November 9, 2023

Christopher J. Kirkpatrick
Secretary
Commodity Futures Trading Commission
Three Lafayette Centre
1155 21st Street, N.W.
Washington, D.C. 20581

> Re: <u>Cboe Digital Exchange, LLC Product and Rule Certification for Financially-Settled Margin Futures on Ether Submission Number CDE-2023-13E</u>

Dear Mr. Kirkpatrick:

Pursuant to Section 5c(c)(1) of the Commodity Exchange Act, as amended ("Act"), and Regulation 40.2 and Regulation 40.6 of the regulations promulgated by the Commodity Futures Trading Commission ("CFTC" or "Commission") under the Act, Cboe Digital Exchange, LLC ("CDE" or "Exchange") hereby submits terms and conditions for financially-settled Ether futures on a margined basis ("Product") to be traded on CDE and accompanying rule amendments to incorporate the Product into CDE's rules ("Amendment").

This submission contains the following:

- A summary of the terms and conditions of the Product;
- A summary of the rule changes being made as part of the Amendment to incorporate the Product into CDE's rules;
- An explanation and analysis of the Product's and the Amendment's compliance with the applicable provisions of the Act, including the Designated Contract Market ("DCM") Core Principles ("Core Principles"), and the Commission regulations thereunder;
- A certification that the Product and Amendment comply with the Act and Commission regulations thereunder;
- A certification of a notice of pending product and rule certification with the Commission and a copy of the submission on the Exchange's website;
- A copy of the Product contract specifications attached as **Exhibit A**;
- The rule changes included in the Amendment attached as **Exhibit B**; and
- A copy of the Cboe Kaiko Rates methodology attached as **Exhibit C**.

The terms and conditions for the Product and the Amendment will become effective on November 27, 2023 ("Effective Date"). The Product may be listed for trading on CDE on or after the Effective Date on a date to be announced by the Exchange through the issuance of an Exchange notice.

Product Description

As stated, the Exchange plans to list financially-settled Ether futures ("FET") on a margin basis.[1] The Exchange notes that up until recently it listed physically-settled futures contracts on Ether on a fully-funded basis, that is, they were fully-funded at the time of execution, with final settlement at execution price. The Exchange removed its offering of fully-funded Ether futures products in anticipation of launching the margined Product.

Underlying Digital Asset Market

Ethereum is likewise a decentralized, open-source protocol of a peer-to-peer payments network built using blockchain technology, and Ether is the native digital asset of the Ethereum blockchain. Blocks are created by "validators" that must stake at least 32 Ether to own the right to validate transactions. Like bitcoin, Ether is the asset that can be transferred on the network, to which one claims ownership, and no single entity owns or operates the Ethereum network as the infrastructure of the Ethereum network is collectively maintained by a decentralized user base. Unlike bitcoin, Ether is not capped at a maximum supply, but it does have a monetary policy that follows the objective of minimum issuance to secure the network. That is, the Ether monetary policy aims to reduce issuance to minimum amounts without sacrificing security. As Ethereum is a decentralized network, the monetary policy cannot be modified unless there is a majority consensus from all the stakeholders (developers, community members, ecosystem projects, validators and network participants). As of October 2023, the total supply of Ether is approximately 120.2 million Ether, which represents close to $214 billion in market capitalization.

Ether may be obtained through various methods, including paying cash for Ether or providing a good or service in exchange for Ether (including exchange on the secondary market); or verifying other Ether transactions, which rewards the validators with additional Ether, thus incentivizing more validators to stake their Ether and own the right to validate transactions in turn making the network more secure.

Since early 2019, the volume traded in Ether has experienced substantial growth. The 30-day moving average of dollar value of USD-based Ether volume has grown from $344 million in February 2019 to approximately $2.1 billion in October 2023. [2]

Contract Specifications

The Product is based on the price of Ether in U.S. dollars based on the Cboe Kaiko Ether Rate ("CKER") Index .[3] These futures are designed to reflect economic exposure related to the price of Ether. As reflected in the attached contract specifications (Exhibit A) and in

---

[1] The Exchange additionally plans to submit product certifications for and list the following margined products: physically-settled bitcoin futures ("BTC") on a margin basis; financially-settled bitcoin futures ("FBT") on a margin basis; and physically-settled Ether futures ("ETH") on a margin basis.

[2] Statistics derived from https://rates.coinmetrics.io/.

[3] The Cboe Kaiko Reference Rates are customized rates, developed by Kaiko for Cboe Digital.

revised Chapter 11 of the CDE Rulebook, the contract specifications for the Product include the following:

The contract unit for a FET futures contract will be 1 Ether, as represented by CKER, and the minimum tick increment is $0.10 per Ether (thus, $0.10 per contract). The Product prices will be quoted in USD per 1 Ether.

CDE may list up to 3 weekly expirations, the nearest 2 serial months and the nearest 4 quarterly months in the Product. Expiry will occur in the same manner as it did for fully-funded Ether futures; 10:00 a.m. CT on the Friday of the expiry week or on the last Friday of the contract month, as applicable. If expiry Friday is a non-business day, then expiration will occur on the preceding business day.

Block Trades will be permitted in the Product provided that they satisfy the requirements of CDE Rule 601 (Block Trades). Block Trades may be negotiated in $0.01 increments in the Product, as was the permissible increment for Block Trades in the Exchange's fully-funded Ether futures product offering. The Block Trade minimum size for FET futures will be 10 contracts. The minimum Block Trade parameters for FET futures are equivalent in structure to the Block Trade parameters applied to the Exchange's fully-funded Ether futures, respectively, which have the same minimum contract size, price increment and notional value as FET futures.

The position limits for the Product will be 120,000 contracts. The position limits for the Product are generally lower than the position limits imposed by other DCMs for substantively the same products.[4] The Exchange reviewed the position limits from a volume perspective as compared to volume underlying another DCM's Ether futures product. Specifically, the Exchange reviewed the volume of spot Ether transactions across the constituent exchanges that comprise the CKER as compared to the volume of spot Ether transactions in the constituent exchange that comprises the MarketVector Coinbase Ether Benchmark Rate. The MarketVector Coinbase Ether Benchmark Rate is used to settle a comparable Ether futures product on Coinbase Derivatives[5] that currently have a position limit of 400,000. The volume in the CKER was approximately 29% of the volume in the MarketVector Coinbase Ether Benchmark Rate. As such, the Exchange believes it is reasonable to set position limits that represent approximately 29% of the position limits applicable to Coinbase Ether futures.

Additionally, the Exchange notes that it is a common practice to set position limits so that

---

[4] For example, Coinbase Derivatives offers a nano Ether futures contract with a contract size of 1 and a position limit of 400,000 contracts, larger than that of FET futures. See Coinbase Derivatives Exchange Rulebook. CME also has position limits that are notionally larger than the Product's limits, offering a micro Ether futures contract with a contract size of 0.01 of CME's standard Ether futures contract and a position limit of 8,000, thus a position limit equal to a notional 400,000 Ether, compared to FET futures (size of 1 Ether x 120,000 limit).

