

BlockchainX indices

Vinter Capital

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1 About Vinter Capital

We believe that blockchain technology has the potential to transform our world. The application of this technology can result in a more decentralized and transparent economy with far-reaching positive effects such as financial inclusion for everyone.

The objective of Vinter Capital is to lower the entry barriers that exist today when investing in cryptocurrencies. We do so by providing transparent and regulated indices that can be used in financial products. Our products have the potential of being a bridge between the professional investment industry and the cryptocurrency community.

2 BlockchainX indices

The cryptocurrency market is in its infancy. This presents a challenge to established methods for indexing. BlockchainX indices combine the best of traditional index methodologies with appropriate adjustments for cryptocurrency factors such as, liquidity, exchange stability, custody limitations as well as regulatory requirements.

The BlockchainX index family is developed to provide a rule-based and transparent way to track the value of cryptocurrencies. All indices are designed to be regulated investable benchmarks.

All BlockchainX indices are compliant by design. Decisions must be clear, rule-based, robust, reliable and transparent. The methodology is developed, operated and administered transparently in compliance with Article 13 of the Regulation 2016/1011 on indices used as benchmarks in financial instruments and financial contracts or to measure the performance of investment funds (the "BMR"). The key elements of this methodology are published and made available for each benchmark provided and published or, when applicable, for each family of benchmarks provided and published.

This methodology states the regulatory framework for the development, calculation and administration of the BlockchainX index family.

3 Input data

3.1 Input data requirements

Vinter Capital's provision of benchmarks shall be governed by the following requirements in respect to its input data:

- the input data shall be sufficient to represent accurately and reliably the market or economic reality that the benchmark is intended to measure;
- The input data shall be transaction data, if available and appropriate. If transaction data is not sufficient or is not appropriate to represent accurately and reliably the market or economic reality that the benchmark is intended to measure, input data which is not transaction data may be used, including estimated prices, quotes and committed quotes, or other values;

- the input data shall be verifiable;
- clear guidelines regarding the types of input data, the priority of use of the different types of input data and the exercise of expert judgment shall be published;
- where a benchmark is based on input data from Contributors, Vinter Capital will obtain, where appropriate, the input data from a reliable and representative panel or sample of Contributors so as to ensure that the resulting index is sufficient to represent accurately and reliably the market or economic reality that the benchmark is intended to measure.

Vinter Capital will not use input data from a contributor if the administrator has any indication that the contributor does not adhere to the code of conduct referred to in Article 15 of the BMR, and in such a case shall obtain publicly available representative data.

3.1.1 Contributor selection

The quality of data contributors is assured through the following controls:

- Presumable Contributors are evaluated on the basis of data quality, cost of sources, reputation and market share.
- Input data is compared between multiple Contributors in order to ensure its integrity and accuracy. In the event of data being insufficient or unverifiable, one Contributor will be replaced with another.

3.2 Continuous evaluation of selected contributors

Reliability of provided data is assessed with respect to availability and consistency of each data source. Data is compared across multiple independent data providers. Anomalies, such as abnormal deviation from average, are investigated. Providers with substantial and persistent anomalies are at risk of being removed as data contributors to the BlockchainX indices. Accuracy is verified by comparing contributed data with other trusted data sources. Furthermore, computation schemes, such as free-float schemes, are also compared between independent scheme providers.

3.3 Data correction procedure

In the case of data corruption, Vinter Capital will immediately inform stakeholders concerning the error. An investigation into the reasons behind the corrupted data will take place in order to remove possible vulnerabilities from data-collection processes. Erroneous computations are corrected whenever possible. Furthermore, a consequence analysis will be performed where financial and legal consequences, with respect to corrupted data, are assessed and a structural review of relevant computational schemes are performed. Affected clients will then be informed about the error, its potential legal and

financial consequences and relevant recalculations. Any conduct that may involve manipulation or attempted manipulation of an index is reported to regulators.

