



SIX Crypto Indices

Methodology Rulebook Governing SIX Real-Time Crypto Indices and SIX Reference Rate Crypto Indices

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1 Introduction

This document is an integral part of the SIX Global Index Rules. The SIX Index Rules are outlined in a Methodology Rulebook for Equity and Real Estate Indices, Bond Indices, Strategy Indices, Swiss Reference Rates, and this Rulebook about SIX Crypto Indices. The initial section 'General principles' outlines the guiding principles underlying the rulebook and the application of the rules. The next section provides an overview of the terminology used in this rulebook. It is followed by a section on the calculation of the SIX Real-Time Crypto Indices and by a section on the calculation of the SIX Reference Rate Crypto Indices. The document closes with sections on correction policy, governance, external communication and trademark protection.

2 General Principles

This rulebook is based on the general principles stated below. SIX uses the principles as an orientation and guiding principles for unforeseen circumstances that are not covered by the rulebook or in case of doubt.

Representative	The value of the underlying asset is represented by the index
Tradable	The instrument is tradable in terms of size and market
Replicable	The development of the index can be replicated
Stable	High index continuity
Rule-based	Index changes and calculations are rule-based
Projectable	Changes in rules are applied with appropriate notification period (usually at least 2 trading days) – no retrospective rule changes
Transparent	Decisions are based on public information

3 Terminology

Term	Definition
Fork	A fork is a split in the blockchain network, usually effected by introducing changes to the software protocol. Depending on the impact of those changes, the terms hard fork (software change resulting in the previous version not being accepted any longer) or soft fork (a backward-compatible software change) are used.
Fiat Currency	Fiat currencies are traditional currencies such as the Swiss Franc, the Euro, or the US Dollar. These are issued by governments and are not linked to any other asset, such as gold.
Cryptocurrency	A cryptocurrency is a digital currency which is most commonly distributed across a decentralized network (distributed ledger). Cryptocurrencies are generally not issued by governments or another central authority. In this rulebook, the term Cryptocurrency is used for Crypto Assets as well as for Tokens.
Cryptocurrency Pair	A cryptocurrency pair is the trading pair available for each single cryptocurrency. These can be crypto/crypto pairs, such as BTC/ETH or they can be crypto/fiat pairs, such as BTC/USD.
Eligibility Criteria	The eligibility criteria are a set of conditions which a cryptocurrency needs to fulfil to be considered for price calculation. The conditions are outlined in section 5.3.
Crypto Exchanges	A crypto exchange in the context of this rulebook is a platform that allows trading of cryptocurrency Pairs. The requirements that crypto exchanges need to meet in order to be used as a source for the Indices in this rulebook, are outlined in section 5.2.
Top of The Book	The top of the Book data are Top Ask (Lowest Ask) and Top Bid (Highest) from orderbook for the relevant pair from an exchange.
Volume Weighted Median Price (VWMP)	The SIX Reference Rate Crypto Indices in this rulebook are weighted according to the trade volume. The volume weighted median price is calculated by using cryptocurrency pairs over a certain timeframe. The specific calculation is defined in more detail in section 7.4.
Whitelisted Exchange	A cryptocurrency exchange that meets the criteria outlined in section 5.2 and approved by the Index Management to serve as pricing source for the SIX Reference Rate Crypto Indices and SIX Real-Time Crypto Indices calculation.

4 Index Maintenance

4.1 Ordinary Index Review

Unless described differently in sections 6 and 7, the SIX Crypto Indices are reviewed four times a year based on data available on the Cut-Off Date. Any resulting changes are implemented on the third Friday of the subsequent month (the "Implementation Date"):

Quarter	Cut-Off-Date	Implementation Date
First	Last trading day of February	Third Friday in March
Second	Last trading day of May	Third Friday in June
Third	Last trading day of August	Third Friday in September
Fourth	Last trading day of November	Third Friday in December

4.2 Extra-Ordinary Market Events

4.2.1 Forks

Forks are generally not included in the SIX Crypto Indices unless explicitly described for a specific index.

4.3 Trade Suspensions and Market Distortions

There are certain circumstances which might require extraordinary adjustments to the SIX Crypto Indices. These circumstances include, but are not limited to:

- Longer or recurring outages of a cryptocurrency exchange or trading venue;
- Misconduct of a crypto exchange or with a cryptocurrency has been noticed;
- Sharp decline in trading volumes of cryptocurrencies, certain crypto exchanges/trading venues or even larger areas of the crypto market in general;
- Implementation of investment restrictions for international investors in certain countries or for certain exchanges;
- A cryptocurrency does not trade any more permanently or for an extended period of time;
- Technological failure.

