



**WINKLEVOSS BLENDED INDICES
METHODOLOGY**

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Winklevoss Blended Indices (WBxl)

The Winklevoss Blended Indices (WBxl)¹ are used to collar their respective 4pm Eastern Time Gemini auctions. The WBxl includes the Winklevoss Blended Bitcoin Index (WBBI) and the Winklevoss Blended Ethereum Index (WBEI).

The BTCUSD Gemini Auction is the settlement pricing mechanism used for the Cboe Bitcoin (USD) Futures Contracts (XBT), which trade on the Cboe Futures Exchange, LLC (CFE) under the ticker symbol “XBT” ([contract specifications](#) | [fact sheet](#)).

XBT Futures

XBT futures are cash-settled contracts based on Gemini’s Auction price for bitcoin, denominated in U.S. dollars (symbol: BTCUSD). XBT futures are specifically designed to allow participants to implement straightforward trading strategies through settlement via a single, tradeable auction price.

- XBT futures are cash settled — see [contract specifications](#) for details
- Final settlement value (XBTS) will reflect the Gemini Auction price on the day of settlement
- XBT futures will enable investors to take a directional view on the price of bitcoin (both long and short), gain exposure to bitcoin prices, or hedge their existing bitcoin positions
- XBT futures will bring benefits to traders, including transparency, efficient price discovery, deep liquidity, and centralized clearing
- CFE is regulated by the Commodity Futures Trading Commission (CFTC)
- Gemini Trust Company, LLC (Gemini) is a New York trust company regulated by the New York Department of Financial Services (NYDFS)
- Gemini is a digital asset exchange and custodian that allows customers to buy, sell, and store digital assets such as bitcoin.
- Gemini and CFE have cross-market surveillance and an information-sharing agreement in place
- See XBT futures [contract specifications](#) for additional details

Gemini Auction

¹ Winkdex® and Winklevoss Index® are registered trademarks. Winklevoss Blended Bitcoin Index, WBBI, Winklevoss Blended Ethereum Index, WBEI, Cboe, and XBT are proprietary marks. Patented and patent pending, U.S. Patent No. 10,002,389.

The Gemini Auction runs every day, including on weekends and holidays. Among other controls, a successful Gemini Auction price must be within a required range of the collar price. Gemini uses the WBxI to collar the Gemini Auction.²

The Gemini website and market data show the Gemini Auction price and quantity as well as the WBxI value used as the collar price.

Indicative Auction Prices

Starting at 3:50pm ET, ten minutes before the Gemini Auction runs, Gemini publishes an indicative Gemini Auction price (Indicative Price), quantity, and WBxI collar price every minute.

Starting at 3:59pm ET, one minute before the Gemini Auction runs, Gemini publishes an Indicative Price, quantity, and WBxI collar price every fifteen seconds.

Each Indicative Price event will use the WBxI value at the time of calculation as the collar price. The market data for every Indicative Price event includes the WBxI value used as the collar price.

More Information

Visit Gemini's website to learn more about [Gemini Auctions](#) and view our [API Documentation](#). Our connectivity options meet the needs of sophisticated traders; they include REST, WebSockets, and FIX via cross-connect from the Equinix NY4 or NY5 data centers. You can use these protocols to access public market data as well as private trading sessions. To set up a cross connect, please contact us at connectivity@gemini.com.

Visit Cboe's website to learn more about [XBT](#).

How Is the Index Calculated?

The WBxI is a ten minute volume-weighted average (VWAP) that discards the quantity from prices under the fifth and over the 95th percentile.

Methodology

This example has been simplified to make the calculation clear. For instance, each table shows only ten trades from only three constituents.

² Gemini will use the closest reasonable value of the WBxI to 4pm ET.

Step One: Assembly of Constituent Trades

Assume that these ten trades were collected from three constituent exchanges over ten minutes. Timestamps are represented as integers for simplicity.