[5] See supra note 4.

a market participant holds no more than 25% of the deliverable supply of a commodity. As stated above, the supply of Ether has no limit and the current deliverable supply of Ether is approximately 120.2 million Ether. 25% of the deliverable supply is approximately 30.1 million Ether. A position limit of 120,000 FET contracts is reasonable as it is well-below 25% of the global supply.

Finally, the Exchange analyzed any possible impact the proposed position limits could have on susceptibility to manipulation and believes the position limits in place are set at a reasonable level that does not lead to any incentive to manipulate the CKER. As described in further detail below, Cboe Kaiko Rates methodology[6] uses a volume -weighted median and time-weighted calculation on the trading activity over an hour look-back. Therefore, even if one or more of the constituent exchanges were experiencing relatively lower volume during the hour look-back leading up to the final settlement price (i.e., the CKER reference rate at 10:00 a.m. CT, as described below), any attempt to manipulate the final rate through activity in the lower-volume constituent exchange(s) would not be impactful. The volume- and time-weighted index calculation decreases the likelihood in any attempt to manipulate the price over the full period of time by limiting the impact of any one transaction and highly mitigating the risk of incorporating outliers into the calculation. As such, in order to impact the index price at expiration (i.e., the final settlement price), a significant majority of the volume across all of the constituent exchanges—not just any exchange that may be experiencing lower volume on that particular day—would have to be manipulated. Further, this would have to occur over a period of one hour. This would make any attempt at manipulation inherently very costly as arbitrage opportunities reduce any price divergences continuously over time. The proposed position limits set well-under the 25% of deliverable supply and at a limit proportional to volume/limits on another DCM will serve to further reduce, if not eliminate, any already de minimis incentive to manipulate the settlement as mitigated by the applied index methodology.

The Large Trader reporting requirements under CDE Rules 532 and 533 will apply to the Product. The Large Trader reporting threshold applicable to ETH futures is 5 contracts. The Exchange believes that the reporting thresholds appropriately correspond to the Product's size.

The Exchange will determine the final settlement price for the Product based on the reference rate of the CKER at the time of expiration (i.e., at 10:00 a.m. CT on expiration Fridays). Pursuant the Cboe Kaiko Rates methodology, the rate of the CKER at a given hour (e.g., at 10:00 a.m. CT for the final settlement price), represents the price of Ether in U.S. dollars by aggregating trade data from the eligible trading venues that comprise the CKER during a one-hour calculation window (e.g., 9:00 a.m. through 10:00 a.m. CT for the CKER rate for which the final settlement price is based).

Pursuant to Exchange Rule 906(c) and the Product's contract specification, the Product's final settlement price is based on the CKER. The CKER provides a USD-denominated reference rate for the spot price of Ether. The Cboe Kaiko Ether Rate leverages real-time prices from the constituent exchanges to provide a reliable and accurate reflection of the underlying

---

[6] Currently, the Cboe Kaiko Rates include the CKER and the Cboe Kaiko Bitcoin Rate ("CKBR").

Ether spot market. The CKER represents the price of Ether by aggregating trade data from eligible trading venues during one-hour calculation windows. Kaiko implements an aggregation methodology that consists of a look-back that splits the one-hour reference rate calculation periods into ten six-minute segments (or, "partitions") and, for each partition, calculates the most representative trade price used for the final rate calculation. Specifically, executed trades in each partition are subject to a volume-weighted median price calculation. A time-weighted average price calculation is then applied to each partition's volume-weighted median (providing more weights to the last partitions which are the most recent). The ten weighted partition prices are then aggregated to provide the final index reference rate for the hour.

Pursuant to the Cboe Kaiko Rates methodology, if for any reason any constituent transactions are identified as potentially suspect within a partition, the most representative trade may be adjusted to disregard spurious data. In addition, Kaiko may remove a constituent exchange or otherwise revise its methodology to ensure the Cboe Kaiko Rates, which includes the CKER, continue to reflect the target underlying economic reality, particularly if a constituent exchange has been found to have experience an "exclusion action" such as fraud, market manipulation, or significant loss of volume or liquidity. Further, CDE will conduct reviews of each final settlement price and, pursuant to Rule 906(c), as amended, if CDE concludes that the final settlement price based on the CKER rate at 10:00 a.m. CT does not fairly represent the market value of the period, CDE may determine an alternative settlement price, based upon, among other things, a third party or combination of third-party index or reference prices. The Exchange also notes that, pursuant to Rule 906(d), the Exchange's affiliated derivatives clearing organization ("DCO"), Cboe Clear Digital, LLC ("CCD"), through which all products, including the Product, are settled and cleared, may modify settlement prices in its discretion in accordance with CCD rules.

For the purposes of any Kaiko reference rates computation, including the Cboe Kaiko Rates, Kaiko implements strict vetting of data sources to include only the trusted and liquid exchanges. The Cboe Kaiko Ether Rate follows a quarterly rebalancing calendar (March, June, September and December). An asset-agnostic vetting process for the Cboe Kaiko Rates is carried out on a quarterly basis by the Kaiko team and approved by the Kaiko Exchange Ranking Steering Committee. Each underlying exchange must meet the following criteria as part of the vetting process: is absent from any sanction list; has been operating for the past five years; is located in a stable and open country; is regulated by an independent government body; has KYC/AML controls in place; has trading policies in place; offers reliable REST API and WebSocket data feeds; offers reliable live and historical trade data; and provides cold storage for customers funds. Additionally, the liquidity of each exchange is assessed to only consider meaningful contributors, defined as at least 0.5% of the total observed liquidity over the past three months. The observed liquidity is the 90-day volume measured for all Kaiko-vetted exchanges.[7]

---

[7] The Kaiko-vetted exchange include: Bitflyer, Binance, Bittrex, Coinbase, Coincheck, CEX.io, Currency.com, Cboe Digital, Gemini, itBit, Kraken, LMAX, Luno, OKcoin, OSL, Bitstamp, Upbit and Zalf.

A description of the procedures and rules governing the Cboe Kaiko Rates will be posted on the Kaiko website and a copy of which is provided as an informational part of this submission in **Exhibit C**.

Each of the underlying component exchanges has a comprehensive set of rules or binding terms and conditions for members. The rules or terms and conditions governing activity on each underlying exchange have provisions in place that prohibit members from engaging in fraudulent acts, market manipulation and abusive practices.[8] The Exchange understands that each underlying exchange has surveillances in place to monitor for market abuse and other trade practice violations. Additionally, each of the constituent exchanges is regulated as a money services business ("MSB') under Financial Crimes Enforcement Network ("FinCEN') and subject to strict anti-money laundering and know-your-customer ("AML/KYC Program") compliance obligations.