In each of these cases, apply the rules outlined in section 6 and 7 for data collection and cleansing. In extreme cases a deviation from the rules defined in this rulebook can occur, for example, shifting the schedule of a regular index review.

5 Currency and Exchange Specifications

5.1 Input Data Sources

SIX collects cryptocurrency pricing data from multiple approved cryptocurrency exchanges to create a pool of raw tick data. All input data are based on actual transactions or on top of the book data. Several quantitative and qualitative processes are in place to determine and validate input prices, such as automated outlier filters and data monitors.

The exchanges selected as a source for input data have met specified metrics and standards to ensure that raw prices are of high quality.

5.2 Eligible Exchanges

To calculate cryptocurrency prices, SIX sources and consolidates trade and top of the book data from a variety of well-established exchanges that have been approved by the Index Management. SIX heavily emphasizes the reliability and correctness of the data used in its crypto indices.

Exchanges are periodically assessed on usability and reputation based on whether the exchange:

- Supports trading for cryptocurrencies and tokens against USD;
- Is Located in the jurisdictions of FATF members (Financial Action Task Force) or Moneyval member states complying with local, Anti Money Laundering (AML) and Know-Your-Customer (KYC) regulations;
- Provides a market data feed via API to SIX to source data on an ongoing basis including price, volume and time stamps;
- Demonstrates stable operations not incurring in outages or withdrawal freezes and in business for at least 18 months;
- Information about the exchange must be available in English including a clear statement about the location of the exchange and the place of jurisdiction;
- It has a sustainable business model in place, e.g., sourcing revenues through trading fees.

If an exchange fulfills all these criteria, it can be included in the SIX Crypto Exchanges Whitelist. Only trades and top of the book data occurring in whitelisted exchanges are considered.

The SIX Crypto Exchanges Whitelist is reviewed and re-assessed every quarter. An exchange monitoring process has been established as an ongoing continuous process to ensure that extraordinary events do not affect the ability of the index to accurately represent the market.

5.3 Cryptocurrencies Eligibility Criteria

A cryptocurrency must meet the following qualitative and quantitative requirements to be considered for price calculation:

- Be a digital bearer that cannot be duplicated and cryptographically secured;
- The related on-chain transactions are not obscured but traceable and publicly stored on a distributed ledger;
- Its value must not be pegged to any other kind of asset, currency or basket of assets (USDT, Gold, etc...);
- Have a trading volume of at least USD 500,000 over the last 30 days prior the cut-off dates as stated in section 4.1, across all whitelisted exchanges and trading pairs;
- Cryptocurrencies pairs vs USD available;
- Quoted on at least 2 whitelisted exchanges;
- Trading on an exchange at least once a day;

6 SIX Real-Time Crypto Indices

6.1 Purpose

SIX develops and administers the SIX Real-Time Crypto Indices to provide market participants with robust Real-Time valuation for cryptocurrencies. Provided 24 hours a day, 7 days a week, these real – time Indices can be used globally by asset servicers, index providers, NAV providers, custodians, asset managers, asset owners and media.

6.2 Input Data

The SIX Real-Time Crypto Indices are calculated based on top-of-the-book data and disseminated every second . “Top-of-the-book” refers to the Best Ask (Lowest Ask) and Best Bid (Highest Bid) quotes derived from the orderbook for the relevant pair.

The following data is collected from each whitelisted exchange:

- Best Ask for each relevant pair;
- Best Bid for each relevant pair;
- Data collection timestamp;
- Exchange name.

Exchanges are selected based on the criteria described in section 5.2 of this rulebook.

All top-of-the-book data are converted to and stored as USD if expressed in another currency. For each one second-interval, top-of-the-book data are eligible for inclusion in the calculation based on the process outlined in the next section.

6.3 Data Collection and Cleansing

6.3.1 Invalid Data

Invalid data are not considered for the calculation.

