

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, capital controls, exchange stability and custody limitations.

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, such as ECB, to which the associations patterns are considered to be known. Furthermore, computation schemes such as free-float schemes are also compared, both from a qualitative as well as quantitative perspective, 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. Iterating over all mined blocks and summing all newly minted cryptocurrency. The summation is based on the transaction history of a full node controlled by the BlockchainX index committee.
3. Public Blockchain explorers selected and reviewed by the BlockchainX index committee.
4. Public code and documentation reviewed by the BlockchainX index committee.
5. Other selected data contributors.

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

Foreign exchange reference rates are obtained from ECB daily at 16:00 CET.¹

3.7 Selected exchanges

Selected exchanges contribute market data to the computation of the BlockchainX indices. As of December 20, 2018, 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. for at least one month, implemented trading, deposits and withdrawal fees
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. fulfilled all applicable regulatory frameworks 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 risk, security and suitability review. The review includes 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.

¹www.ecb.europa.eu/stats/policy_and_exchange_rates/euro_reference_exchange_rates

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.

A daily closing value is calculated at 17:00 CET. The index value is published in USD, EUR and SEK using exchange rates from ECB.

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. have not been pegged to another asset such as currencies or commodities.
3. have for at least one month been traded on two selected exchanges.
4. can be deposited and withdrawn from at least two selected exchanges.
5. are not an ongoing Initial Coin Offering (ICO).
6. have at least 20% of its monthly trading 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 at least a daily volume of USD 20 million over the past month.
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 ECB.

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:

$$\frac{\sum_1^{k(t)} w_i(t) p_i(t)}{\text{DIV}(t)} \quad (1)$$

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

$$w_i(t) = \begin{cases} 1/k(t), & \text{for equally weighted indices} \\ f_i(t)/f(t), & \text{for market capitalization weighted indices} \end{cases} \quad (2)$$

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

$$\text{DIV}(0) = \frac{1}{K} \sum_i^{k(0)} w_i(0) p_i(0) \quad (3)$$

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

$$\text{DIV}(t) = \frac{\sum_i^{k(t)} w_i(t) p_i(t)}{\sum_i^{k(t-\delta)} w_i(t-\delta) p_i(t-\delta)} \text{DIV}(t-\delta) \quad (4)$$

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 network of computers that have installed the same software in order to manage a distributed database of transaction history. To own cryptocurrency is equivalent to having writing permission to its Blockchain's 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. As anyone can copy and edit the codebase, it is also possible for anyone to edit the rules of the blockchain. Therefore two or more groups can create two implementations with incompatible rulesets. If the different rulesets are constructed to only differ after a certain point in the transaction history, the transactions that happened before that point is compatible with both implementations. Because of this, two blockchains can share the same transaction history up to a certain point, but differ after that point. A ruleset change that creates two incompatible rulesets after a certain point but where the transaction history is shared until the change, is called a Contentious hard fork.

Contentious hard forks occur most often due to technical disagreements regarding the development of the blockchain. As the transaction history is shared on two blockchains that have split due to a contentious hard fork, a user that possessed cryptocurrency in the shared transaction history before the time of the contentious hard fork, will most likely possess an equivalent amount of cryptocurrency on both blockchains after the contentious hard fork. The combined value of the cryptocurrency holdings after a contentious hard fork can be lower, higher or the same as before the fork. This is primarily due to new structural and technological aspects of each blockchain as well as their communities.

Forks that occur with respect to cryptocurrencies not acting as selected constituents are treated as any other cryptocurrency. Forks that occur with respect to cryptocurrencies that presently act as constituents of a BlockchainX index and is a selected contentious hard fork creates uncertainty in the pricing of the forked constituent and are therefore treated as follows:

4.7.2 Selected contentious hard forks

A selected contentious hard fork is a contentious hard fork where at least two selected exchanges publicly announced it's support. Contentious hard forks without public announcements from two selected exchanges are treated as any other cryptocurrency.

1. the price of the forked cryptocurrency is frozen from the time of the fork plus or minus 2 hours, until at least two index exchanges have enabled deposits and withdrawal for both forks.

2. after the criterion of deposits and withdrawal is satisfied, the fork that is eligible to act as a selected constituent is used to determine the index value. In the case where both forks are eligible as selected constituents where both chains have the same validation rules, and its only purpose is chronological ordering of transactions, the fork with the most work done, meaning the most cumulative work (Proof-of-Work) “weight” , is used to determine the index value.

In the case where both forks are eligible as selected constituents where validation rules for transactions differ, the BlockchainX Index Committee will decide the valid chain.

3. the fork that was eligible to act as a selected constituent and used to determine the index value is exempt from criteria 5-8 that concern trade volumes. Furthermore, the fork only needs to fulfill each criterion at the time of rebalancing and not for the standard period of three months.
4. the fork that was not used as a price source can be included in the index as a constituent if it, at the next rebalancing date, fulfills all eligibility criteria except criteria 5-8 that concern trade volumes. Furthermore, the fork only needs to fulfill each criterion at the time of rebalancing and not for the standard period of three months.
5. hard forked eligible index constituents with a fork block number less than two weeks from a rebalancing date will not be rebalanced on the rebalancing date.

A fork that occurs with respect to cryptocurrencies that presently act as constituents of a BlockchainX index can result in none, one or more cryptocurrencies to be included in the indices at the rebalancing date.

4.7.3 Staking

Writing permissions to a Blockchain’s transaction history are administered by the access to private keys, which are connected to public addresses containing 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 that is external to the network. 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 **stacked**, 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.

4.7.4 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.

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:

- a) 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.
- b) overseeing any changes to the benchmark methodology and being able to request the administrator to consult on such changes.
- c) 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.

- d) reviewing and approving procedures for cessation of the benchmark, including any consultation about a cessation.
- e) overseeing any third party involved in the provision of the benchmark, including calculation or dissemination agents.
- f) assessing internal and external audits or reviews, and monitoring the implementation of identified remedial actions.
- g) 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.
- h) 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.
- i) 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.

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:

- a) 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.
- b) 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 0180101, when the European Bench- mark 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	The price of an index constituent is frozen during a 2-hour time window centered at the time point at which the fork will occur.