

Kaiko Reference Rates

Capital Market Rates

Equity, FX, Commodity

About Kaiko Indices

Kaiko Indices offers institutional-grade rates and indices, setting the standard for reliability and transparency in the digital asset market. As a regulated Benchmark Administrator under the EU BMR framework and compliant with IOSCO principles, we empower exchanges, asset managers, and financial institutions with trusted data solutions that support robust settlement and risk management practices.

Version History

Version	Publication Date	Comments
1.0.0	15/01/2026	Created
1.0.1	04/02/2026	Formula updated (p. 8)
1.1.0	03/04/2026	3.1. Data Sources (add new source) 3.3. Kaiko Equity & ETF Reference Rates (remove U.S., add description for HK and KR equities)
2.0.0	15/07/2026	- 2.2.6 Data Gaps / Missing data - New calculation methodology: 2.2.1, 2.2.5 - New index: 3.1.2, 3.1.3, 3.1.4, 3.2. 3.3

Table of Contents

About Kaiko Indices	2
Version History	3
Table of Contents	4
1. Introduction	5
2. Methodology	6
2.1. Data Sources	6
2.1.1. Asset Coverage	6
2.1.2. Market Data Feeds	6
2.1.3. Trading Hours and Holiday Calendars	7
2.2. Rates Calculation	8
2.2.1. Selection of Reference Futures Contract	8
2.2.2. Microprice Computation	9
2.2.3. Liquidity Weight	9
2.2.4. Rate Aggregation	10
2.2.5. Implied Spot Price Calculation	11
2.2.6. Data Gaps	12
3. Kaiko Capital Market Rates	13
3.1. Kaiko Equity Reference Rate	13
3.1.1. Spot-based rate	13
3.1.2. Perpetual Futures-based rates	16
3.1.3. Calendar Futures-based rates	17
3.1.4. Implied Spot rates with calendar futures	20
3.2. Kaiko FX Reference Rate	22
3.2.1. Spot-based rate	22
3.3. Kaiko Commodity Reference Rate	23
3.3.1. Spot-based rate	23
3.3.2. Perpetual futures-based rate	24
3.3.3. Swap-based rate	25
Disclaimer	26

1. Introduction

This document outlines the methodology of the Kaiko Reference Rates for the Kaiko Capital Market Reference Rates, covering equities, foreign exchange (FX), and commodities with spot, perpetual-futures, and calendar-futures, or other variants. The rates are designed to provide transparent, manipulation-resistant reference prices suitable for liquidation mechanisms, funding-rate calculations, margin determinations, and the settlement of derivative products requiring continuous reference pricing across global trading sessions.

Section 2 sets out the shared methodology including data sources, microprice computation, liquidity weighting, and the aggregation framework that applies to all Kaiko Capital Market Reference Rates. Section 3 then specifies, for each rate family (Equity, FX, Commodity), the data sources, trading-hour coverage, and calculation parameters used.

This document should be read in conjunction with the Kaiko Single Asset Reference Rates Benchmark Statement, available on the Kaiko website.

2. Methodology

Section 2 sets out the common methodology applicable to all Kaiko Capital Market Reference Rates, Equity, FX, and Commodity, across their spot, perpetual-futures, and calendar-futures variants. The shared framework comprises the data-source vetting principles (§2.1), the microprice and liquidity-weight definitions (§2.2.2–§2.2.3), the time-weighted volume-weighted-median aggregation (§2.2.4), and the cost-of-carry conversion used to derive spot-equivalent prices from futures inputs (§2.2.5). Rate-specific calculation steps, parameters, data sources, and trading hours are specified in Section 3.

2.1. Data Sources

2.1.1. Asset Coverage

The capital market rates provide coverage across key segments demonstrating sufficient liquidity and data quality. Coverage extends to:

- All National Market System (NMS)-listed U.S. equities and major U.S. index ETFs
- Major equities and index ETFs listed on the Hong Kong Stock Exchange (HKEX), Korea Exchange (KRX), Singapore Exchange (SGX), and Japan Exchange Group (JPX)
- Major foreign exchange and selected emerging-market currency pairs sourced from the wholesale interdealer market
- Commodities including metal and energy

The complete and current list of underlying assets covered by each Kaiko Capital Market Reference Rate is maintained by the Administrator and published at the reference URL (<https://www.kaiko.com/indices/reference-rates>.) The list constitutes the authoritative coverage record and is updated upon any change to the constituent universe.

2.1.2. Market Data Feeds

Kaiko applies continuous data-quality monitoring to validate feed integrity, including real-time checks for completeness, recency, accuracy, and anomaly detection.

2.1.2.1. Equity

The Kaiko Equity Reference Rate sources real-time, sub-second National Best Bid and Offer (NBBO) feed data across all covered exchanges. Each feed delivers continuous quote updates reflecting the most competitive bid and offer prices available on the respective venue.