3.4 Circulating supply

Circulating supply for each constituent is determined via:

1. The summation of all Unspent Transaction Outputs (UTXOs). The summation is based on the transaction history of a full node controlled by the BlockchainX index committee.
2. The summation of issued cryptocurrency. The summation is performed with respect to previously mined blocks, using the transaction history of a full node controlled by the BlockchainX index committee.
3. If information on issued cryptocurrency is not available, circulating supply is estimated based on the cryptocurrency's specified emission rate and present block number.
4. Other data sources reviewed by the BlockchainX index committee.

3.5 Free-float

Free-float equals circulating supply with a potential reduction due to one or more of the following factors:

- The amount of cryptocurrency allocated prior to the public release of a blockchain and that remain in the control of developers, principals, foundations or corporations.
- Cryptocurrencies that are deemed not accessible to any market participant due to loss of private keys, dust-accounts (accounts with lower holdings than the current fees or cost associated with transfers or creation of a wallet), or burning (a strategy that seeks to obtain a price increase by directly reducing the circulating supply of a cryptocurrency).
- Other factors as determined by the BlockchainX index committee.

Issuance will be returned to the free-float circulation in the event of a public announcement that assets have been sold into the public market. Free-float adjustments are made on the monthly rebalancing date.

3.6 Foreign exchange rates

Intraday rates are provided by WM/Reuters and interday foreign exchange rates are obtained from ECB.

3.7 Selected exchanges

Selected exchanges contribute market data to the computation of the BlockchainX indices. As of January 25, 2019, market data is obtained from the following cryptocurrency exchanges: Bitfinex, OKCoin, Bitstamp, Itbit, Coinbase, Coinbase Pro, Kraken and Gemini. For an exchange to be selected as a data contributor it must have:

1. been operating as a cryptocurrency exchange for a minimum of two years.
2. implemented trading, deposits and withdrawal fees without interruption and for the duration of one month.
3. met a minimum monthly liquidity threshold with respect to total trading volume.
4. for at least one month, provided reliable and valid market data.
5. for at least one month, offered the possibility to withdraw and deposit USD.
6. chosen a jurisdiction of incorporation that offers sufficient investor protection.
7. complied with relevant regulations such as know your customer and anti-money laundering requirements.
8. provided information concerning ownership and corporate structure.
9. passed the BlockchainX index committee's exchange review. The review is an overall assessment of market and operational risks. It includes but is not limited to an evaluation of past security breaches, trading cessations, legal disputes and if provided market data are to be considered readily available.

Under extraordinary circumstances, exchanges can be added or removed as data contributor at the discretion of the BlockchainX index committee.

4 Index methodologies

The BlockchainX index family consists of several indices. The BL10M-U index contains the 10 largest assets, weighted by market capitalization, and is denominated in USD. The BL5E-S index contains the 5 largest assets. It is equally weighted and denominated in SEK. All indices are listed in the appendix.

Every index is priced using a 20-second average of the BlockchainX composite constituent price (described in 4.3). Pricing occurs with 20-second intervals between 00:00 and 24:00 CET. The index value is published in USD, EUR and SEK using validated exchange rates.

4.1 Eligible constituents

Cryptocurrencies trading on *selected exchanges* are eligible as index constituents in BlockchainX indices if they:

1. allow for air-gapped cold storage, including offline wallet generation and offline transaction signing.
2. are not pegged to another asset such as currencies or commodities.
3. been traded on two selected exchanges for the duration of one month.
4. can be deposited and withdrawn from at least two selected exchanges.
5. are not an ongoing Initial Coin Offering (ICO).
6. in the last month had at least 20% of its publicly traded volume located at selected exchanges.
7. have no more than 90% of its monthly trading volume located at a single selected exchange.
8. have a monthly trading volume that exceeds 20% of its circulating supply.
9. have for the past month had a daily trading volume that exceeds USD 20 million.
10. have not been deemed a security, or potential security, by the BlockchainX index committee.
11. have not been deemed fraudulent by the BlockchainX index committee.
12. are a cryptographically secured digital bearer instrument.
13. are freely traded and can be freely held for the foreseeable future.
14. maintain an underlying protocol that has been deemed technically and cryptographically sound with no known security vulnerabilities, including critical bugs, undue exposure to 51% attacks, or other factors as determined by the BlockchainX index committee.

