# **METHODOLOGY**

Bloomberg Galaxy Crypto Index

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#### INTRODUCTION

The Bloomberg Galaxy Crypto Index ("Index") is designed to measure the performance of the largest Cryptocurrencies traded in USD. The index is owned and administered by Bloomberg Index Services Limited ("BISL" or the "Administrator") and is co-branded with Galaxy Digital Capital Management LP ("Galaxy").

The Index can be accessed on the Bloomberg Terminal® via ticker BGCI Index <GO>.

BISL administers the Index according to four guiding principles:

1. Data Integrity	Pricing Sources are selected for liquidity and reliability and approved for use following risk and suitability assessments. Cryptocurrencies must meet minimum thresholds for daily traded USD-value.
2. Diversified	No single constituent can exceed 30% or contribute below 1% of the Market Capitalization of the Index.
3. Representative	The Index seeks to provide a proxy for the broader Cryptocurrency market.
4. Continuity	The Index is intended to be responsive to the changing nature of the market in a manner that does not completely reshape the character of the Index from year to year.

#### **SELECTION OF CONSTITUENTS**

The Index systematically determines a Cryptocurrency's eligibility in the Index based on the following:

- 1. Trades in USD
- 2. Trades on a minimum of two Bloomberg-approved Pricing Sources <sup>1</sup>
- 3. Minimum 30-day median daily value traded of \$2 million across a minimum of two eligible Pricing Sources
- 4. Free floating prices (not pegged to the value of any asset, including a currency or physical commodity)
- 5. Cryptocurrency must meet the above eligibility requirements for three consecutive monthly rebalances
- 6. Hard Forks are considered under the same criteria as any established cryptocurrency
- 7. Index is limited to the largest twelve eligible Cryptocurrencies by Market Capitalization

The top twelve Cryptocurrencies are measured by their average Market Capitalization over the last five Index Days up to, and including, the Rebalance Announcement Day. The application of these rules will generate the Constituents of the Index.

#### **WEIGHTING SCHEME**

All Constituents are initially weighted by their free-float Market Capitalization based on the Circulating Supply<sup>2</sup>. Subsequently, weight caps and floors are applied to the Constituents to promote diversification and avoid overweighting and underweighting. The maximum weight for any Constituent is 30% (Cap) of the Index's float-adjusted Market Capitalization and the minimum weight is 1% (Floor).

<sup>&</sup>lt;sup>1</sup> Approved Cryptocurrency Pricing Sources have, at a minimum, represented to Bloomberg that they have documented compliance programs that include, but are not limited to, Anti-Money Laundering (AML) and Know Your Customer (KYC) policies, and have provided Bloomberg with an organizational and/or ownership chart.

<sup>&</sup>lt;sup>2</sup> Circulating Supply sourced from Mosaic and OnChainFX.

If a Constituent exceeds the Cap, the weight will be reduced to the Cap and the excess weight shall be redistributed across all other Constituents in proportion to their weight. Subsequent to the capping, Constituents contributing less than the Floor will be rounded up with the increase removed from the balance of the Constituents below the 30% Cap proportional to their weights. This process is repeated until none of the Constituents have weights exceeding the Cap or fall short of the Floor.

Weights are calculated using the 16:15:00 ET Bloomberg Crypto Price Fixings ("CFIX") four Index Business Days prior to the end of the month. Once the Cap and Floor weights are applied, any subsequent price changes will move the weights away from their Cap or Floor.

#### **RECONSTITUTION AND REBALANCE SCHEDULE**

The Index is reconstituted (changing of Constituents) and rebalanced (changing of Constituent weights) monthly. Index weights and Constituents are calculated and announced four Index Business Days prior to end of month ("Rebalance Announcement Day") and implemented on the first Index Business Day of the next month ("Rebalance Implementation Day"). Cryptocurrencies that meet eligibility criterion for three consecutive monthly rebalances will be added and those that fall short of eligibility requirements for three consecutive monthly rebalances will be removed.

The number of constituents in the Index cannot exceed twelve. In the event that the number of eligible Cryptocurrencies exceeds twelve, only the largest twelve, as ranked by their average Market Capitalization, will be included. Average Market Capitalization is defined as the average over the five Index Business Days leading up-to, and including the Rebalance Announcement Day.

No new Constituents will be added or existing Constituents removed from the Index intra-month (see "Stress Events" section for exceptions).

#### **CONSTITUENT PRICING**

The Constituent CFIX mid-price is used to derive the end-of-day Index level. CFIX is a simple average of the BGN price for any given Cryptocurrency over a 15 minute window between 16:00:00 and 16:15:00 ET.