Invalid data are defined as:

- Top-of-the-book data where Best Bid and Best Ask values are non-numerical or non-positive values;
- Top-of-the-book data where Best Bid and/or Best Ask data are non-complete or missing;
- Top-of-the-book data where the Best Ask is lower than the Best Bid

6.3.2 Outlier Elimination

Once Invalid data are excluded as outlined in section 6.3.1, an outlier analysis of the top-of-the book data is performed as follows:

- The median of the best Asks (A_{median}) from the whitelisted exchanges and the median of the best Bids (B_{median}) from the whitelisted exchanges are identified;
- If, for the whitelisted exchange i:

$$\left|1 - \left(\frac{Ask_i}{A_{median}}\right)\right| > 0.1 \quad \text{or} \quad \left|1 - \left(\frac{Bid_i}{B_{median}}\right)\right| > 0.1$$

then the top of the book data from the whitelisted exchange i are considered as outlier.

Top-of-the-book data identified as outliers are not considered for the calculation.

6.4 SIX Real-Time Crypto Indices Calculation

Each SIX Real-Time Crypto Index value is calculated utilizing the top-of-the-book data, after eliminating invalid data and outliers as described, collected during the last second. The following procedure applies:

- The median of the best Asks (A_{median}) from the whitelisted exchanges is identified;
- The median of the best Bids (B_{median}) from the whitelisted exchanges is identified;
- Then the SIX Real-Time Crypto Index value at time t , is obtained by the simple average between A_{median} and B_{median} :

$$SIX \text{ Real} - Time \text{ Crypto Index}_t = \frac{(A_{\text{median}} + B_{\text{median}})}{2} \text{ eq. 1}$$

If no top-of-the-book data are available for the Index value calculation, including due to the application of the rules set forth in section 6.2, then section 8.1 applies.

7 SIX Reference Rate Crypto Indices

7.1 Purpose

SIX develops and administers the SIX Reference Rate Crypto Indices to provide market participants with robust valuation reference points for cryptocurrencies. Provided across different calculation timeframes adapted to global time zones, these fixings can be used globally by asset servicers, index providers, NAV providers, custodians, asset managers, asset owners, and media.

7.2 Input Data

SIX Reference Rate Crypto Indices are calculated and disseminated on a hourly basis during a 24-hour a day, 7 days a week schedule.

The following data is collected from each transaction:

- Trade price;
- Trade amount;
- Trade timestamp;
- Exchange where the transaction was executed.

Exchanges are selected based on the criteria that can be found in section 5.2 of this rulebook.

All trade data are converted to and stored as USD if expressed in another currency. Trades are assessed for inclusion in the calculation based on the processes outlined in the next section.

7.3 Data Collection and Cleansing

7.3.1 Invalid Data

Invalid data are not considered for the calculation.

Invalid data are defined as:

- Non accurate trades data, where price and volume values are non-numerical or non-positive;
- Not complete trades data where trade price, trade volume and trade timestamp are completely or partially missing;
- Executed trades outside the 60-minute windows prior to the fixing as outlined in section 7.4.

7.3.2 Outlier Elimination

Once that Invalid data are excluded as outlined in section 7.3.1, an outlier analysis of the trades, is performed as follow:

- The volume-weighted median price of all trades is computed for each whitelisted exchange. For the purpose of calculating the volume-weighted median price the following process is applied:
 - All trade prices from the whitelisted exchange e (X_e), are sorted in ascending order by price i.e. $\{\min(X_e)=X_{1,e}, X_{2,e}, \dots, X_{n,e}, \max(X_e)\}$, along with the respective trade volumes of each trading price ($V_{1,e}, V_{2,e}, \dots, V_{n,e}$);
 - With n equal to the number of trades of the whitelisted exchange e and V_e equal to the total trade volume for the whitelisted exchange e , the Volume-Weighted Median Price for the whitelisted exchange e ($VWMP_e$) is identified:
 - As trade price $x_{e,j}$, satisfying:

$$\sum_{i=1}^{j-1} v_{e,i} < \frac{1}{2} V_e \text{ and } \sum_{i=j+1}^n v_{e,i} \leq \frac{1}{2} V_e \text{ eq. 2}$$

- If no $x_{e,j}$ is found with eq. 2 above, then the $VWMP_e$ equals the trade price $x_{e,m}$ with $m = \{1, n\}$, satisfying:

$$v_{e,j} \geq \frac{1}{2} V_e \text{ eq. 3}$$

- If eq. 2 and eq. 4 are both satisfied:

$$\sum_{i=j+1}^n v_{e,i} = \frac{1}{2} V_e \text{ eq. 4 then } VWMP_e = \frac{x_{e,j} + x_{e,j+1}}{2}$$

- The median of the volume-weighted median prices ($VWMP_{\text{median}}$) among all whitelisted exchanges, calculated in the previous step, is then identified;
- If, for the whitelisted exchange e :

$$\left| 1 - \left(\frac{VWMP_e}{VWMP_{\text{median}}} \right) \right| > 0.1$$

then all the trades from that whitelisted exchange are identified as outliers.