Cryptocurrencies that meet these criteria are *eligible constituents*.

4.2 Selected constituents

Eligible constituents (section 4.1) are ranked by market capitalization in descending order. For indices with 10 constituents, the top 8 of the ranked list are selected immediately. Secondly, constituents that (a) were selected at the previous rebalancing date and (b) have a rank between 9 and 12 are added to the selected constituents. Remaining constituents are chosen according to their market capitalization.

For indices with 5 constituents, the top 3 of the ranked list are selected immediately. Secondly, constituents that (a) were selected at the previous rebalancing date and (b) have a rank between 4 and 7 are added to the selected constituents. Remaining constituents are chosen according to their market capitalization.

If it is not possible to reach the intended number of constituents, the BlockchainX index committee can decide to either include non-eligible constituents or allow the index to have less constituents than intended.

4.3 Constituent price (BCP)

All eligible cryptocurrencies are priced using the BlockchainX composite price algorithm. In order to compute the BlockchainX composite constituent price (BCP), the algorithm executes three steps.

First, at time t , order data on executed trades are obtained from all selected exchanges with respect to a 20-second time window.

Secondly, for each exchange and constituent, a Volume Weighted Average Price (VWAP) is computed with respect to executed trades within the specified time window.

Thirdly, the median of all exchange specific VWAP:s is taken as the BCP for each constituent.

Missing data is imputed through a nearest neighbor approach with respect to time. Imputation is performed using data from all selected exchanges. All BCPs are computed using USD as quote currency. The BCP is then translated into SEK and EUR using foreign exchange reference rates from trusted data providers.

4.4 Index price and weights

Let the number of selected constituents at time t be denoted as $k(t)$. Let $w_i(t)$ and $p_i(t)$ be the weight and BCP of asset i . The BlockchainX index price is then given by:

$$\frac{\sum_1^{k(t)} w_i(t) p_i(t)}{\text{DIV}(t)}$$

where $\text{DIV}(t)$ is a divisor (described in section 4.5). The weight of asset i at time t is:

$$w_i(t) = \begin{cases} 1/k(t), & \text{for equally weighted indices} \\ f_i(t)/f(t), & \text{for market capitalization weighted indices} \end{cases}$$

where $f_i(t)$ is the free-float of constituent i and $f(t) = \sum_1^{k(t)} f_i(t)$, both are recalculated at rebalancing date.

4.5 Divisor

Index adjustments, such as monthly rebalancing, should not change the index value. A divisor is therefore introduced in order to insure that the index value only fluctuates due to price movements in the underlying assets and not due to other events that affect total market capitalization. At inception, the divisor is given by

$$\text{DIV}(0) = \frac{1}{K} \sum_i^{k(0)} w_i(0) p_i(0)$$

where $K = 100$ in order to ensure an initial index value of 100.

A fee of 2.5 percent per annum is deducted from the divisor on a daily basis. The closing index price is published daily at 17:00 CET, and the fee is accounted for by multiplying the previous day's divisor with $(1 + 0.025/365)$.

Given a positive number δ , the divisor can be calculated for any time t recursively via

$$\text{DIV}(t) = \frac{\sum_i^{k(t)} w_i(t) p_i(t)}{\sum_i^{k(t-\delta)} w_i(t-\delta) p_i(t-\delta)} \text{DIV}(t-\delta)$$

which ensures index continuity.

4.6 Rebalancing

BlockchainX indices are rebalanced monthly. All weights $w_i(t)$ have identical numerical values between rebalances.