A BGN price is calculated and used in the calculation of intraday Index levels. The BGN price is generated with real-time pricing data from multiple Pricing Sources (see "Intraday Index Levels" section).

For a BGN price to be computed for a Cryptocurrency, the Cryptocurrency must be priced by a minimum of two Pricing Sources that have non-zero trading fees. The BGN algorithm calculates the BGN median bid and median ask prices for the Cryptocurrency. The BGN mid-price is the average of the BGN bid and BGN ask prices.

Data from the Pricing Sources are the executable bid and ask prices - not executed trade prices.

## **INDEX DISTRIBUTION**

The closing Index level is calculated using the CFIX from 16:15:00 ET and published after review and quality checks. Intraday Index levels will be calculated and published on the Bloomberg Terminal from 18:15:00 ET to 16:15:00 ET (22 hours).

# **INDEX CALCULATION**

The Index level is calculated using the following formula:

$$Index_{t} = \frac{\sum_{i=1}^{x} P_{i,t} \times CS_{i,m} \times CF_{i,m}}{D}$$

Where

 $Index_t = Index level on day t$ 

 $P_{i,t}$ = Intraday BGN price or end of the day CFIX price for Constituent i on day t, expressed in Cryptocurrency per index currency (e.g. Bitcoin per USD)

 $CS_{i,m}$ = Circulating Supply of Constituent i in month m of the current year

CF<sub>i,m</sub>= Cap/Floor factor for a Constituent i in month m of the current year

D = Index Divisor

x = Number of constituents

Indicative intraday level for the Index is published every 15 seconds. This level uses intraday BGN pricing. In the above formula for Index, Pit represents the intraday BGN price used in the calculation of the intraday level.

The base level for the Index was set at 1000 on May 3, 2018.

Cap/Floor factor is calculated as:

$$CF_{i,m} = \frac{W_{i,c}}{W_{i,i}}$$

Where

 $W_{i,c}$  = Capped/Floor Weight on rebalance day r

 $W_{i,i}$  = Initial Weight on rebalance day r

Initial Divisor is calculated as:

$$D_0 = \frac{\sum_{i=1}^{x} P_{i,0} \times CS_{i,0} \times CF_{i,0}}{1000}$$

Where

 $D_0$  = Divisor on May 3, 2018

 $P_{i,0}$  = CFIX price for Constituent i on May 3, 2018, expressed in Cryptocurrency per Index currency (e.g. Bitcoin per USD).

 $CS_{i,0}$  = Circulating Supply of Constituent i on May 3, 2018

 $CF_{i,0}$  = Cap/Floor factor for Constituent i on May 3, 2018

x = Number of constituents

#### **DIVISOR ADJUSTMENTS**

Changes in the Circulating Supply, addition or deletions of Constituents should not change the level of the Index. If the Index closes at a level of 1000 and after the market close a Constituent is replaced by another Constituent, the Index will still open at the 1000 level. This is accomplished by adjusting the Index divisor. Any changes to the Constituent that alter the total market value of the Index while holdings Constituent prices constant, require a divisor adjustment. The Index divisor is simply a scaled representation of the adjusted Market Capitalization of the Index.

$$D_{new} = D_{old} * \frac{\sum_{i=1}^{x} P_{i,t} \times CS_{i,m} \times CF_{i,m}}{\sum_{i=1}^{n} P_{i,t} \times CS_{i,r} \times CF_{i,r}}$$

Where

 $P_{i,t}$  = CFIX for Constituent i on day t, expressed in Cryptocurrency per Index currency (e.g. Bitcoin per USD)

 $CS_{i,m}$ = Circulating Supply of Constituent i in month m of the current year

CF<sub>i,m</sub> = Cap/Floor factor for a Constituent i in month m of the current year

 $CS_{i,r}$  = Circulating Supply of Constituent i in month m-1 of the current year

 $\mathit{CF}_{i,r}$ = Cap/Floor factor for a Constituent i in month m-1 of the current year

 $D_{old}$  = Old Index Divisor in month m-1 of current year

x = New number of Constituents in month m

n = Old number of Constituents in month m - 1

# **ROUNDING OF INPUT DATA**

The following rounding protocols are used for the Index calculation:

- Index divisor is rounded to four decimal places
- Weighting Cap/Floor factors are rounded to twelve decimal places

#### DATA PROVIDERS AND DATA EXTRAPOLATION

The Index is rules-based, and its construction is designed to consistently produce Index Levels without the exercise of discretion. The Index is produced without the interpolation or extrapolation of input data. As further discussed below (e.g., see "Stress Events"), the Index uses level carry-forwards rather than interpolation or extrapolation, but the Administrator will update this Methodology and its internal procedures should either become necessary.