At the time of this submission, the Cboe Kaiko Ether Rate has four eligible trading venues: LMAX Digital, Bitstamp, itBit and Cboe Digital.[9] The Exchange represents that it has or will have entered into an Information Sharing Agreement ("ISA") that complies with CFTC guidance and requirements with each of the non-Cboe-affiliated three other constituent exchanges[10] that comprise the CKER prior to listing the Product for trading on the Exchange. Additionally, Kaiko will provide CDE the trades (by timestamp, symbol, price, quantity, and underlying exchange) that make up the Cboe Kaiko Ether Rate during final settlement price period (9:00 a.m. to 10:00 a.m. CT) to assist CDE's ability to monitor trading in the reference indices. Prior to and during the final settlement price period on the final settlement date for the Product, CDE will monitor the Ether transactions in U.S. dollars on those trading venues using the information that is available to CDE and request additional information from the

---

[8] <u>See</u> Cboe Digital Spot Market Rules available at: https://www.cboedigital.com/wp-content/uploads/CboeDigital/Cboe%20Digital%20Exchange%20Rulebook%20%2820231023%29.pdf; Itbit's Marketplace Rules available at: https://paxos.com/market-manipulation-protection/; LMAX Digital Rulebook at: www.lmaxdigital.com/documents/LMAXDigital-Rulebook.pdf; and Bitstamp's Terms of Use available at: https://www.bitstamp.net/legal/terms-of-use/inc/.

[9] The Exchange currently operates a digital asset spot market, separate from its DCM ("Cboe Digital Spot Market"). The Cboe Digital Spot Market is regulated as a money services business ("MSB') under Financial Crimes Enforcement Network (FinCEN) and is licensed in various states in accordance with state money transmitter licensing ("MTL") requirements. The Exchange implements best practices of a traditional financial market surveillance program designed around CFTC Core Principles which was established to help protect investors and the integrity of our markets. Participation in the Cboe Digital Spot Market is governed by a comprehensive Rulebook and membership requirements, and subject to substantially the same market surveillance program as for Cboe Digital's futures market. The Cboe Digital Spot Market offers trading in bitcoin (BTC) and Ether (ETH) in U.S dollars on a central limit order book ("CLOB"), which allows for continuous interactions between fully-displayed marketable orders and limit orders. Cboe Digital Exchange requires all orders placed in BTC and ETH on its spot market to be fully-funded.

[10] As Cboe Digital's spot market and futures market are part of the same legal entity, Cboe Digital Exchange, LLC, an ISA does not need to be in place to access such information.

trading venues as appropriate.

CDE conducted an analysis of the Cboe Kaiko Ether Rate prices compared to other Ether indices over the last year to determine whether the Cboe Kaiko Ether Rate is representative of the broader Ether market. Specifically, the analysis compared the Cboe Kaiko Ether Rate against the daily CME CF Ether Reference Rate[11], the weekly CoinDesk Ether Price Index rate and the Kaiko Ether Reference Rate. The CME CF Ether Reference Rate is comprised of pricing sourced from Bitstamp, Coinbase, Gemini, itBit, Kraken, and LMAX Digital; the CoinDesk Ether Price Index rate is comprised of pricing sourced from Bitstamp, Coinbase, Kraken, and LMAX Digital; and the Kaiko Ether Reference Rate is comprised of pricing sourced from Coinbase, Gemini, LMAX Digital, Kraken and Bitstamp. As such, the pricing sources that comprise the Cboe Kaiko Ether Reference Rate, the CME CF Ether Reference Rate, the CoinDesk Ether Price Index Rate and the Kaiko Ether Reference Rate are representative of the broader digital asset spot market.

CDE reviewed the correlation between the daily returns of the Cboe Kaiko Ether Rate and the CME CF Ether Reference Rate.[12] CDE identified a 0.998 correlation between the Cboe Kaiko Ether Rate and the CME CF Ether Reference Rate. A 0.998 correlation indicates the rates' prices are very strongly aligned.

CDE also reviewed the correlation between the daily returns of the Cboe Kaiko Ether Rate and the Kaiko Ether Reference Rate. CDE identified a 0.999 correlation between the Cboe Kaiko Ether Rate and the Kaiko Ether Rate. A 0.999 correlation indicates the rates' prices are very strongly aligned.

Cboe Digital also reviewed the differences between the Cboe Kaiko Ether Rate and the daily CME CF Ether Reference Rate, the weekly CoinDesk Ether Price Index rate and the hourly Kaiko Ether Reference Rate over a year look-back:[13]

- The average difference between the daily CME CF Ether Reference Rate and Cboe Kaiko Ether Reference Rate was 0.07%, and the median difference 0.04%;
- The average difference between the weekly Coindesk Indices Ether Index and Cboe Kaiko Ether Reference Rate was 0.13%, and the median 0.9%; and
- The average difference between the hourly Kaiko Ether Reference Rate and the Cboe Kaiko Ether Reference Rate was 0.02%, and the median 0.01%.

CDE's analysis demonstrates that the Cboe Kaiko Ether Rate adequately and consistently

---

[11] CME Ether futures are based on the CME CF Ether Reference Rate.

[12] The CME CF Reference Rates are published daily at 4:00 pm ET. CDE conducted this review on the daily rates at 4:00 pm ET from November 2022 through October 2023.

[13] See supra note 11 regarding CDE's review timeframe for the CME CF Reference Rates. Regarding CDE's review timeframe for the CoinDesk Index rates, CDE reviewed the CoinDesk Index rates at weekly expiration (each Friday at 10:00 am CT) from September 2022 through September 2023. Regarding CDE's review timeframe for the Kaiko Reference Rates, CDE reviewed the Kaiko Reference Rates each hour from December 2020 through October 2023.

represent the price of the Ether spot market due to high price correlation and marginal, price divergence as compared to other digital asset spot market indexes generally representative of the wider spot market. CDE notes that such marginal differences in reference prices, in particular when compared to the CoinDesk Ether Price Index rate and CME CF Ether Reference Rate, are by and large due to the differences in index methodology calculations between the different indexes.

Additionally, CDE conducted an analysis of the volume over the last year[14] during the final settlement price period (9:00 a.m. to 10:00 a.m. CT) between the Cboe Kaiko Ether Rate and the Lukka Bitcoin Reference Rate, which is used to settle comparable digital asset futures products certified for offering by another DCM and is based on prices sourced from only two exchanges.[15] CDE identified that, on average, the volume included in the Cboe Kaiko Ether Rate was 16% greater than the volume included in the Lukka Bitcoin Reference Rate.[16] This further emphasizes the fact that the Cboe Kaiko Ether Rate is representative of the broader market and the exchange constituents experience deeper levels liquidity as compared to another digital asset index on which competing futures products currently may be offered.

Additional Product Information

In addition to the above, the Exchange notes that the applicable margin methodology for the Product will be calculated and administered by CCD, the Exchange's affiliated DCO, through which all products, including the Product, are settled and cleared. A participant trading in the Products on the Exchange will be required to clear all transactions in the Product through a futures commission merchant ("FCM") clearing member of CCD.[17] Margin for the Product will be computed on a daily basis and posted daily on the Cboe Digital website.

