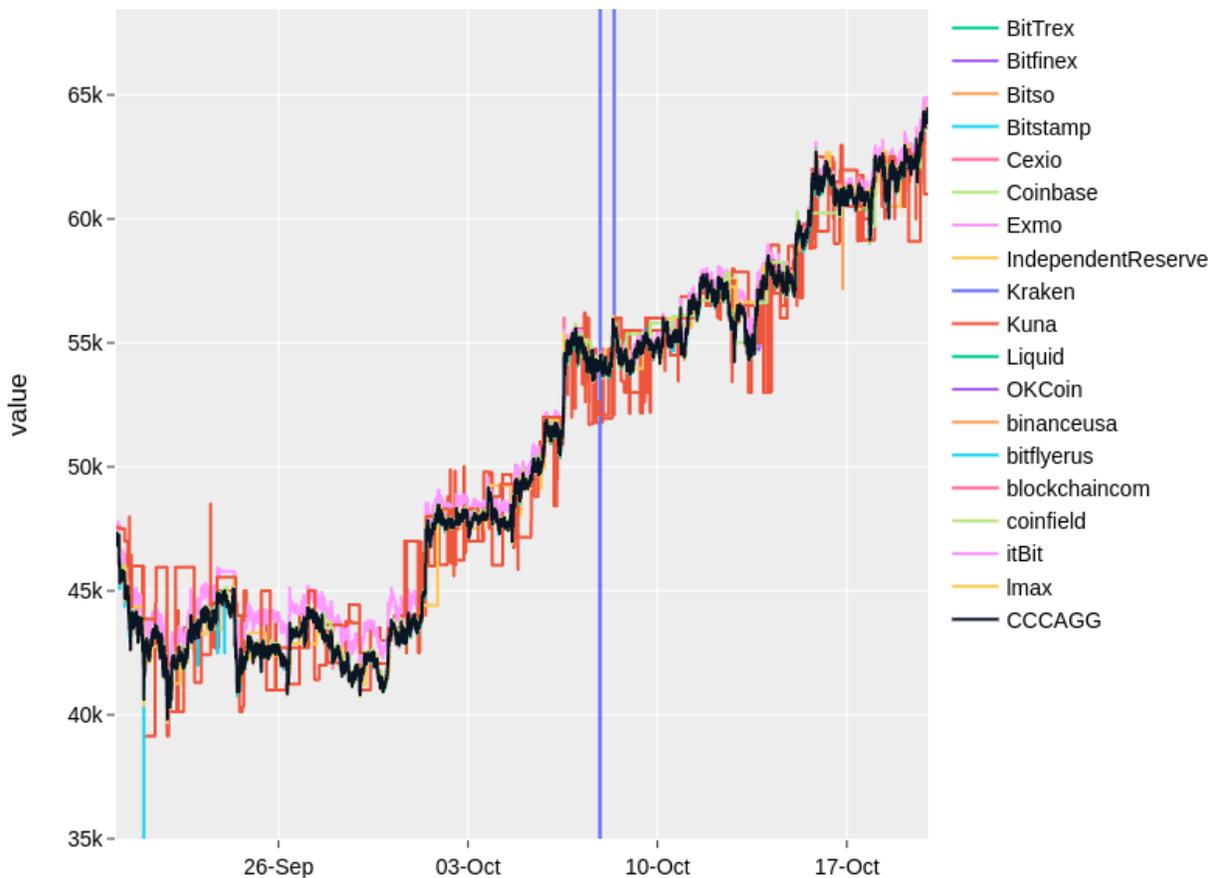**BTC - USD price** - Last 30 days -Minute data

Chart depicting minute BTC-USD CCCAGG and constituent exchange prices for the last 30 days.

It is clear that CCCAGG is not affected by the erroneous prices on Kraken on the 7th of October, as they were removed from the CCCAGG calculation by the outlier detection methodology. It is also clear that stale prices, such as those occasionally on Kuna or bitflyerus, do not impact CCCAGG price.