In addition, the Administrator seeks to avoid contributions of input data that may be subject to the discretion of the source of such data and instead seeks to use input data that is readily available and/or distributed for a number of non-index or benchmark creation purposes. Accordingly, the Indices require no 'contributors' to produce and no codes of conduct with any such sources are required.

#### **END-OF-DAY INDEX LEVEL**

The official end-of-day Index level is calculated using the Bloomberg Crypto Price Fixings (CFIX) at 16:15:00 ET and rounded to two decimal places.

#### **INTRADAY INDEX LEVEL**

The intraday price levels for the Index are calculated using BGN prices. BGN prices are designed to track indicative and executable bid and ask quotes from a select subset of Cryptocurrencies, which have met selection criteria such as pricing consistency, frequency, and quality. To resist manipulation by sources, (a) at least two executable or indicative price inputs are required, (b) sources are anonymous to users and the sources themselves at each pricing point, and (c) sources change from time-to-time depending on the quality of data they provide. Each source is assigned a quality score based on numerous factors including update frequency and spike frequency. BGN also reduces potential bias in pricing by including quotes from both market makers and market participants. Errors related to intraday levels will not be restated, as real time levels are considered indicative only. Intraday index levels are calculated from 18:15:00 ET to 16:15:00 ET on every Index Business Day.

#### **DATA SOURCING CHANGES & RULE EXCEPTIONS**

The following data sourcing changes and rule exceptions were made since the launch date of May 3, 2018:

- Mosaic replaced OnChainFX as the data source for circulating supply starting with the October 2018 rebalancing
- Constituent selection for the May 3, 2018 launch was done on May 3, not four Index Business Days prior to April end of month

#### **BACK FILL METHODOLOGY**

The following summarizes the back fill methodology to August 2, 2017:

- Constituent selection was done four Index Business Days prior to end of month with the exception of August 2, 2017, which was done on August 2
- Liquidity and Seasoning screens were not applied
- Constituent pricing used a price source waterfall:
  - 1. CFIX
  - 2. Bloomberg Generic (BGN) prices
  - 3. Average of multiple Pricing Sources
  - 4. Single Pricing Source
- The April 2018 rebalancing constituents and weights were used through 5/2/18
- Mosaic was the data source for Circulating supply

# **INDEX PUBLICATION DAYS**

The Index is published on New York Stock Exchange trading days<sup>6</sup>, also referred to as Index Business Days.

<sup>&</sup>lt;sup>6</sup> https://www.nyse.com/markets/hours-calendars

#### **STRESS EVENTS**

If CFIX is unavailable due to unforeseen events, the Index will be calculated using the last available CFIX. If CFIX is unavailable for more than three consecutive Index Business Days, escalation to the PROC, as further discussed below, will be made to determine whether to remove the Constituent from the Index. Any such removal will be subject to PROC review, as well as to the transition policies.

# **LIMITATIONS OF THE INDEX**

Though the Index is designed to be representative of the market it measures or otherwise align with its stated objective, it may not be representative in every case or achieve its stated objective in all instances. They are designed and calculated strictly to follow the rules of this Methodology, and any Index Level or other output is limited in its usefulness to such design and calculation.

Markets can be volatile, including those market interests which the Index intends to measure or upon which the Index is dependent in order to achieve its stated objective. For example, illiquidity can have an impact on the quality or amount of data available to the Administrator for calculation and may cause the Index to produce unpredictable or unanticipated results.

In addition, market trends and changes to market structure may render the objective of the Index unachievable or to become impractical to replicate by investors.

In particular, the Index measures the performance of the largest Cryptocurrencies traded in USD. The Index is therefore subject to volatile market movements and illiquidity of certain cryptocurrencies. Cryptocurrencies traded in USD have tended to be more volatile over both long-term and short-term periods as compared to other asset classes with market indices including, but not limited to fixed income and equities. In addition, prices are collected from third party sources for the purpose of establishing index Constituent valuations. Failure to receive accurate or timely pricing can impact the quality of Constituent valuation.

In addition, unlike traditional stock and commodity exchanges, Cryptocurrency Pricing Sources face a number of risks, including but not limited to, distributed denial-of-service ("DDoS"), interruption of trading, hacking of user accounts, lack of standards and naming convention for symbols, and an unstable technological and legal environment (causing changes in fee structure, blocking of funds withdrawal, etc.). Suspension or disruption of market trading in Cryptocurrencies may adversely affect the value of the Index.