The rebalancing window is set to 12:00 CET on the first business day of the month, plus or minus 24 hours. Rebalancing will occur at a randomly chosen time during this window. Randomization is used in order to avoid front-running. Clients subscribed to any of Vinter Capital's indices will receive an email containing information about the new weights for all assets in that index. On the second business day of the month at 16:30 CET, the actual weights are published on Vinter Capital's website. The delay is implemented in order to increase the investability of BlockchainX indices.

Rebalancing involves (i) a review of exchanges, (ii) selecting constituents and (iii) calculating their weights.

4.7 Market events

Cryptocurrencies have a series of unique market events, compared to traditional assets, such as forks, staking and airdrops. These events have the potential to disrupt as well as increase the value and security of current selected constituents. However, in order to reduce unpredictable changes in the composition of the index, the BlockchainX index committee will handle each event with the intention that intra monthly index return should solely depend on price movements in index constituents.

4.7.1 Forks

Formally, a blockchain is a distributed database of a network's transaction history. To own a blockchain's cryptocurrency is to have writing permission to this database. A transaction of cryptocurrencies is therefore the transferal of these writing permissions to another user. Blockchains are often developed under an open source license and can therefore be copied and transformed by any group of developers. Whenever this happens the developers can choose to keep parts of the transaction history or to erase it. Erasing it means that the developers create a new cryptocurrency and keeping it means that the blockchain is experiencing what has been named a fork. Forks can occur due to technical disagreements regarding the development of the blockchain or to correct certain parts of the transaction history. The old blockchain's transaction history is therefore often kept intact or partly intact in order to retain as much of the old network as possible. This results in that those with cryptocurrency assets on the old blockchain find themselves with an equal amount of cryptocurrency on the new blockchain. All BlockchainX indices therefore define a fork as an event that fulfills the following two criteria:

1. Holdings of one cryptocurrency leads to the obtainment of an equal amount of another cryptocurrency and these two cryptocurrencies are independently traded.
2. The same form of actions are required to access the old as well as the new assets.

Forks that occur with respect index constituents can cause uncertainty in the computation of the index since it is not clear which of the two, or more, forks that should be used as the constituent. Forks are also an operational risk for those who seek to track the index since initiating trading of a new cryptocurrency often requires adjustments of trading infrastructure. In order for a fork to be eligible as an index constituent it needs to fulfill all BlockchainX constituent criteria, with exemption of those criteria that are based on historical performance. The eligible fork that is traded on the largest number of *selected exchanges* is then chosen as the constituent. If two or more eligible forks are traded on the same number of exchanges, highest price is used to select a constituent. This selection process continues until next rebalancing date. If prices are unavailable due to trade cessation, or other reasons, a last observation carried forward approach is used to obtain a price.

4.7.2 Staking

Writing permissions to a blockchain's transaction history are administered by the access to private keys, which are connected to public addresses controlling cryptocurrencies. However, only using private keys does not protect the blockchain from users trying to spend their holdings twice, also known as double-spend attacks. To protect itself from these attacks, all blockchains implement some form of consensus process that enables the network to reach consensus regarding transaction validity. In order to ensure that users do not corrupt the consensus process, participation must come with a cost. For example, the Bitcoin network consumes electricity, in a process called Proof-of-Work (PoW), in order to protect its transaction history. Staking, or more formally Proof-of-Stake (PoS), is another technology used by blockchains in order to maintain the immutability of their transaction history. Participants of a blockchain that implements staking can stake some of their holdings of the network's cryptocurrency in order to participate in the consensus process. Those who stake and verify transactions in an honest manner are rewarded with new cryptocurrencies, while those who verify transactions that later are deemed invalid are penalized by losing their stake. Certain blockchains demand that staked cryptocurrencies are locked for a certain time or that a certain amount of cryptocurrencies are staked, while others allow the reward of staking to depend on the time the holdings have been staked. The cost of staking is therefore an alternative cost, i.e., the cost incurred due to not being able to invest in other investments with higher return. An index that includes return due to staking forces investors who seek to track the index to stake some of their assets. This creates more complexity and, for that reason, the BlockchainX indices do not include returns due to staking. However, specific purpose indices can be created for clients where staking revenue is included.