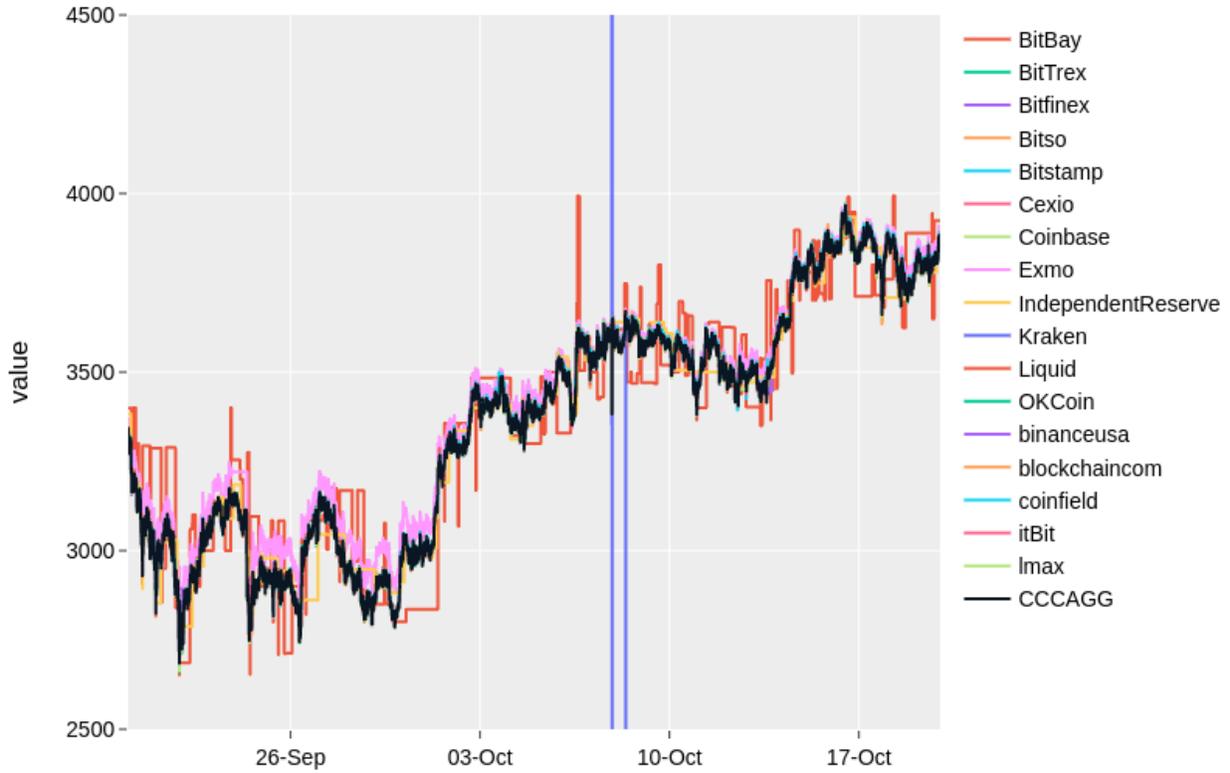**ETH - USD price** - Last 30 days - Minute data

Chart depicting minute ETH-USD CCCAGG and constituent exchange prices for the last 30 days.

The CCAGG price follows the market and is not affected by the erroneous pricing on Kraken on the 7th October. The stale prices on BitBay and Liquid are avoided thanks to the 24 hour volume weighting.

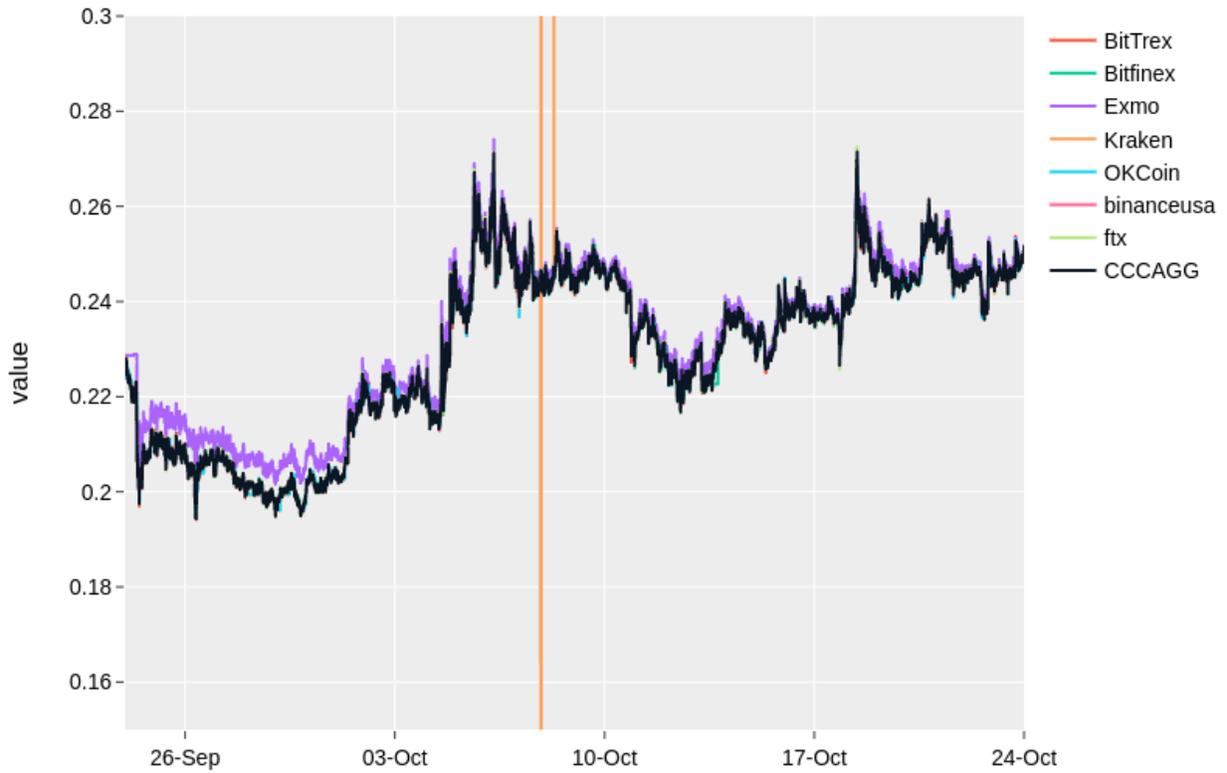**DOGE - USD price** - Last 30 days - Minute data