<i>Source</i>	<i>Timestamp</i>	<i>Price (USD)</i>	<i>Quantity (BTC)</i>	<i>Quantity As Percent of Total Quantity</i>
Exchange A	1	57	18	18.00%
Exchange B	2	51	8	8.00%
Exchange C	3	52	14	14.00%
Exchange B	4	59	5	5.00%
Exchange A	5	54	10	10.00%
Exchange C	6	55	14	14.00%
Exchange B	7	56	6	6.00%
Exchange A	8	50	2	2.00%
Exchange A	9	58	11	11.00%
Exchange C	10	53	12	12.00%

Interlude: sanity check

- For each data point, parse a valid representation of a trade to check for clearly erroneous data
- Check whether one exchange is providing price data that is far off from the pricing data of the other exchanges. We refer to this as [Possibly Erroneous Values](#).

Calculate VWAP Values for Individual Constituents

Volume is price multiplied by quantity. The VWAP is the sum of the volumes divided by the sum of the quantities.

<i>Constituent</i>	<i>Calculation</i>	<i>Result</i>
Exchange A	Sum of volumes: $(57 * 18) + (54 * 10) + (50 * 2) + (58 * 11)$ Sum of quantities: $18 + 10 + 2 + 11$	56

Exchange B	Sum of volumes: $(51 * 8) + (59 * 5) + (56 * 6)$ Sum of quantities: $8 + 5 + 6$	54
Exchange C	Sum of volumes: $(52 * 14) + (55 * 14) + (53 * 12)$ Sum of quantities: $14 + 14 + 12$	53

Compare Constituents

We will use the following methodology to ensure on market pricing for each constituent of the WBxI:

1. Calculate the median of constituent VWAPs
2. Select the constituent (or constituents in the case of a tie) VWAP that is the greatest percentage difference from the median
 - a. If the VWAP difference is greater than or equal to 10%, remove the constituent(s) from the list of participating constituents and return to step one
 - b. If the VWAP difference is less than 10%, proceed to step three
3. Calculate the percentage of constituents that have been removed from the list of participating constituents
 - a. If 50% or more of all WBxI constituents have been removed, then all of the constituents will be used to calculate the WBBI value, which will be used as the collar price for the Gemini Auction. The intent of the individual constituent VWAP pruning is to remove potentially erroneous data, not to eliminate legitimate volatility.
 - b. If less than 50% of all WBxI constituents have been removed, then the remaining constituents will be used to calculate the WBxI value, which will be used as the collar price for the Gemini Auction

In the simplified example above, the median VWAP is 54 and all three WBxI constituents are included in the calculation of the WBxI.

To better demonstrate iterative removal, here's a second example using four WBxI constituents:

WBxI Constituent	VWAP (USD)
Exchange W	17,500
Exchange X	17,800
Exchange Y	18,200
Exchange Z	22,400

- All four exchanges are constituents of the WBxI and the median of constituent VWAPs is calculated as 18,000 USD
- Exchange Z has the VWAP with the greatest difference from the median, which is $(22,400-18,000)/18,000 = 24.44\%$ off of the median
- Exchange Z is removed from the list of participating constituents
- The new median of participating constituent VWAPs is 17,800 USD
- Exchange Y has the VWAP with the greatest difference from the median, which is $(18,200-17,800)/17,800 = 2.25\%$ off of the median
- One of four WBxI constituents — 25% — has been removed from the list of participating constituents
- Exchange W, X, and Y are used to calculate the WBxI and the WBxI will be used as the collar price

Step Two: Sort Trades by Price

Sort all the trades by price, from lowest to highest.

<i>Source</i>	<i>Timestamp</i>	<i>Price (USD)</i>	<i>Quantity (BTC)</i>	<i>Quantity As Percent of Total Quantity</i>
Exchange A	8	50	2	2.00%
Exchange B	2	51	8	8.00%
Exchange C	3	52	14	14.00%
Exchange C	10	53	12	12.00%
Exchange A	5	54	10	10.00%
Exchange C	6	55	14	14.00%
Exchange B	7	56	6	6.00%
Exchange A	1	57	18	18.00%
Exchange A	9	58	11	11.00%
Exchange B	4	59	5	5.00%

Step Three: Identify Trades with Prices in Cutoff Threshold

Once trades have been sorted by price, discard the trades in the bottom and top 5%. This will eliminate volume from the prices under the fifth and over the 95th percentile in the VWAP calculation.