Trades that are identified as outliers are not considered for the calculation.

7.4 SIX Reference Rate Crypto Indices calculation

Each SIX Reference Rate Crypto Indices value is calculated utilizing the above-mentioned trades collected in the last 60 minutes prior the fixing. The following procedure applies:

- The 60-minute window is divided into 12 consecutive 5-minute blocks;
- All trade prices within the specific block k (X_k) are sorted in ascending order by price, i.e. $\{\min(X_k)=x_{1,k}, x_{2,k}, \dots, x_{n,k}=\max(X_k)\}$, along with the respective trade volumes of each trading price ($v_{1,k}, v_{2,k}, \dots, v_{n,k}$);
- The Volume-Weighted Median Price for the block k at time t ($VWMP_{k,t}$), is then identified:
 - As trade price $x_{k,j}$, satisfying:

$$\sum_{i=1}^{j-1} v_{k,i} < \frac{1}{2} V_k \text{ and } \sum_{i=j+1}^n v_{k,i} \leq \frac{1}{2} V_k \text{ eq. 5}$$

- If no $x_{k,j}$ is found with eq. 5 above, then the $VWMP_{k,t}$ is trade price $x_{k,m}$ with $m = \{1, n\}$, satisfying:

$$v_{k,j} \geq \frac{1}{2} V_k \text{ eq. 6}$$

- If eq. 5 and eq. 7 are both satisfied:

$$\sum_{i=j+1}^n v_{k,i} = \frac{1}{2} V_k \text{ eq. 7 then } VWMP_{k,t} = \frac{x_{k,j} + x_{k,j+1}}{2}$$

- Finally, the SIX Reference Rate Crypto Index value is computed as a simple average of the volume-weighted medians prices of all blocks:

$$SIX \text{ Reference Rate Crypto Index value } _t = \frac{\sum_{i=1}^K VWMP_{k,t}}{K} \text{ eq. 8}$$

Legend	
VWMP_k:	Volume-Weighted Median Price of the k th block
n:	Number of trades in the k th block
W:	Time window of 1 hour prior to the Fixing time
K	Number of blocks
k:	The k th block
x_{k,i}:	Trade price at position i of the k th block
v_{k,i}:	Trade volume at position i of the k th block
V_k	Total trade volume in the k th block ($\sum_{i=1}^n v_{k,i}$)

It could occur that after the application of the rules outlined in section 7.3 or due the lack of data from whitelisted exchanges, no trades in a specific block k are found. In that case the block k is not considered for the calculation of the Index value and the value K in the eq.10, is decremented accordingly. If no trades are available for Index value calculation, including due to the application of the rules set forth in section 7.2, then section 8.1 will apply.

7.5 Fixing Times

SIX Reference Rate Crypto Indices values are calculated hourly and at specific times to align with the closure of the main financial markets. Some examples are:

- 16:00 GMT (London, Europe);
- 16:00 EST (New York);
- 16:00 HKT (Hong Kong);
- 17:00 SST (Singapore);
- 17:30 CET (Europe, Switzerland).

8 Correction Policy

8.1 Unavailable Data

If data to determine the SIX Real-Time Crypto Indices or the SIX Reference Rate Crypto Indices is not available to SIX due to trade suspensions or market distortions, the latest available data is used. Such cases may lead to a deviation from the general principles of the Indices defined in the respective rulebooks. These changes may be related to review schedules, ordinary reviews and component and weighting changes outside of ordinary index reviews and are publicly announced with a notification period of at least 2 trading days.

8.2 Wrong Data

Data errors caused by calculation errors or by incorrect inbound data.

Calculation errors which are detected within a trading day are immediately corrected. Intraday tick data is not corrected retrospectively. Calculation errors that are older than a trading day and incorrect inbound data are only corrected if technically possible and economically viable. If the correction leads to a significant difference in the index levels, those can be corrected retrospectively.

8.3 Market Disruption

In periods of market stress that might result in inaccurate market prices, delayed data inputs, illiquid cryptocurrencies or fragmented markets, SIX calculates cryptocurrency Indices following predetermined procedures as set out below.