Legal Conditions

CDE has undertaken a due diligence review of the legal conditions, including conditions that relate to contractual and intellectual property rights, which may materially affect the trading of the Product. Kaiko has granted a license to CDE permitting CDE to use the Cboe Kaiko Rates, including the CKER, for the purposes of providing settlement prices for CDE's

---

[14] From January 2022 through October 2023.

[15] MGEX's BTF Futures Contracts and TINI Futures Contacts are based on the Lukka Bitcoin Reference Rate, which is comprised only of trade prices executed on Gemini and Bitstamp.

[16] CDE notes that while the volume in the Cboe Kaiko Ether Rate and the Lukka Bitcoin Rate are measured on transactions in different spot digital assets, the volume of the transactions that comprise the Lukka Bitcoin Rate should generally represent a sufficient level of volume in a digital asset index for which a digital asset futures product may be deemed not generally susceptible to manipulation.

[17] The margin methodology implements a filtered historical simulation method for implementing value-at-risk ("FHSVaR") using a lookback period of five years (or longest available) and two-day market return and 99th percentile (0.5 percent for each tail of the distribution) risk coverage. The FHSVaR approach uses historical changes in spot bitcoin and Ether price returns to generate historical distribution and does not rely on any assumptions regarding distributional shape or distributional parameters.

futures contracts. Kaiko is permitted to use CDE data for the Cboe Kaiko Rates, and CDE also understands that Kaiko has data licensing agreements in place with the other three constituent exchanges.

Potential Product Use

As the Product's prices are derived from the Cboe Kaiko Ether Rate, which accurately reflect the underlying spot market, market participants may use the Products to achieve both long and short exposure to the price of Ether. The Product will allow validators to hedge production costs, Ether merchant processors to hedge inventories, merchants that accept Ether to hedge inventories, and holders of Ether to adequately hedge their holdings in a less capital-intensive manner than that of fully-funded futures. The Product will likewise provide liquidity providers with a less capital-intensive means to hedge their Ether exposure from their transactions on the Cboe Digital Spot Market, other exchanges, in the over-the-counter markets, and on other markets for Ether derivatives. FET futures in particular will provide market participants that do not wish to transact in or hold spot digital assets with a way to gain exposure to Ether without the need to take or make delivery of the actual digital asset.

FET futures have a 1 Ether contract size with a $0.10 price increment, respectively; finer increments and smaller contracts sizes than its physically-delivered counterpart[18] are intended to provide Customers with additional flexibility to tailor their exposure to the digital asset ecosystem without the need to hold the underlying digital assets. Price increments across the two settlement styles of the margined Ether futures that CDE plans to offer[19] complement each other while allowing for aggregation of size compared to the underlying digital assets, which typically trade at $0.01 increments.Smaller sizes and smaller price increments for FET futures will enable liquidity providers to offset risk while providing liquid quote-driven markets for the Product.

Rule Changes

The Amendment updates the Exchange rules to incorporate the Product's contract specifications, as described herein above and reflected in **Exhibit A**, into Rule 1102.[20] Specifically, the Amendment incorporates subparagraph (b) into Rule 1102, which provides for the contract specifications applicable to margin-based financially-settled Ether futures.

---

[18] The physically-settled Ether futures contract that CDE also plans to offer (ETH) has a 10 Ether contract size with a $0.50 price increment.

[19] See supra note 17.

[20] On October 27, 2023, CDE submitted a self-certification (Submission Number 2023-05E) to remove the contract specifications for fully-funded physically-settled BTC and ETH futures from Rules 1101 and 1102, respectively. Submission Number 2023-05E will become effective on November 13, 2023. Exhibit B reflects Rule 1102as amended pursuant to Submission Number 2023-05E. This rule change additionally removes the contract specs for futures on the Ether Bitcoin Pair in Rule 1103. The Exchange no longer lists, and in anticipation of its margin futures offering does not intend to re-list, these futures contracts.

Additionally, the Amendment updates the Position Limit, Position Accountability, Reportable Level, and Volume Threshold Level Table ("Table") in Rule 533 to reflect the levels applicable to the Product. Specifically, the Table is being updated to reflect the Large Trader and position limit levels for the Product as described in detail in the "Contract Specifications" section above, and to reflect a reportable volume threshold of 50 contracts applicable to the Product.[21] The Amendment also adds language to Rule 533 clarifying that such other volume threshold reportable levels than those set forth in the Table may otherwise be designated by the Commission.[22]

The Amendment also adds new Rule 540 to address temporary trading halts applicable to the Products.[23] Rule 540(a) provides that the market for a Contract (which includes the Products) will enter into a halt state for a period of time designated by the Exchange, during Trading Hours for the Contract, if a circuit breaker is triggered: the price of a bid (offer) in the Contract is higher (lower) than a percentage designated by the Exchange as compared to the highest (lowest) bid (offer) observed during the lookback window as designated by the Exchange. The Exchange shall publish the circuit breaker parameters as designated by the Exchange on its website. Further, Rule 540(b) provides that the Exchange may, in its discretion, temporarily halt trading in a Contract or modify the circuit breaker parameters, including the time of a halt state, to preserve market integrity in a Contract market. The proposed rule additionally provides that any action taken in response to an Emergency is governed by Rule 212, including notification to the CFTC of any Emergency Rule in accordance with CFTC Regulations.

Finally, the Amendment updates Rule 906 to add subparagraph (c), which explicitly provides for the Exchange's determination of the final settlement price of the Products, as defined in the "Contract Specifications" section above , as well as the Exchange's discretionary authority to determine an alternative settlement price if the Exchange concludes the final settlement price does not fairly represent the market value.[24]

Compliance

CDE believes that the Products and the Amendment are consistent with the DCM Core Principles under Section 5 of the Act. In particular, CDE believes that the Product and the Amendment are consistent with the following DCM Core Principles:

DCM Core Principle 2 (Compliance with Rules) because CDE Rules include

---

[21] Like for fully-funded Ether futures contracts previously offered by the Exchange, there are no position accountability levels applicable to the Product.

[22] For consistency and clarity, the additional language in Rule 533 will also be reflected in the rule change amendments as part of CDE's submissions for BTC, FBT, and ETH.

[23] For consistency and clarity, new Rule 540 will also be reflected in the rule change amendments as part of CDE's submissions for BTC, FBT, and ETH.