Chart depicting minute DOGE-USD CCCAGG and constituent exchange prices for the last 30 days.

The CCCAGG price tracks the market price well throughout the period, With the outlier detection again removing the erroneous Kraken pricing. CCCAGG is also not influenced by the price on Exmo at the beginning of the period which is not in line with the market.

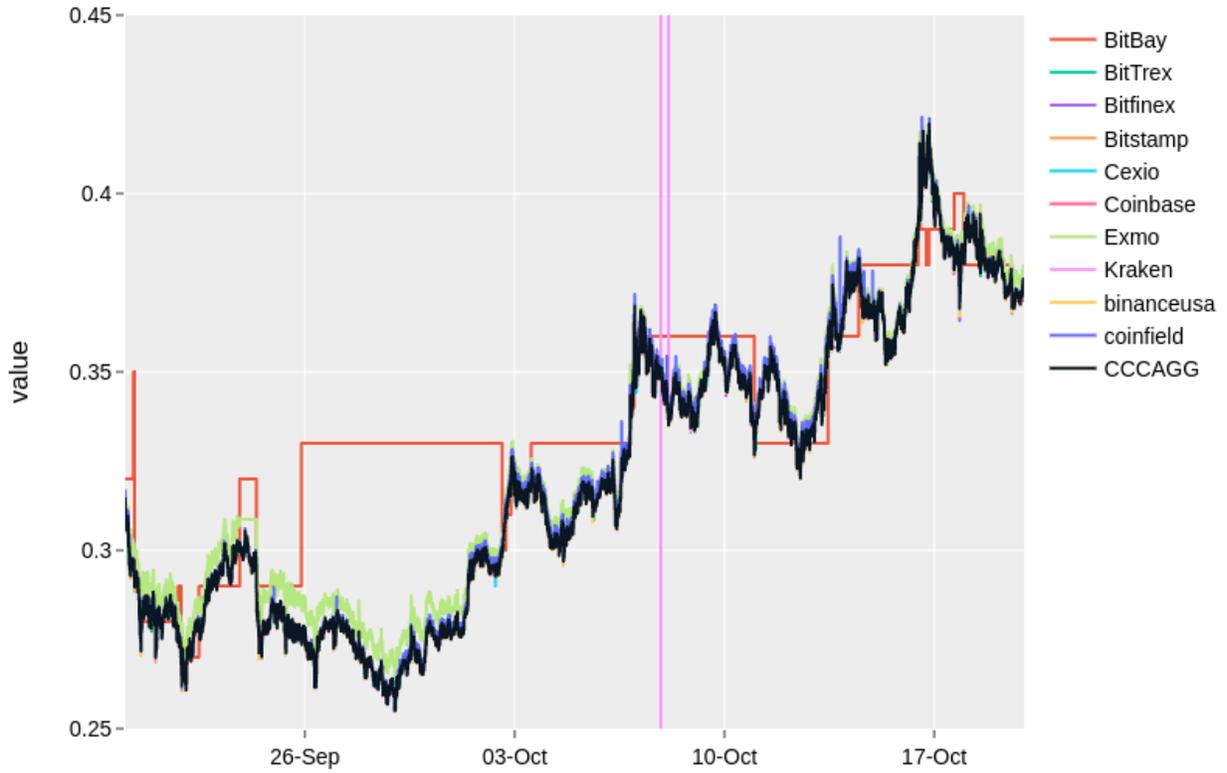**XLM - USD price** - Last 30 days - Minute data

Chart depicting minute XLM-USD CCCAGG and constituent exchange prices for the last 30 days.

We see that CCCAGG price again ignores the Kraken prices on the 7th October. It is also not affected by stale prices on BitBay as the time penalty factor ensures that the index always reflects the latest price.