If, during a situation of market stress, a given cryptocurrency is available for trading at only whitelisted exchange, the requirement for a minimum of two whitelisted exchanges is relaxed as long as the 30-day trading volume is of at least USD 250,000. In the event that no secondary exchange becomes available again within 30 days, the Index Management will make a determination on whether to terminate the index dissemination.

If the 30-day trading volume across all the whitelisted exchanges drops below USD 500,000 for 30 consecutive days, the Index Management will make a determination on whether to terminate the index dissemination. This requirement is assessed monthly on the last trading day.

9 Governance

The Indices are managed by the index team of SIX. The team ensures that the index rules are applied and the Indices fulfil the required quality standards. The index team works against structured processes to ensure compliance with a regulatory framework. The main concepts of that framework are:

Review of Index Concepts

The validity of the index concepts and rules is reviewed on a regular basis by SIX. For significant changes a broad market consultation is conducted. The changes to the index rules are publicly announced with appropriate lead time (usually 3 months).

Termination of Indices

A decision to discontinue an index will be publicly announced with appropriate lead time.

In case of existing financial products linked to the index of which SIX is aware a market consultation is conducted in advance and a transition period is introduced before the definitive termination. Otherwise no market consultation will be carried out.

Controls and Rules for the Exercise of Expert Judgement

The rules in this rulebook have been designed to eliminate discretion or expert judgement for the calculation of Indices. However, potential limitations of the methodology can materialize in situations including:

- unexpected events, such as important and complex Forks
- technical reasons, for example the inability of a whitelisted exchange to provide a close price due to a computer outage
- where a rule allows for several interpretations ("unclear rule")
- the absence of a rule in the methodology which potentially leads to a Index value which does not properly reflect the nature of the Index ("insufficient rule")
- determination of materiality of changes to the index methodology

In such unexpected cases, a pre-defined incident and escalation process has been established. SIX will evaluate and document the use of discretion as part of the incident management process. To the extent possible, this rulebook will be updated to capture such unexpected cases with a new transparent rule.

In addition, any feedback from market participants about the use of discretion will usually be discussed with index management.

Further documentation on regulation and processes can be found on the SIX website¹.

¹ www.six-group.com/indices > Index Regulation

10 External Communication

SIX uses the following tools to inform the market about index changes. Index changes are changes in index compositions and component weightings as well as ordinary and extraordinary index adjustments.

Reports

The index team creates and maintains reports containing index compositions, component weightings, and other index-relevant information. SIX publishes the reports on its website. The majority of the reports is only made available to license holders, however. Since the information of some reports is index-specific, the number of reports which are relevant for an index varies from index to index. Depending on the recency of their information, the reports are updated with different frequencies ranging from daily to annual.

Data Vendor Code Sheet

Information on the actual ticker symbols, index standardizations, launch dates and calculation parameters of the Indices can be found in the Data Vendor Code Sheet which is published under [All indices calculated by SIX](#) on the website of SIX.

Newsletter Email Service

SIX provides the Index Service Crypto to inform in depth on Crypto Indices including historical index values, extraordinary market events, and information regarding the index composition. Interested parties may subscribe to the newsletter email service on the website². SIX distributes all notifications regarding indices over this channel. This may include but is not limited to

- Updates to the periodic index reviews
- Problems and error in the index calculation
- The launch or discontinuation of indices
- Market consultations
- Issuer surveys

Media Release

If an index adjustment is of broad public interest, SIX can decide to publish a media release to inform the public about the index adjustment. Furthermore, media releases can be made for marketing purposes which do not refer to index adjustments.

² www.six-group.com/indices > Market Data > Indices > Request account

11 Trademark Protection, Use of Licensing

The Trademarks are the intellectual property (including registered trademarks) of SIX Index AG, Zurich, Switzerland. SIX Index AG does not give any warranty and exclude any liability (whether in negligence or otherwise) with respect to their usage. The use of SIX Index AG Indices and their registered trademarks (®) as well as the access to restrictive index data are governed by a licensing agreement. Information about licensing and the format of the disclaimer can be found on the SIX website³.

³ www.six-group.com/indices > Market Data > Indices > Licensing

12 Contact

Any requests with respect to the Indices may be directed to one of the following addresses:

Index Business Support

Index Sales, Licensing and Data

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indexdata@six-group.com

Technical Support

Index Operations

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