Source	Timestamp	Price (USD)	Quantity (BTC)	Quantity As Percent of Total Quantity
Exchange A	8	50	2	2.00%
Exchange B	2	51	8	8.00%
Exchange C	3	52	14	14.00%
Exchange C	10	53	12	12.00%
Exchange A	5	54	10	10.00%
Exchange C	6	55	14	14.00%
Exchange B	7	56	6	6.00%
Exchange A	1	57	18	18.00%
Exchange A	9	58	11	11.00%
Exchange B	4	59	5	5.00%

Step Four: Apportion Trades, Splitting as Necessary

Trades have now been sorted by price, and in the previous step we identified and discarded trades with prices falling within the bottom 5% and top 5% of prices.

If the trades above or below the 5% threshold don't add up to 5% perfectly, then the last trade on the bottom and the first trade on the top will be split into two parts so as to discard only the part of the trade necessary to make up 5% on either side.

In the example below, to discard the bottom 5%, we start by discarding the trade with timestamp eight priced at 50 USD, which is 2% of total quantity. The next trade is the trade with timestamp two priced at 51 USD which is 8% of total quantity. We don't want to discard 10% of the volume, so we will split the trade with timestamp two into two segments: the first, a 3% segment, will be discarded. The second, a 5% segment, will be retained in the VWAP calculation.

To discard the top 5%, no splitting is necessary: the trade with timestamp four priced at 59 USD is exactly 5% of the total quantity.

<i>Source</i>	<i>Timestamp</i>	<i>Price (USD)</i>	<i>Quantity (BTC)</i>	<i>Quantity As Percent of Total Quantity</i>
Exchange A	8	50	2	2.00%
Exchange B	2	51	3	3.00%
Exchange B	2	51	5	5.00%
Exchange C	3	52	14	14.00%
Exchange C	10	53	12	12.00%
Exchange A	5	54	10	10.00%
Exchange C	6	55	14	14.00%
Exchange B	7	56	6	6.00%
Exchange A	1	57	18	18.00%
Exchange A	9	58	11	11.00%
Exchange B	4	59	5	5.00%

Step Five: Calculate VWAP with Retained Values

The table below shows the trades with their new weights after the trades falling within the cutoff threshold were removed or truncated.

<i>Source</i>	<i>Timestamp</i>	<i>Price (USD)</i>	<i>Quantity (BTC)</i>	<i>Recalculated Quantity As Percent of Total Quantity</i>
Exchange B	2	51	5	5.56%
Exchange C	3	52	14	15.56%
Exchange C	10	53	12	13.33%
Exchange A	5	54	10	11.11%
Exchange C	6	55	14	15.56%
Exchange B	7	56	6	6.67%

Exchange A	1	57	18	20.00%
Exchange A	9	58	11	12.22%

The calculation then becomes straightforward: a sum of volumes divided by a sum of quantities.

Sum of volumes: $(51 * 5) + (52 * 14) + (53 * 12) + (54 * 10) + (55 * 14) + (56 * 6) + (57 * 18) + (58 * 11) = 4929$

Sum of quantities: $5 + 14 + 12 + 10 + 14 + 6 + 18 + 11 = 90$

The VWAP for the calculation period in this example is **54.77**.

Missing Values

WBxI values are calculated with the best available trade data at the time of request. WBxI values must be historically reproducible using only values that were known at the time the value was calculated. Missing trades that arrive later will be omitted from the WBxI calculation as of the time of that request timestamp.

If a WBxI constituent has suspended trading at the time the WBxI value is calculated, the WBxI will omit trade data from that constituent for that day.

Example

Assume that these ten trades were collected from three constituent exchanges over ten minutes. Timestamps are represented as integers for simplicity.

Each trade has two timestamps: the timestamp when the trade occurs, and the timestamp when the WBxI data collector received the data for that trade from the exchange's API.

Source	Timestamp	Price (USD)	Quantity (BTC)	Received at timestamp	First calc that includes this datapoint at timestamp
Exchange A	1	57	18	3	4
Exchange B	2	51	8	5	6
Exchange C	3	52	14	6	7
Exchange B	4	59	5	5	6

Exchange A	5	54	10	7	8
Exchange C	6	55	14	9	10
Exchange B	7	56	6	7	8
Exchange A	8	50	2	11	12
Exchange A	9	58	11	12	13
Exchange C	10	53	12	15	16

Every calculation of the WBxI is relative to the “received at timestamp.” The first calculation that each data point can be included in is relative to the time it was received.