[24] For consistency and clarity, new Rule 906(c) will also be reflected in the rule change amendments as part of CDE's submissions for BTC, FBT, and ETH.

prohibitions against market manipulation and fraudulent, non-competitive, and disruptive trading practices that will apply to trading activity in the Product and CDE will conduct monitoring and surveillance of trading in the Product for compliance with CDE Rules;

DCM Core Principle 3 (Contracts not Readily Susceptible to Manipulation) because of, among other things, the following factors:

- The underlying digital asset market is a highly liquid and capitalized market, wherein the dollar value of ether volume is currently approximately $2.1 billion;
- The methodology and constituent structure of the Cboe Kaiko Ether Rate promotes the integrity of the settlement price and discourage manipulative conduct. They do so because:
  - o The Cboe Kaiko Ether Rate is calculated from a high volume of trades across four eligible trading venues during the final settlement period and, due to deep liquidity, particularly regarding the volume across CKER constituents as compared to volume across constituents that comprise a rate used to settle comparable digital asset futures products certified for offering by another DCM (as detailed above), are not generally susceptible to manipulation. As demonstrated and explained above, the Cboe Kaiko Ether Rate experiences volume during the final settlement period well-above that of the volume experienced during the final settlement period in a comparable digital asset index (comprised of only two constituent exchanges) on which competing futures products currently may be offered;[25]
  - o The Cboe Kaiko Ether Rate accurately represents the underlying spot market prices. As demonstrated and explained above, Cboe Kaiko Ether Rate adequately and consistently represents the price of the Ether spot market due to high price correlation and insignificant levels of price divergence as compared to other digital asset spot market indexes generally representative of the wider spot market;
  - o Each index is comprised of multiple constituents. Therefore, to manipulate the index price a market participant would have to manipulate the prices in most if not all the constituent exchanges—a prohibitively costly endeavor. Arbitrage opportunities across multiple digital asset trading venues serves to reduce price discrepancies and converge prices. The Exchange notes that comparable digital asset futures products certified for offering by at least one other DCM are based on rates comprised of less than four constituent exchanges;[26]
  - o Focusing the volume- and time-weighted calculations on the trading activity over an hour look-back decreases the likelihood in any attempt to manipulate the price over the full period of time by limiting the impact of any one transaction and highly mitigating the risk of incorporating outliers into the calculation. The one-hour look-back also greatly increases the cost of any

---

[25] MGEX's BTF Futures Contracts and TINI Futures Contacts are based on the Lukka Bitcoin Reference Rate, which is comprised only of trade prices executed on Gemini and Bitstamp.
[26] See supra note 24.

attempt to manipulate due to arbitrage opportunities during the calculation window;

- o The Cboe Kaiko Ether Rate is calculated using six 10-minute partitions. Calculation of the reference rate across six partitions limits any impact of attempted manipulation as transactions made in an attempt to manipulate executed during one partition will only have a limited effect on the overall reference rate;

- o Use of a volume-weighted median calculation is outlier resistant by nature. For distributions that may have outliers or may be skewed, as could be the case in an attempt to manipulate, the median is significantly less sensitive to outliers than the mean. Additionally, volume-weighting serves to reduce higher counts of smaller trades that may be outliers and could otherwise impact a non-volume weighted median;

- o As described above, Kaiko's methodology is designed to prevent outliers and minimize the impact of any one market deviating in price from the rest of the constituent markets. Particularly, to address any potential anomalies or manipulation at individual exchanges, the index provider implements measures that identify and disregard spurious data and that may remove a constituent exchange or otherwise revise its methodology in light of, but not limited to, fraud, market manipulation, or significant loss of volume or liquidity on a constituent exchange;

- o The data-sharing and ISAs in place between CDE and Kaiko and the underlying exchanges will assist CDE in monitoring for market manipulation and abuses, and in enforcing compliance with CDE rules;

- o Each of the underlying component exchanges have a comprehensive set of rules or binding terms and conditions for members that prohibit members from engaging in fraudulent acts, market manipulation and abusive practices, and surveillance in place to monitor for any such abusive practices;

- o As each constituent exchange is a registered MSB, all members of each exchange are subject to rigorous AML/KYC checks and procedures during the onboarding process;

- Pursuant to Rule 409(c), Trading Privilege Holders must make available to the Exchange any information regarding their activities in a reference market of an index on which a CDE futures product is based, which would include the Product; and

- The Product is subject to Rule 530, which governs position limits. Position limits apply to all accounts for which a person directly or indirectly owns (more than 10% ownership) or controls the trading, and all positions held by persons acting pursuant to an agreement. As described above, the position limits for the Product are substantially the same as position limits imposed for similar products on other DCMs.

DCM Core Principle 4 (Prevention of Market Disruption) because CDE Rules prohibit participants from manipulating the market in, disrupting the orderly functioning of the market in, or creating a condition in which prices do not or will not reflect fair market values in the Product, and CDE enforces compliance with such CDE Rules. Further, the Amendment implements trading halt provisions applicable to the Product, which will halt trading in the

Product during a circuit breaker event (parameters of which are determined by the Exchange and will be made available on its website), and makes it clear in the CDE Rules that the Exchange may halt trading or otherwise modify the circuit breaker parameters in its discretion in the interests of preserving market integrity, which will contribute toward reducing the potential risk of price distortions and market disruptions in the Product;

DCM Core Principle 5 (Position Limits or Accountability), as described in detail above, because the Product's contract specification and the Amendment establish an appropriate initial position limit for the Product that will serve to reduce the potential for market manipulation in the Product;

DCM Core Principle 7 (Availability of General Information) because the contract specifications for the Product will be posted and maintained on CDE's website;

DCM Core Principle 8 (Daily Publication of Trading Information) because in that volume, open interest, settlement prices, and other price information for the Product will be made available publicly on a daily basis on CDE's website consistent with CFTC Regulation 16.01;

DCM Core Principle 9 (Execution of Transactions) because CDE will make the Product available for trading on CDE's trading system. This provides for a competitive, open, and efficient market and mechanism for executing transactions that protects the price discovery process of trading on CDE's centralized market. Block trades in the Product must be submitted and reporting pursuant to the CDE block trading rules;

DCM Core Principle 10 (Trade Information) because CDE will maintain trade information for the Product as part of its audit trail and this information will be accessible to CDE Regulation for regulatory surveillance and enforcement purposes;

DCM Core Principle 11 (Financial Integrity of Transactions) because the Product will be cleared by CCD, which is registered with the Commission as a DCO and is subject to the provisions of the Act and CFTC regulations relating to DCOs;

DCM Core Principle 12 (Protection of Markets and Market Participants) because the CDE Rules include prohibitions against abusive practices, including abusive practices committed by a party acting as an agent for a participant, that will apply in relation to the Product, and promote fair and equitable trading in the Product;

DCM Core Principle 13 (Disciplinary Procedures) because CDE maintains disciplinary procedures and rules that authorize the Exchange to discipline market participants that commit CDE rule violations, including any rule violations relating to the Product;

DCM Core Principle 14 (Dispute Resolution) because the CDE Rules provide a mechanism for market participants to arbitrate disputes that arise out of transactions executed on or subject to the rules of the Exchange, including transactions in the Product;

DCM Core Principle 18 (Recordkeeping) because CDE's recordkeeping procedures, established pursuant to Commission Regulation 1.31, will apply with respect to Exchange records relating to the Product, including trade records and investigatory and disciplinary files;

DCM Core Principle 19 (Antitrust Considerations) because the listing of the Product will promote competition with digital asset futures products that are offered for trading on other markets; and

DCM Core Principle 20 (System Safeguards) because CDE maintains system safeguards controls and procedures for its operations and automated systems that will be utilized to facilitate trading in the Product.