4.7.3 Airdrops

Airdrops occur when a blockchain, or a part of a blockchain, decides to distribute cryptocurrencies, free of charge, to either their or a different blockchain's users. They are most often performed in order to boost network activity or to reward long-term users. Airdrops can come unannounced or they

can be disclosed beforehand. Established blockchains that want to reward old users or boost network activity tend to not announce airdrops, while new networks often announce their airdrops due to marketing reasons. Airdrops often come with a need to perform some tasks in order to obtain the free cryptocurrencies. This can include holding the native asset at a specific date, having to perform a set of transactions on the network, or participating in different surveys. Given the unpredictable nature of airdrops, the BlockchainX indices do not include their return. However, certain airdrops are technically and structurally equivalent to forks and therefore treated as such.

5 Governance and control requirements for supervised contributors

5.1 Oversight function

Vinter Capital has, according to Article 5(1) of the BMR, established a permanent and effective oversight function for all aspects of the provision of benchmarks in the form of an index committee. The members of the oversight function are selected and assured to have, in their entirety, the necessary skills, knowledge and expertise. No member of the committee has been convicted of financial service related offences. The BlockchainX indices are not based on contributors and are thus not subject to contributor-related conflict risks. The oversight function is embedded within the Vinter Capital's organizational structure to allow it to effectively challenge the management body's decision. The oversight function has the power to act independently of the administrator, where the Regulation requires it to report to the relevant competent authority any misconduct by contributors or administrators and any anomalous or suspicious input data according to Article 5(3) point (i) of the BMR. The oversight function continuously assures that the administrator can operate exclusively using readily accessible data.

The oversight function shall operate with integrity and shall have the following responsibilities, which shall be adjusted by Vinter Capital based on the complexity, use and vulnerability of the benchmark:

1. reviewing the benchmark's definition and methodology annually which includes, but is not limited to, exchange and constituent criteria, ranking procedures and weighting schemes, data providers and standardized evaluation procedures.
2. overseeing any changes to the benchmark methodology and being able to request the administrator to consult on such changes.
3. overseeing the administrator's control framework, the management and operation of the benchmark. The control framework contains provisions requiring periodic review of the process for contributing input data, effective oversight of the same, and policy on whistleblowing, including appropriate safeguards for whistle-blowers.

As of today, Vinter Capital considers all of its data used for the benchmark as readily available and, therefore, not in need of a code of conduct referred to in Article 15 of the BMR.

4. reviewing and approving procedures for cessation of the benchmark, including any consultation about a cessation.
5. overseeing any third party involved in the provision of the benchmark, including calculation or dissemination agents.
6. assessing internal and external audits or reviews, and monitoring the implementation of identified remedial actions.
7. if the benchmark at any time becomes based on input data from contributors, monitoring the input data and contributors and the actions of the administrator in challenging or validating contributions of input data.
8. if the benchmark at any time becomes based on input data from contributors, taking effective measures in respect of any breaches of the code of conduct referred to in Article 15.
9. reporting to the relevant competent authorities any misconduct by contributors, where the benchmark is based on input data from them, or administrators, of which the oversight function becomes aware, and any anomalous or suspicious input data.

5.1.1 Constitution of the oversight function

Vinter Capital will have clear criteria to select members and observers including the evaluation of their expertise and skills (but without publicly disclosing their identity), rules for the meetings of the oversight function and on the participation of staff members therein, the selection of the contact person for the management body and on the interaction with it and arrangements to ensure confidentiality. Vinter Capital will establish procedures to manage the conflicts of interests which may arise due to competing interests of committee members. This list covers the disclosure of conflicts of interest of members of the oversight function, limitations and removal of voting rights from conflicted members as well as the exclusion of members from discussions where they could be conflicted. Furthermore, these procedures forbid members to sit on oversight functions of more than one administrator.