Missing Data that Arrives Later

A WBxI value calculated at timestamp 13 and as of timestamp 14, would not include the last row (the trade from Exchange C) because although that trade occurred at timestamp ten, it was not received until timestamp 15.

<i>Source</i>	<i>Timestamp</i>	<i>Price (USD)</i>	<i>Quantity (BTC)</i>	<i>Received at timestamp</i>	<i>Included at timestamp 14 to calculate value as of timestamp 13?</i>
Exchange A	1	57	18	3	Y
Exchange B	2	51	8	5	Y
Exchange C	3	52	14	6	Y
Exchange B	4	59	5	5	Y
Exchange A	5	54	10	7	Y
Exchange C	6	55	14	9	Y
Exchange B	7	56	6	7	Y
Exchange A	8	50	2	11	Y
Exchange A	9	58	11	12	Y
Exchange C	10	53	12	15	N

Reproducing a Historical Value

A WBxI value calculated at timestamp eight and as of any later timestamp (e.g., timestamp 200), would only need to take into account the values that were known as of timestamp eight.

<i>Source</i>	<i>Timestamp</i>	<i>Price (USD)</i>	<i>Quantity (BTC)</i>	<i>Received at timestamp</i>	<i>Included at timestamp 200 to calculate value as of timestamp 8?</i>
Exchange A	1	57	18	3	Y
Exchange B	2	51	8	5	Y
Exchange C	3	52	14	6	Y
Exchange B	4	59	5	5	Y
Exchange A	5	54	10	7	Y
Exchange C	6	55	14	9	N
Exchange B	7	56	6	7	Y
Exchange A	8	50	2	11	N
Exchange A	9	58	11	12	N
Exchange C	10	53	12	15	N

Erroneous Values

If a constituent supplies an individual data point which is clearly erroneous, that trade will be excluded. The Oversight Committee deems the following types of data points clearly erroneous:

- Any unexpected format that cannot be parsed to the expected trade representation documented in the exchange's API documents;
- Missing, non-numeric, or non-positive quantity and/or amount; and
- A trade timestamp with an unexpected format or value (causing issues such as, but not limited to: a timestamp that cannot be parsed to a date or that represents a date in the distant past).

If all the data points supplied by a WBxI constituent during a calculation period are clearly erroneous, then that constituent will not take part in the WBxI calculation for that calculation period.

Possibly Erroneous Values

The WBxI calculation always discards notional volume from prices falling within the fifth and 95th percentile over the calculation period.

As an additional control, the Oversight Committee mandates that before calculating the WBxI value for any period, the WBxI will calculate the VWAP of each constituent over the same period and compare them to each other. The individual constituent VWAP calculation does not discard any data points, so as to highlight when an individual constituent is far off market with respect to the other constituents.

See [Compare Constituents](#) for a detailed explanation of how individual VWAPs are compared against the median VWAP and, when necessary, removed in an iterative manner.

Methodology Changes

As the market becomes more liquid and volatility decreases, the Oversight Committee will periodically evaluate and adjust the calculation period, the controls for price outliers, and the handling of potentially erroneous data.

To be notified when our methodology changes, please sign up to our [mailing list](#).

Index Constituents

The Winklevoss Blended Indices Oversight Committee manages the WBxI constituents. The Oversight Committee aims to select constituents that follow the best possible practices. Consideration may include, among others, one or more of the following criteria:

- Obtaining the highest levels of regulation available in a given jurisdiction;
- Participating in regulated market activities such as cross-market surveillance and information sharing; and
- Robust compliance practices including but not limited to relations around:
 - Anti-money laundering (AML); and
 - Know your customer (KYC).