<u>Certification</u>

CDE believes that the impact of the Product offering and the Amendment will be beneficial to the public and market participants. CDE is not aware of any substantive opposing views to the Amendment. CDE hereby certifies that the listing of the Product and the Amendment complies with the Act and the regulations thereunder. CDE further certifies that it has posted a notice of pending certification with the Commission and a copy of this submission on the Cboe Digital website (https://www.cboedigital.com/regulation/exchange-notices/) concurrent with the filing of this submission with the Commission.

Questions regarding this submission may be directed to Rebecca Tenuta at rtenuta@cboe.com or (312) 786-7570.

Sincerely,

/s/ Rebecca Tenuta

Rebecca Tenuta
Senior Counsel, Cboe Digital

EXHIBIT A

Contract Specifications

Financially-Settled Ether Futures

Description	A margin-based financially settled futures contract for ether
Contract Symbol	FET
Contract Size	1 ether, as defined by the Cboe Kaiko Ether Rate (CKER) Index
Price Quotation	USD per 1 ether
Minimum Price Increment	$0.10 per ether ($0.10 per contract) Block trades may be negotiated in $0.01 increments.
Listed Contracts	Up to 3 weekly expirations, nearest 2 serial months and nearest 4 quarterly months.
Settlement	Financially-settled. Final settlement price is determined pursuant to Rule 906(c) and based upon the Cboe Kaiko Ether Rate (CKER) Index. The final settlement price is the CKER rate published at 10:00 a.m. CT on the Last Trading Day.
Trading Days and Hours	Sunday through Friday 5:00 p.m. CT (open on previous business day) through 4:00 p.m. CT (close on trade date), unless otherwise determined by the Exchange and published in a Notice to Participants.
Daily Closing Time	4:00 p.m. CT
Last Trading Day/Time	Weekly - 10:00 a.m. CT Friday* of the expiry Week Monthly - 10:00 a.m. CT Last Friday* of the contract month * Preceding business day if day falls on a non-business day
Block Trade Minimum	10 Contracts
Position Limit	120,000 Contracts
Large Trader Reporting	25 Contracts
Collateral Withheld	Collateral required on a margin-basis. Margin requirements are published daily on the Cboe Digital website at cboedigital.com.
Forks	Support for forks in the underlying product will be evaluated in accordance with the Cboe Digital Fork Policy.

Amendments to the Cboe Clear Digital Rulebook

(All deletions are struck-through and all additions are underlined)

* * * * *

RULE 533.   Position Limit, Position Accountability, Reportable Level, and Volume Threshold Level Table

The reportable levels for all Contracts are set forth in the Position Limit, Position Accountability, Reportable Level, and Volume Threshold Level Table below. For purposes of the Large Trader Report, Contracts shall be reported according to discrete Commodity Code. The reportable level is the net long position or the net short position for each discrete Commodity Code. Pursuant to Rule 909, concurrent long and short positions must be reported to the Exchange for both sides as open positions (i.e., net long positions or net short positions). Such other volume threshold reportable levels than those set forth in the Position Limit, Position Accountability, Reportable Level, and Volume Threshold Level Table may otherwise be designated by the Commission.

Position Limit, Position Accountability, Reportable Level, and Volume Threshold Level Table:

Contract Name	Commodity Code	Reportable Futures Level for each discrete Commodity Code (Large Trader Report and Form 102A)	Position Accountability for each discrete Commodity Code	Position Limit for each discrete Commodity Code	Volume Threshold Reportable Level for each discrete Commodity Code (Form 102B)
* * * * *					
Ether ~~Bitcoin~~ Futures (financially-settled)	~~ETBT~~FET	25 contracts	N/A	~~75~~120,000	~~2~~50 contracts

* * * * *

RULE 541. Trading Halts

(a) The market for a Contract will enter into a halt state for a period of time designated by the Exchange, during Trading Hours for the Contract, if a circuit breaker is triggered: the price of a bid (offer) in the Contract is higher (lower) than a percentage designated by the Exchange as compared to the highest (lowest) bid

(offer) observed during the lookback window as designated by the Exchange. The Exchange shall publish the circuit breaker parameters as designated by the Exchange on its website.

(b) The Exchange may, in its discretion, temporarily halt trading in a Contract or modify the circuit breaker parameters, including the time of a halt state, to preserve market integrity in a Contract market. Any action taken in response to an Emergency is governed by Rule 212, including notification to the CFTC of any Emergency Rule in accordance with CFTC Regulations.

* * * * *

RULE 906. Settlement Prices

(a) The Exchange, in conjunction with the Clearing House, will determine the Settlement Price for Contracts. For each Contract, the Exchange shall publish a daily settlement price and information regarding volume, open interest and opening and closing ranges.

(b) Daily Settlement Price. Unless specified in the terms of a Contract, the daily settlement price for all Exchange Futures Contracts based on a Digital ~~Currency~~ Asset will be determined as follows:

> (1) Based on the volume weighted average price of executed trades for the ~~c~~Contract during the last ten (10) minutes of trading on each trading day, where the closing period will be broken down into two (2) distinct five (5) minute periods for which the volume weighted average price will be calculated and the average of the two (2) value weighted average prices will be the daily settlement price;

> (2) If no trades occur during the last ten (10) minutes of trading, the last trade in the Exchange's spot market during the same period for the relevant underlying Digital Currency will be used and adjusted by the difference between the previous day spot closing price and the previous day futures closing price; or

> (3) If no trade has occurred in the Exchange's spot market during this period or in the event that the Exchange concludes that the settlement price determined in accordance with the foregoing does not fairly represent the market value of the period, the Exchange may determine an alternative settlement price. Such determination may be based upon, among other things, a third party or combination of third-party index or reference prices.

(c) Final Settlement Price. Unless specified in the terms of a Contract, the final settlement price for all Exchange Futures Contracts based on a Digital Asset will be determined based on the reference rate of a third-party index, as specified in the relevant Contract specifications, published at the time of expiration. If the Exchange concludes that the final settlement price determined in accordance with the foregoing does not fairly represent the market value, the Exchange may determine an alternative settlement price. Such determination may be based upon, among other things, a third party or combination of third-party index or reference prices.

(d) Notwithstanding the foregoing, the Clearing House may modify Settlement Prices in its discretion in accordance with Clearing House Rules.

<center>* * * * *</center>

RULE 1102. Ether Futures

<center>* * * * *</center>

(b) Financially-Settled Ether Futures.

Description	*A margin-based financially settled futures contract for ether*
Contract Symbol	FET
Contract Size	1 ether. by the Cboe Kaiko Ether Rate (CKER) Index
Price Quotation	USD per 1 ether
Minimum Price Increment	$0.10 per ether ($0.10 per contract) Block trades may be negotiated in $0.01 increments
Listed Contracts	Up to 3 weekly expirations, nearest 2 serial months and nearest 4 quarterly months.
Settlement	Financially-settled. Final settlement price is determined pursuant to Rule 906(c).
Trading Days and Hours	Sunday through Friday 5:00 p.m. (open on previous business day) through 4:00 p.m. (close on trade date), unless otherwise determined by the Exchange and published in a Notice to Participants.
Daily Closing Time	4:00 p.m.
Last Trading Day/Time	Weekly - 10:00 a.m. Friday[*] of the expiry Week Monthly - 10:00 a.m. Last Friday[*] of the contract month [*] Preceding business day if day falls on a non-business day
Block Trade Minimum	10 Contracts
Position Limit	120,000 Contracts
Large Trader Reporting	25 Contracts
Collateral Withheld	Collateral required on a margin-basis. Margin requirements are published daily on the Cboe Digital website at cboedigital.com.
Forks	Support for forks in the underlying product will be evaluated in accordance with the Cboe Digital Fork Policy.