A fork is defined as an event where a holder assets are being copied onto a new blockchain and the holder does not have to take an other form of action in order to access this holding thatn the holdings on the old blockchain.

5.2 Changes

The procedures for consulting on any proposed material change in Vinter Capital's methodology as benchmark administrator and the rationale for such changes are included below. This includes a definition of what constitutes a material change and the circumstances in which Vinter Capital is to notify users of any such changes. The procedures required regarding proposed material changes provides for advance notice, with a clear time frame, that gives the opportunity to analyse and comment upon the impact of such proposed material changes. Those comments and Vinter Capital's response to those comments are made accessible after any consultation, except where confidentiality has been requested by the originator of the comments.

5.2.1 Material change

ESMA allows administrators to define material change and determine the practical aspects of the consultation procedure at their discretion. A material change of a benchmark is any change to the index methodology that would lead to a substantial change in index trajectory.

5.2.2 Consultation

Vinter Capital's Compliance Department will review any changes to this methodology. The Compliance Department, as well as the independent Oversight Function, has the power to, at any time, request further explanations and information regarding those changes. The Compliance Department will analyse the possible changes with respect to their accuracy, reliability, verifiability, clarity, robustness, transparency, validity and integrity. The Compliance Department will produce a review statement, wherein the compliance of the proposed changes is determined. The statement will be sent to Vinter Capital's operative department and archived. Material changes must, in addition to being approved by Vinter Capital's Compliance Department, be approved by the independent Oversight Function in order to be enforced and implemented.

5.2.3 Notice

All material changes are subject to an advance notice published by Vinter Capital. The notice will be sent to users as well as published 60 days prior to the change and will include a clear time frame. Vinter Capital may apply a shorter notice at its own discretion if the affected index is not being used nor is licensed to any third party using it for its financial product(s). All recipients of the notice will be given the opportunity to comment on the proposed change(s). All comments will be published by Vinter Capital except when the commenting party explicitly has requested confidentiality.

5.2.4 Discretion

Vinter Capital has established clear rules identifying how and when discretion may be exercised in the determination of benchmarks. Vinter Capital may at its own discretion change input data if it can not be derived from:

1. a computational scheme using readily available data, or data contributed under a code of conduct, and that are approved by the oversight function or to be considered of the same standard as those approved by the oversight function or another assessor independent scheme.
2. a designated assessor or a group of designated assessors whose expertise, experience as well as characters have been reviewed by the oversight function.

6 Compliance statement

Vinter Capital is compliant with Article 25 and 26 of the BMR and will therefore not publish a compliance statement explaining its reason for non-compliance.

7 Appendix

7.1 Index tickers

Table 1: Ticker naming convention for the BlockchainX indexes.

Constituents	Weighting	Denomination	Ticker
10	Market cap.	SEK	BL10M-S
10	Equal	SEK	BL10E-S
5	Market cap.	SEK	BL5M-S
5	Equal	SEK	BL5E-S
10	Market cap.	EUR	BL10M-E
10	Equal	EUR	BL10E-E
5	Market cap.	EUR	BL5M-E
5	Equal	EUR	BL5E-E
10	Market cap.	USD	BL10M-U
10	Equal	USD	BL10E-U
5	Market cap.	USD	BL5M-U
5	Equal	USD	BL5E-U

7.2 Changes to the index methodology

This table contains all changes to the index methodology after 20180101, when the European Benchmark Regulation became effective.

Table 2: Changes to the index methodology

Date	Version	Section	Change
20181220	0.2	3.4 Circulating supply	Computation scheme
20181220	0.2	4.7.1 Forks	Criteria for selected contentious hard forks
20181220	0.2	4.7.1 Forks	
20190125	0.3	4.7.1 Forks	Definition and mangement
20190125	0.3	4.7.3 Airdrops	Management