Eligibility

The eligibility criteria for a digital asset exchange to be considered as a potential constituent in the WBxI may include, among others, the following criteria:

1. The exchange allows spot trading of bitcoin or ether against U.S. dollars;

2. The exchange makes trade data available through a reliable API. If historical trade data is not freely available, the exchange must be willing to provide the calculation agent with a sample of at least the previous two consecutive calendar quarters of trade data;
3. The volume of bitcoin vs U.S. dollars or ether vs U.S. dollars traded on the exchange, as shown by their trade data and obtained through their API, is both steady and significant for the previous two consecutive calendar quarters;
4. The exchange demonstrates ongoing effort to follow all applicable laws and regulations;
5. The exchange seeks to prevent unfair and manipulative conduct or deceptive practices, by engaging in information sharing with regulators, implementing internal trade surveillance tools, and dedicating personnel to monitoring market activity for manipulative conduct or deceptive practices;
6. The exchange has a robust anti-money laundering program and only allows market participants who have engaged in a KYC process to trade
7. The exchange has policies and procedures in place that minimize its exposure to the operational and credit risk of market participants;
8. The Oversight Committee believes that adding the exchange to the WBxI will provide a more representative and stable WBxI price; and
9. The exchange satisfies any additional criteria that the Oversight Committee deems relevant.

Current Constituents of WBBI

- Gemini Trust Company, LLC (Gemini)
- ItBit Trust Company, LLC (itBit)
- Bitstamp Ltd. (Bitstamp)
- Payward, Inc. (Kraken)
- bitFlyer, Inc. (bitFlyer)

Current Constituents of WBEI

- Gemini Trust Company, LLC (Gemini)
- Bitstamp Ltd. (Bitstamp)
- Payward, Inc. (Kraken)

When Constituents Change

To be notified when our constituents change, please sign up to our [mailing list](#).

Membership Review

The Oversight Committee meets once per quarter to:

- Review current WBxI constituents against the membership criteria; and
- Consider proposals for new index constituents.

The Oversight Committee will hold current WBxI constituents to the same level of scrutiny as potential incoming constituents.

Addition

If you are interested in nominating a digital asset exchange for inclusion as a constituent in the WBx, please send an email to contact@winkdex.com.

The Oversight Committee reviews incoming applications at least once per quarter.

The Oversight Committee will review each application. Based upon consideration of the application and whether the exchange satisfies the eligibility criteria, the Oversight Committee may add that exchange to the list of WBxI constituents.

At its discretion, the Oversight Committee may choose to review applications sooner. For instance, if an WBxI constituent has been removed, the Oversight Committee will act in the best interests of the WBxI by seeking a prompt replacement.

Suspension and Removal

If the Oversight Committee becomes aware of a major event that violates the WBxI constituent principles, the Oversight Committee may temporarily suspend the constituent in question.

Whenever possible, the Oversight Committee will suspend the constituent in question before the next business day on which the Gemini Auction runs and WBxI values are calculated as the collar price for Indicative Prices and the Gemini Auction final price.

When the Oversight Committee completes its investigation, it will decide whether to suspend the constituent in question temporarily or remove the constituent from the WBxI.

In the case of a temporary suspension, the Oversight Committee will record how the constituent violated the criteria, and determine a date on which the Oversight Committee will reconvene to decide whether the constituent has cured the violation. If the constituent has not cured its violation by that deadline, the Oversight Committee may remove the constituent from the WBxI.

When the Oversight Committee removes a constituent from the WBxI, the Oversight Committee will seek to find a replacement within three months.

Once an exchange has been removed from the WBxI, the Oversight Committee will consider whether to add the exchange back. Consideration may include, among others, one or more of the following criteria:

- The violation(s) has been cured to the satisfaction of the Oversight Committee;
- The exchange has met all eligibility criteria for a minimum of either two consecutive calendar quarters or whatever time period the Oversight Committee deems necessary; and
- Any criteria that the Oversight Committee deems relevant.

How Will the Index Handle Forks?

The underlying protocol of the relevant digital asset network is subject to changes in its operating rules (i.e., “hard fork”). A hard fork means that a digital asset network has been modified in a way that makes it incompatible with the unmodified digital asset network, and some population of miners and/or users of the digital asset network accept the modifications, thereby resulting in two digital asset networks that have not been merged together in a timely fashion.