RULE 1103. ~~Ether Bitcoin Futures~~[Reserved]

Description	*A fully funded physically settled futures contract for the Ether Bitcoin Pair*
Contract Symbol	ETBT
Contract Size	1 ETH
Price Quotation	BTC equivalent of 1 ETH
Minimum Price Increment	0.00001 Bitcoin
Listed Contracts	Up to 5 Daily expirations, 3 Weekly expirations, nearest 2 serial months and nearest 2 quarterly months.
Settlement	Physical Delivery
Trading Hours	Sunday 17:00 - Friday 16:00 (CT)
Daily Closing Time	16:00 (CT)
Last Trading Day/Time	Daily - 10:00 (CT) of the expiry day Weekly - 10:00 (CT) Friday[*] of the expiry Week Monthly - 10:00 (CT) Last Friday[*] of the contract month [*] Preceding business day if day falls on a non-business day
Position Limit	75,000
Large Trade Reporting	25 Contracts
Collateral Withheld	Buyer: No. of Contracts * Contract Size * Trade Price Seller: No. of Contracts * Contract Size
Delivery	Pursuant to the Cboe Clear Digital rulebook, purchase price of the future and the underlying deliverable commodity are deposited with the Clearinghouse (in accordance with Cboe Clear Digital Rules 403 and 315) by the buyer and seller prior to the futures trade. Therefore, delivery is made through the Clearinghouse to the buyer's account. Further information about delivery can be found in Cboe Clear Digital Rule 410.
Forks	Any forks in the underlying blockchain for the digital asset will be evaluated in accordance with Exchange Rule 911.

* * * * *

Cboe Kaiko Digital Assets Rates

CONTENT

Version	Publication date	Comments
1	26/10/2023	Created

INTRODUCTION

This document describes the methodology of the Cboe Kaiko Digital Assets Rates - (together, the "Cboe Kaiko Rates"). Designed to bring greater transparency to pricing, the Cboe Kaiko Rates are solely based on executed trades from centralised exchanges.

Calculation and dissemination: All Cboe Kaiko Rates are calculated hourly.

The list of all rates can be found here:

| Rate	Kaiko Symbol	ISIN
Cboe Kaiko Bitcoin Rate	Cboe-KAIKO_BTCUSD	TBD
Cboe Kaiko Ether Rate	Cboe-KAIKO_ETHUSD	TBD

REVIEW CALENDAR

Scheduled Review and Rebalancing

Rebalancing is a scheduled, regular process designed to ensure that the Cboe Kaiko Rates are composed of the most relevant price data feeds and to ensure the Cboe Kaiko Rates continue to comply with the methodology detailed in this document, including initial vetting, liquidity and optimization requirements (in particular please refer to the Exchange Selection Model section).

All Cboe Kaiko Rates will follow the same quarterly rebalancing calendar (March, June, September and December) with cut off and effective dates structuring the data collection and processing periods followed by publication periods.

Event	Date	Description
Cut-off	Last day of the month preceding the rebalancing	Data collection for composition determination stops on that day.*
Underlying data	Second Friday of the rebalancing month	The new exchange composition with corresponding weights is available.
Effective	Monday after the third Friday of the rebalancing month	The new exchange composition becomes effective in the calculation of the rates.

For instance, if a 3-month Average Daily Traded Volume must be calculated, the covered period will start 3 months before the cut-off date and end on the cut-off date (included).

5
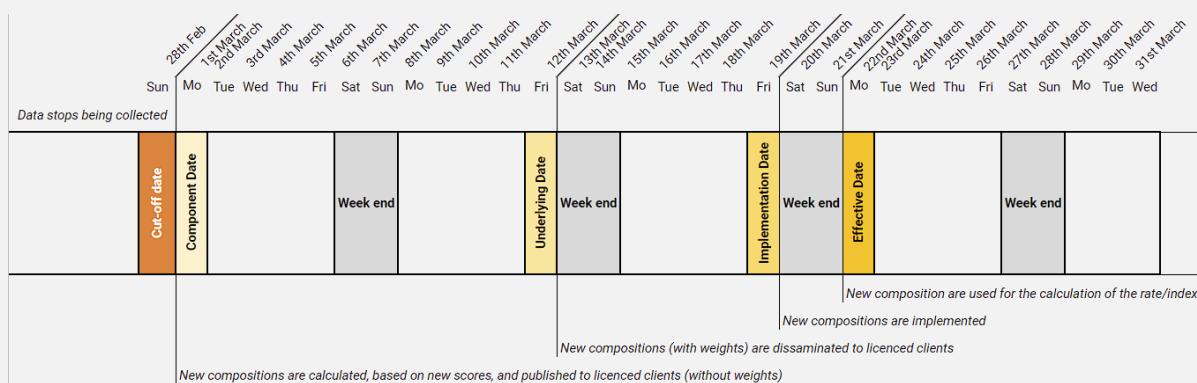
Extraordinary Review

On the basis of its qualified and expert judgement, Kaiko, in consultation with Cboe and other relevant stakeholders, reserves the right to exclude or replace an exchange selected during the Scheduled Review, or to suggest and consult on any methodology change that Kaiko considers necessary to ensure the Cboe Kaiko Rates continue to reflect the target underlying economic reality. Such a consultation could happen if, for example, an exchange has been found to experience an exclusion action including but not limited to:

- Fraud
- Market manipulation
- Significant loss of volume or liquidity

In such cases, the Kaiko Index Steering Committee will publish a consultation document, explaining its findings and any suggested methodology change. A clear timetable for the consultation will be outlined, including the proposed notice period that will be provided before the implementation of any change.

METHODOLOGY

Cboe Kaiko Rates emphasise data quality. Before any rate can be computed, each eligible exchange is screened for both quantitative and qualitative aspects. Said screenings compose a key element to ensure the reliability and authenticity of each and every rate.

Data Source

The daily price levels are based on the historical tick-by-tick trade data provided by Kaiko.

Kaiko is the leading source of cryptocurrency market data, providing businesses with industrial-grade and regulatory-compliant data. Kaiko empowers market participants with global connectivity to real-time and historical data feeds across the world's leading centralized and decentralized cryptocurrency exchanges. Kaiko's proprietary products are built to empower financial institutions and cryptocurrency businesses with solutions ranging from portfolio valuation to strategy backtesting, performance reporting, charting, analysis, indices, pre-and post-trade.