2.1.2.2. Foreign Exchange

The Kaiko FX Reference Rate sources real-time order-book data from TP ICAP, a leading global interdealer broker that aggregates executable streaming prices from institutional counterparties across its electronic platforms. The feed delivers continuous Best Bid and Offer (BBO) updates for major and selected emerging-market currency pairs from the wholesale interdealer FX market, providing 24/5 coverage across the Sydney, Tokyo, London, New York trading sessions.

2.1.2.3. Commodity

The Kaiko Commodity Reference Rates source data from a combination of wholesale OTC and regulated-venue feeds, selected to provide coverage across precious metals, base metals, energy, and agricultural soft commodities:

- **Hyperliquid:** real-time trade data from Hyperliquid, a decentralized perpetual-futures venue, covering commodity-linked perpetual contracts, providing 24/7 price discovery outside the trading hours of the underlying OTC and listed-futures venues.
- **TP ICAP:** real-time spot order-book data for precious metals (gold, silver) and one-month flat-price commodity swaps for Brent, WTI, and natural gas, from the wholesale OTC interdealer market, providing 24/5 coverage in line with global market hours.

2.1.3. Trading Hours and Holiday Calendars

Trading hours and holiday calendars applicable to each rate follow the published schedule of the relevant trading venue. The underlying market calendar and trading hour data is sourced from **TradingHours.com** and is maintained by Kaiko.

2.2. Rates Calculation

The aggregation methodology consists of splitting the calculation window into equal-size time partitions and, for each of them, extracting the most representative price to use in the final rate. The methodology operates on all available data sources. The calculation proceeds in the following sequence:

- **Reference contract selection (§2.2.1):** applicable to calendar-futures-based rates only; selects the listed futures contract used as input at each calculation event and governs the roll between expiries.
- **Per-observation pricing (§2.2.2–§2.2.3):** for Best Bid and Offer (BBO) inputs, the microprice and liquidity weight are computed at each BBO update; for trade inputs, the trade price and trade volume serve as the equivalent price/weight pair.
- **Aggregation (§2.2.4):** the calculation window is partitioned; a volume-weighted median is computed per partition; partition VWMs are combined with time weights that emphasize recent partitions to produce the published rate.
- **Implied spot price calculation (§2.2.5):** applicable to calendar-futures-based rates only; the aggregated futures price is converted to a spot-equivalent reference price via the cost-of-carry relationship.
- **Data-gap handling (§2.2.6):** governs missing, delayed, and spurious data at the partition and window level.

2.2.1. Selection of Reference Futures Contract

For each eligible underlying, the Reference Contract is the listed futures contract with the nearest expiry (the “Front Contract”), determined by exchange-listed expiry date. The transition from the Front Contract to the next contract month is governed by the Roll Schedule defined per asset, with the roll completing a fixed number of business days before the expiry date of the Front Contract.

2.2.1.1. Futures Contract Rolling

As the front-month futures contract approaches maturity, Kaiko implements a gradual roll to the next contract month. The roll occurs over a predetermined period with daily weight adjustments to minimize market impact. The specific rolling period and daily weight adjustments are determined on a per-asset basis. Continuous rolling can be adopted for custom rates.

Rolling Schedule Example (2-Day Roll):

- D-2, 100% front future
- D-1, 50% front future, 50% back future
- D-day, 0% front future, 100% back future

Blended Futures Price:

$$F_t = w_0 F_t^{front} + w_1 F_t^{back}$$

Where:

- w_0 = Weight assigned to the front contract
- w_1 = Weight assigned to the back contract
- F_t^{front} = Front contract future price at time t
- F_t^{back} = Back contract future price at time t

2.2.2. Microprice Computation

A microprice is computed at each BBO update to provide a continuous estimate of the prevailing fair value. Unlike the simple mid-price, which assigns equal weight to the bid and ask quotes, the microprice accounts for the relative quoted size on each side of the order book.

$$microPrice = \frac{Bid\ Price \times Ask\ Size + Ask\ Price \times Bid\ Size}{Bid\ Size + Ask\ Size}$$

2.2.3. Liquidity Weight

For each microprice observation, a liquidity weight is assigned to represent the reliability and robustness of that observation. This weight captures the average depth available at the top of the order book, emphasizing price updates supported by stronger liquidity.

$$liquidityWeight = \frac{Bid\ Size + Ask\ Size}{2}$$

2.2.4. Rate Aggregation

The final rate is computed using a time-weighted aggregation of volume-weighted medians where, for Best Bid and Offer (BBO)-based inputs, the microprice serves as the price and the liquidity weight as the volume.

This aggregation framework stabilizes short-term noise through median-based smoothing, mitigates the influence of outliers by emphasizing central market values, remains responsive to genuine market movements via time-weighting, and enhances manipulation resistance by reducing reliance on single-point observations.