# **BENCHMARK OVERSIGHT AND GOVERNANCE**

# **Benchmark Governance, Audit and Review Structure**

BISL uses two primary committees to provide overall governance and effective oversight of its benchmark administration activities:

The Product, Risk & Operations Committee ("**PROC**") provides direct governance and is responsible for the first line of controls over the creation, design, production and dissemination of benchmark indices, strategy indices and fixings administered by BISL, including the Index. The PROC is composed of Bloomberg personnel with significant experience or relevant expertise in relation to financial benchmarks. Meetings are attended by Bloomberg Legal & Compliance personnel. Nominations and removals are subject to review by the BOC, discussed below.

The oversight function is provided by Bloomberg's Benchmark Oversight Committee ("**BOC**"). The BOC is independent of the PROC and is responsible for reviewing and challenging the activities carried out by the PROC. In carrying out its oversight duties, the BOC receives reports of management information both from the PROC as well as Bloomberg Legal & Compliance members engaged in second level controls.

On a quarterly basis, the PROC reports to the BOC on governance matters, including but not limited to client complaints, the launch of new benchmarks, operational incidents (including errors & restatements), major announcements and material changes concerning the benchmarks, the results of any reviews of the benchmarks (internal or external) and material stakeholder engagements.

#### Internal and External Reviews

BISL's Index administration is also subject to Bloomberg's Compliance function which periodically reviews various aspects of its businesses in order to determine whether it is adhering to applicable policies and procedures, and assess whether applicable controls are functioning properly. In addition, Bloomberg may from time to time appoint an independent external auditor with appropriate experience and capability to review adherence to benchmark regulation. The frequency of such external reviews will depend on the size and complexity of the operations and the breadth and depth of the Index use by stakeholders.

#### **INDEX AND DATA REVIEWS**

The Administrator will review the Index (both the rules of construction and data inputs) on a periodic basis, not less frequently than annually, to determine whether they continue to reasonably measure the intended underlying market interest, the economic reality or otherwise align with their stated objective. More frequent reviews may result from extreme market events and/or material changes to the applicable underlying market interests.

Criteria for data inputs include reliable delivery and active underlying markets. Whether an applicable market is active depends on whether there are sufficient numbers of transactions (or other indications of price, such as indicative quotes) in the applicable constituents (or similar underlying constituent elements) that a price (or other value, as applicable) may be supplied for such constituent(s).

Other than as set forth in this Methodology, there are no minimum liquidity requirements for Index constituents and/or minimum requirements or standards for the quantity or quality of the input data.

The review will be conducted by product managers of the Indices in connection with the periodic rebalancing of the Indices or as otherwise appropriate.

Any resulting change to the Methodology deemed to be material (discussed below) will be subject to the review of the PROC under the oversight of the BOC, each of which committees shall be provided all relevant information and materials it requests relating to the change. Details regarding the PROC and BOC are described above.

Material changes will be reflected and tracked in updated versions of this Methodology.

BISL's Index administration is also subject to Bloomberg's Compliance function which periodically reviews various aspects of its businesses in order to determine whether it is adhering to applicable policies and procedures, and assess whether applicable controls are functioning properly.

Material changes related to the Indices will be made available in advance to affected stakeholders whose input will be solicited. The stakeholder engagement will set forth the rationale for any proposed changes as well as the timeframe and process for responses. The Administrator will endeavor to provide at least two weeks for review prior to any material change going into effect. In the event of exigent market circumstances, this period may be shorter. Subject to requests for confidentiality, stakeholder feedback and the Administrator's responses will be made accessible upon

request.

In determining whether a change to an Index is material, the following factors shall be taken into account:

- The economic and financial impact of the change;
- Whether the change affects the original purpose of the Index; and/or
- Whether the change is consistent with the overall objective of the Index and the underlying market interest it seeks to measure

#### **EXPERT JUDGMENT**

BISL may use expert judgment with regards to the following:

- 1. Index restatements
- 2. Extraordinary circumstances during a market emergency
- 3. Data interruptions, issues and closures

When expert judgment is required, BISL undertakes to be consistent in its application, with recourse to written procedures outlined in this Methodology and internal procedures manuals. In certain circumstances exercises of expert judgment are reviewed by senior members of BISL management and Bloomberg Compliance teams, and are reported to the PROC. BISL also maintains and enforces a code of ethics to prevent conflicts of interest from inappropriately influencing index construction, production, and distribution, including the use of expert judgment.

#### RESTATEMENT POLICY

BISL makes every effort to provide accurate calculation of its indices. However, to the extent a material error in Index values is uncovered following its publication and dissemination; a notification will be sent to Index clients alerting them of such error and the expected date of a revised publication, if warranted. BISL considers the following factors in determining whether to restate. Not all conditions need to be present to warrant a restatement, and certain factors may be more determinative than others depending on the circumstances of the given error.