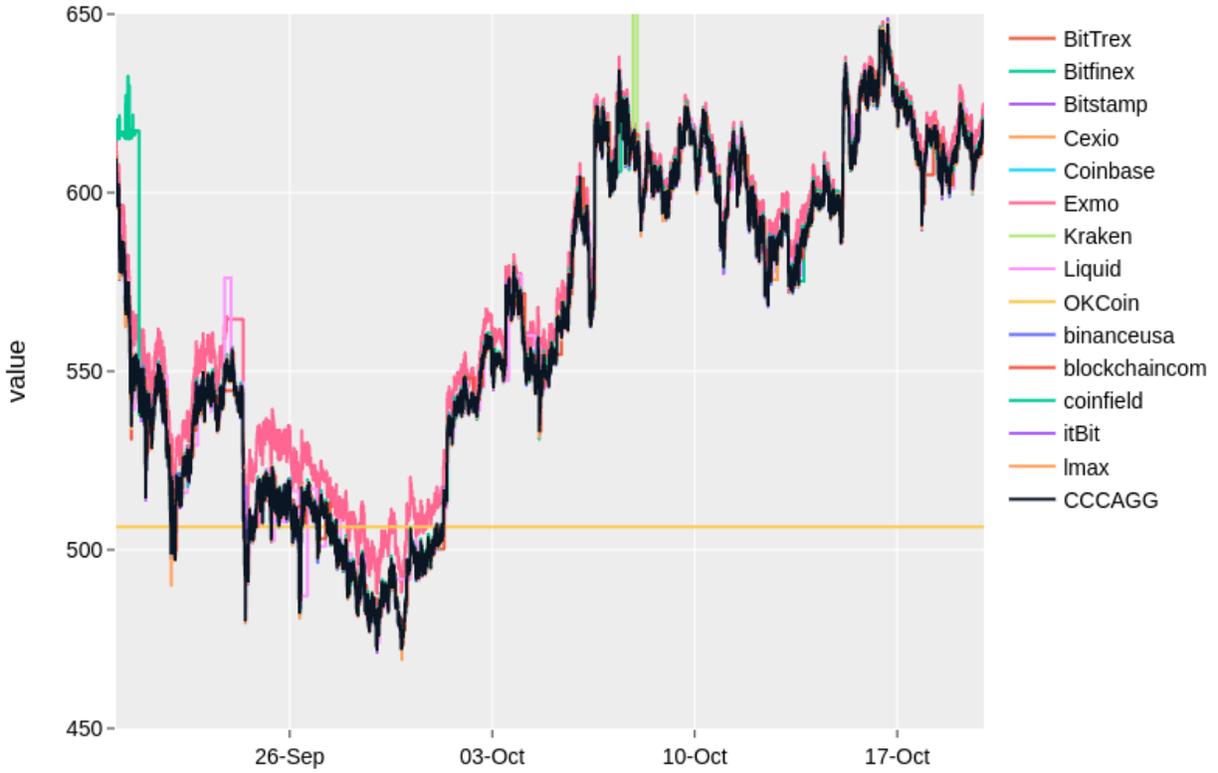**BCH - USD price** - Last 30 days - Minute data

Chart depicting minute BCH-USD CCCAGG and constituent exchange prices for the last 30 days.

We can see that CCCAGG price is not influenced by OKCoin's stale price throughout the period, or by the price on Exmo which differs at times from the market price.

Summary of top pairs

Pair	Price consistency	Price stability	Backtesting
	CCCAGG vs market median (1)	CCCAGG volatility vs average market volatility (2)	Real time CCCAGG value vs Re-calculated CCCAGG value (3)
	mean absolute difference	mean difference	mean absolute difference
BTC-USD	0.02%	-0.47%	0.00%
ETH-USD	0.03%	-0.06%	0.00%
USDT-USD	0.01%	-0.25%	0.03%
DOGE-USD	0.03%	0.05%	0.01%
LTC-USD	0.04%	0.20%	0.01%
XRP-USD	0.05%	-0.05%	0.02%
LINK-USD	0.05%	0.16%	0.02%
XLM-USD	0.07%	-0.16%	0.01%
ADA-USD	0.04%	-0.03%	0.01%
ETC-USD	0.07%	-7.07%	0.01%

Notes:

(1) Daily difference calculated as: (CCCAGG Price / Median Exchange Price) - 1

(2) Volatility calculated as: (Daily high price / Daily low price) - 1

(3) Daily Difference % calculated as: (Real time CCCAGG value / Re-calculated CCCAGG value) - 1

Contact

If you are interested in using the CryptoCompare Aggregate Index (CCCAGG) in your products, please get in touch at data@cryptocompare.com.

Resources

CCCAGG Index Methodology
https://data.cryptocompare.com/reports/cryptocompare-aggregate-index-methodology-jan-2021

CryptoCompare Exchange Benchmark
https://data.cryptocompare.com/reports/exchange-benchmark-august-2021

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