Exchange Selection Model

Markets in crypto assets are by nature highly fragmented, with hundreds or even thousands of exchanges spread over different geographical areas, each with their own regulatory framework. Each crypto asset trading platform works as an independent dark pool, and as such, official statistics and research data are rarely publicly available.

As a global digital asset market data provider, Kaiko covers more than one hundred cryptocurrency exchanges. However, not all exchanges offer the same level of standards in terms of legal and compliance frameworks, infrastructure security, liquidity, data quality or even technology.

An asset-agnostic vetting is built on [Kaiko Exchange Ranking](#) parameters. The Exchange Ranking assessment is carried out on a quarterly basis by the Kaiko team, and approved by the Kaiko Exchange Ranking Steering Committee.

Criteria	
Absent from any sanction list	Yes
Has been operating for the past	5 Years
Located in stable and open country	Yes
Regulated by an independent government body	Yes
KYC/AML controls	Strong
Trading Policies	Significant
Offers reliable REST API & WebSocket data feeds	Yes
Offers reliable live & historical trade data	Yes
Provide cold storage for customers funds	Yes

All exchanges fulfilling **all** criteria mentioned above constitute the Kaiko Vetted Exchanges List (KVEL) for the respective rates. Upon each quarterly review of the Exchange Ranking, a new associated KVEL is created. Kaiko's Exchange Ranking history goes back to January 2022. For the purposes of index and rate performance history older rebalancing periods will be associated with the January 2022 Exchange Ranking Review. Subsequent exchange selections will rely on their respective Exchange Ranking Review.

Additionally, the liquidity of each exchange in the relevant pairs is assessed to only consider meaningful contributors, defined as at least 0.5% of the total observed liquidity over the past 3 months in the relevant pair.

For the purpose of the Cboe Kaiko Rates computation, only market data coming from the following members of the KVEL are considered: Cboe Digital, LMAX, itBit and Bitstamp. In accordance with the Extraordinary Review section above, any material change to the methodology would be subject to consultation with all relevant stakeholders.

Publication Events

The Cboe Kaiko Rates are published on an hourly basis and use a fixed calculation window:

Rate	Publication Interval	Calculation Window
Cboe Kaiko Bitcoin Rate	Hourly fixings	Fixed at 3600 seconds
Cboe Kaiko Ether Rate	Hourly fixings	Fixed at 3600 seconds

Rates Calculation

The aggregation methodology consists of splitting the calculation period considered into equal size partitions and, for each of them, extracting the most representative trade whose price will be used for the final rate calculation.

All trades in the relevant pair from the relevant exchanges are pooled together and grouped into relevant time partitions. For each partition, the most representative trade is defined as the volume median one.

1. Step-by-step Methodology

- At fixing time, collect all executed trades in the calculation window (before the fixing) on all selected exchanges.
- Merge all the executed trades from the different exchanges in the same dataset sorted by prices in ascending order.
- Create K partitions of S_{part} size from the calculation window (eg. 1h calc. window with 10 partitions of 6 min).
- Each partition is then subject to a Volume Weighted Median (outlier resistant by nature). A detailed description of this aggregation method is provided below.
- A time weight is associated with each partition's volume-weighted median (more weights to the last partitions which are the most recent).
- Aggregation of those weighted prices (eg. 10 prices aggregated on 1h calc. window) to obtain the fixing price for this publication event.

2. Inputs

Symbol	Name	Description
t	Event	The timestamp at which the fixing price (FP) is calculated.
S_{wind}	Calculation Window Size	Size of the calculation period for which trades are collected and aggregated.
S_{part}	Partition Size	Size of each partition in the calculation window.
K	Number of Partitions	The number of partitions is an integer calculated as S_{wind}/S_{part}.
k	Partition Number	k_{th} partition.
I_k	Partition Trade Distribution	List of trades included in partition k and ordered by ascending price.

p_i^k	Partition Trade Price	i^{th} trade price in the k_{th} partition (price-ordered distribution).
v_i^k	Partition Trade Volume	i^{th} trade volume in the k_{th} partition (price-ordered distribution).
VWM_k	Volume-Weighted Median	Volume-weighted median of the k_{th} partition.
FP_t	Fixing Price	Fixing price (FP) at time t.

3. Volume Weighted Median

The volume-weighted median (VWM_k) is calculated as the price (p_j^k) of the jth trade where the jth trade is the trade that lies at 50% of the cumulative volume for the partition k. VWM_k is calculated for each partition in S_{wind}:

$$VWM_k = p_j^k \text{ where } j \text{ satisfies } \sum_{i=0}^{j-1} v_i^k < \frac{\sum_{i=1}^{I_k} v_i^k}{2} \text{ and } \sum_{i=j+1}^{I_k} v_i^k \le \frac{\sum_{i=1}^{I_k} v_i^k}{2}$$

$$\text{If } \exists\, j : v_j^k > \frac{\sum_{i=1}^{I_k} v_i^k}{2} \text{ then } VWM_k = p_j^k$$

$$\text{If } \exists\, j : \sum_{i=j+1}^{I_k} v_i^k = \frac{\sum_{i=1}^{I_k} v_i^k}{2} \text{ then } VWM_k = \frac{p_j^k + p_{j+1}^k}{2}$$

4. Fixing Price

The Fixing Price (FP) is calculated as a time weighted average price (TWAP) of all the VWM_k of all the K partitions. We implement a sensitivity calibration method on partitions to increase the weight of the most recent prices included in the calculation window.

First, we apply a specific weighting function in order to obtain weights which are inversely proportional to time t. It gives:

$$w_k = \frac{1}{n} \sum_{j=0}^{I_k} 1_{j \le k}$$

The weights are then normalised:

$$\overline{w_k} = \frac{w_k}{\sum_j w_j}$$

Thus, the fixing price is equal to:

$$FP_T = \sum_{k=1}^{K}(VWM_k \times \overline{w_k})$$

5. Partitioning Scheme

Each rate breaks down the window size into n partitions of equal size. Here is a summary of all the window size / partitions number combinations:

Rate	Number of partitions	Calculation Window
Cboe Kaiko Bitcoin Rate	10	Fixed at 3600 seconds
Cboe Kaiko Ether Rate	10	Fixed at 3600 seconds

6. Data Rounding

All rates are calculated with all available decimals but published with two decimals.

7. Blockchain Forks

In the event of a fork of the blockchain, the ticker used on each Constituent Exchange may be adjusted in order to represent the relevant instrument.

8. Data Gaps

Missing Data
At the time of the calculation (t), some relevant transactions may be missing for an array of reasons. If no relevant transactions are recorded on the relevant partition, the corresponding partition is excluded from the calculation and weights are adjusted accordingly. If no relevant transactions are recorded in the entire calculation window, the price is not published.

Delayed Data
If for any reason Kaiko was unable to retrieve relevant transactions at the Calculation Time, the corresponding partition is excluded from the calculation.

Spurious Data

If for any reason any transactions were identified as potentially suspect within a partition, the most representative trade may be adjusted to disregard the spurious data.