- 1. The relative importance of the data field impacted by the error
- 2. When the error occurred and when it was discovered
- 3. The number of indices impacted
- 4. Whether the impacted indices are linked to tradable products
- 5. The magnitude of the error
- 6. The burden of restatement on client re-processing relative to the impact of the error
- 7. The impact of the restatement on analytical tools

#### **GLOSSARY OF TERMS**

Administrator: means BISL.

<u>BGN</u>: BGN refers to Bloomberg Generic price. The BGN is a sophisticated pricing algorithm that produces accurate indications of quotes that are derived from multiple quality sources.

- For a BGN to be computed for a Cryptocurrency, the Cryptocurrency must be priced by at least two approved Pricing Sources
- The BGN algorithm calculates the BGN median bid and median ask prices for the Cryptocurrency
- The BGN mid-price is the average of the BGN bid and BGN ask prices

Data from Pricing Sources are the executable bid and ask prices - not executed trade prices.

<u>Blockchain</u>: Blockchain is a digitized, decentralized, public ledger of all Cryptocurrency transactions.

Bloomberg Index Services Limited or BISL: the Index owner and administrator.

Bloomberg: Bloomberg L.P. and its affiliates, including BISL.

**BOC**: Benchmark Oversight Committee.

<u>CFIX</u>: Bloomberg Crypto Price Fixings or CFIX is designed as a reference point for Cryptocurrencies. It is a simple average of the BGN pricing source for any given Cryptocurrency over a 15 minute window between 16:00:00 ET and 16:15:00 ET. The CFIX generates the simple average of all the BGN ticks within the window for the bid and ask separately; the mid is the arithmetic average of the bid and ask. CFIX will price once a day and publish immediately after the pricing engine has computed the simple average. There may be slight variances in publication times, within seconds, due to a variance in tick volume per currency and the amount of machine time required to compute those. CFIX will publish Monday to Friday when the BGN is pricing and not over weekends.

<u>Circulating Supply</u>: Circulating Supply, or available supply, is the best approximation of the number of coins that are circulating in the market and are available for trade.

<u>Constituent</u>: Cryptocurrency that is a member of the Index.

<u>Cryptocurrency</u>: A Cryptocurrency is a digital asset designed to work as a medium of exchange that uses cryptography to secure its transactions, to control the creation of additional units, and to verify the transfer of assets.

Hard Fork: A hard fork occurs when a Blockchain protocol is radically changed, such that it becomes incompatible with older versions. In effect, participants taking part in transactions on the old Blockchain must upgrade to the new one in order to continue validating transactions in the new Blockchain. However, participants that do not upgrade may continue to support and validate transactions on the old Blockchain protocol separately. The result: a Blockchain splits into two - hence the name "hard fork". If there are nodes permanently supporting the new chain, then the two chains will co-exist. Users that once held digital assets on an older Blockchain before the protocol change at a pre-specified Blockchain length will now also hold an amount of new coins on the altered Blockchain. This new Cryptocurrency has essentially been derived from an older Cryptocurrency as well as its associated Blockchain's transaction history. As per the Index methodology, hard forks are considered to be new Constituents.

Index Business Day: Days on which the Index is published (New York Stock Exchange trading days).

<u>Index Weight:</u> The percent weight of an individual Constituent in the Index. The sum of all Index weights adds to 100%.

<u>Liquid</u>: A liquid asset can be converted into cash with minimal impact to the price received in the open market. Liquidity is measured by 30-day median daily value traded in USD.

<u>Market Capitalization</u>: Market capitalization, measured in USD, is calculated as the product of each Cryptocurrency's Circulating Supply and CFIX.

<u>Pricing Sources</u>: Pricing Sources are trading platforms that facilitate buying and selling Cryptocurrencies online. Many Pricing Sources refer to themselves as "exchanges," which can give the misimpression that they are regulated or meet regulatory standards of a national securities exchange. Many of the U.S.-based digital Cryptocurrency trading platforms have elected to be state-regulated "money-transmission services". Traditionally, from an oversight perspective, these predominantly state-regulated payment services have not been subject to direct oversight by the SEC or the CFTC.

PROC: Product, Risk & Operations Committee.

<u>Rebalance Announcement Day</u>: Four Index Business Days prior to the end of every month wherein Constituents that will represent the Index in the following month are determined and announced.

<u>Rebalance Implementation Day</u>: First Index Business Day of every month wherein the results announced on the Rebalance Announcement Day are implemented.

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