If the blockchain for a digital asset diverges into different paths, the form of digital asset on which the index will be based is the form of that digital asset traded on the Gemini Exchange, in accordance with the [Gemini User Agreement](#) at the time of the fork. Please refer to the [Gemini User Agreement](#) section on “Forks” for more information.

Constituent Review During Hard Forks

In the lead up to a hard fork, the Oversight Committee will meet regularly to review the position of all the WBxI constituents.

In the event of a hard fork, whereby a WBxI constituent does not offer or continue to offer a central limit order book for the digital asset of a blockchain recognized and supported by Gemini, the Oversight Committee will remove that constituent from the WBxI value calculation before the next business day on which the Gemini Auction runs and Indicative Prices, the Gemini Auction final price, and all respective WBxI collar prices are broadcast.

Once the situation stabilizes, the Oversight Committee will determine whether the constituent should be suspended temporarily or removed.

If the constituent continues to offer a central limit order book for the digital asset of a blockchain recognized and supported by Gemini, and even if that central limit order book is operating with a different symbol, the Oversight Committee will evaluate whether that central limit order book has

sufficient volume, liquidity, transparency, and stability for the exchange to be included as a constituent in the WBxI. If so, the exchange will be used as a constituent in calculating the WBxI value. If the trade data are deemed to be insufficient, then the Oversight Committee will remove the exchange as a constituent of the WBxI. If a constituent is removed, the Oversight Committee will attempt to replace it within three months with another exchange that meets the WBxI selection criteria.

Historical Data

Following each Gemini Auction that runs on a business day, we post an updated zip archive file containing a CSV file, which contains the WBxI values used as collar prices for the indicative and final Gemini Auction events.

WBBI

The BTCUSD collar prices can be downloaded from:

https://downloads.winkdex.com/auction_collar_price_history_btusd.csv.zip

The Gemini BTCUSD Auction on December 18, 2017, was the first Gemini BTCUSD Auction to use the WBBI value as a collar price; however, for reference purposes, the BTUSD CSV file also contains WBBI values for every Gemini BTCUSD Auction since the first ever Gemini BTCUSD Auction ran on September 21, 2016, in an effort to demonstrate how the WBBI behaved historically.

WBEI

The ETHUSD collar prices can be downloaded from:

https://downloads.winkdex.com/auction_collar_price_history_ethusd.csv.zip

The Gemini ETHUSD Auction on July 16, 2018 was the first Gemini ETHUSD Auction to use the WBEI value as a collar price; however, for reference purposes, the ETHUSD CSV file also contains WBEI values for every Gemini ETHUSD Auction since the first ever Gemini ETHUSD Auction ran on July 28, 2017, in an effort to demonstrate how the WBEI behaved historically.

Format

The zip archive contains a single file³ with the following header and column values:

Header	Required?	Data type	Notes
auction_id	No	integer	When present, this value was used as the collar price for an Indicative Price or Gemini Auction final price; when absent, this value is being supplied for reference purposes.

³auction_collar_price_history.csv

scheduled_time_utc	Yes	text	ISO 8601 formatted date, UTC timezone. The time at which a Gemini Auction event ran; if auction id is empty, the time it would have run.
type_of_event	Yes	text	Indicative or Final
index_value	Yes	decimal	The index value used as the collar price for the auction event (if auction_id column is populated) or supplied for reference purposes.
index_value_calculated_at_time_utc	Yes	text	ISO 8601 formatted date, UTC timezone. The time at which the WBxI value was calculated.
symbol	Yes	text	The symbol representing the trading pair for which the index value was generated - either "BTCUSD" or "ETHUSD".

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Revision history

To be notified when this document changes, please sign up to our [mailing list](#).

Date	Notes
2017-12-20	Initial version.
2018-01-17	<ol style="list-style-type: none"> 1. Updated General Disclaimer 2. XBT Futures now links to contract specifications for settlement details
2018-06-25	Updated Current Constituents of WBBI
2018-07-16	Updated for launch of Winklevoss Blended Ethereum Index: <ol style="list-style-type: none"> 1. Updated all relevant sections, including Index Constituents and Historical Data 2. Revised General Disclaimer
2018-08-03	Update Historical Data with reference values of WBEI