2.2.4.1. Step-by-step Methodology

Data Collection: At calculation time, end of each publication interval for real-time and at set times for daily fixings, collect all trades or calculated microprice and liquidity weight pairs from Best Bid and Offer (BBO) snapshot in the calculation window.

- **Partition Creation:** Divide the calculation window into equal time-based partitions (e.g., a 15-second calculation window divided into 5 partitions of 3 seconds each).
- **Partition-level Calculation:** Calculate the Volume-Weighted Median for each partition using liquidity weight. This method provides inherent resistance to outliers and ensures robust price representation within each time segment.
- **Time-weighting application:** Assign time-based weights to each partition's Volume-Weighted Median, with higher weights applied to more recent partitions to reflect current market conditions.
- **Final Aggregation:** Sum the time-weighted partition VWMs to produce the reference price for the publication event.

2.2.4.2. Input

- t : The timestamp at which the rate is calculated
- S_{wind} : The size of the calculation period for which trades are collected and aggregated
- S_{part} : The size of each partition in the calculation window
- K : The number of partitions, an integer calculated as S_{wind}/S_{part}
- k : k -th partition
- I_k : The list of trades included in partition k and ordered by ascending price

- p_i^k : i -th trade price in the k -th partition (price-ordered distribution)
- v_i^k : i -th trade volume in the k -th partition (price-ordered distribution)
- VWM_k : Volume-weighted median of the k -th partition
- WP_t : Window price (WP) at time t

2.2.4.3. Volume-Weighted Median

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

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

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

2.2.4.4. Final Rate

$$Rate_t = \sum_{k=1}^K \left(VWM_k \times \overline{w_k} \right) \text{ where } \overline{w_k} = \frac{w_k}{\sum_j w_j}, w_k = \frac{1}{K} \sum_{j=1}^k 1_{j \leq k}$$

2.2.5. Implied Spot Price Calculation

This step applies only to calendar futures-based rates per §2.2.1. As futures prices embed a cost-of-carry, the aggregated futures price produced in §2.2.4 is converted into a spot-equivalent reference price via the standard cash-and-carry relationship:

$$S_t = F_t * e^{-d_{close} T_t}$$

Where:

- S_t = Implied spot price at time t
- F_t = (Blended) Futures price at time t
- d_{close} = Discount rate, calculated d_t at cash session close where $d_t = \frac{1}{T_t} \ln\left(\frac{F_t}{S_t}\right)$
- T_t = Time to maturity

2.2.6. Data Gaps

Missing Data

The microprice is derived from the prevailing order book rather than from discrete trade events. In the absence of an order book update, the most recently observed best bid and offer continues to represent the market state, and the last computed microprice remains a valid estimate of fair value. The absence of a new order book event therefore does not constitute the absence of a valid price.

If no order book update is recorded in a partition, the partition is populated with the last available microprice (forward fill), and the Volume-Weighted Median of that partition equals that value. Forward-filled partitions receive their standard time weights; accordingly, prices that remain unchanged for an extended period contribute in proportion to their duration, while newly observed prices are incorporated upon arrival. This preserves the responsiveness of the rate to genuine market movements. If no relevant data are recorded in the entire calculation window and no last available microprice exists, the rate is not published for that publication event.

Delayed Data

If Kaiko is unable to retrieve relevant data at the calculation time, the corresponding partition is excluded from the calculation.

Spurious Data

If underlying data are identified as potentially suspect within a partition, such transactions may be adjusted or disregarded.

3. Kaiko Capital Market Rates

3.1. Kaiko Equity Reference Rate

3.1.1. Spot-based rate

3.1.1.1. Data Source

The equity rate sources real-time, sub-second National Best Bid and Offer (NBBO) feed data as its primary input across all covered exchanges. Each feed delivers continuous quote updates reflecting the most competitive bid and offer prices available on the respective venue, ensuring accurate and transparent representation of market activity. Kaiko implements continuous data-quality monitoring to validate feed integrity, including real-time checks for data completeness, recency, and accuracy, ensuring the reliability of the equity rate calculations.

Market	Coverage
United States	Nasdaq, New York Stock Exchange (NYSE), Blue Ocean ATS
Hong Kong	Hong Kong Stock Exchange (HKEX)
Republic of Korea	Korea Exchange (KRX)
Singapore	Singapore Exchange (SGX)
Japan	Japan Exchange Group (JPX)

3.1.1.2. Data Type

Best Bid and Offer (BBO) update

3.1.1.3. Trading Hours and Holiday Calendar

United States

To support continuous pricing suitable for derivative products, Kaiko integrates overnight U.S. equity quote data from two SEC-registered alternative trading systems (ATSs): Blue Ocean ATS (BOATS), operated by Blue Ocean Technologies, and Bruce ATS, operated by Bruce Markets LLC. Both venues offer overnight market coverage for select NMS-listed U.S. equities, delivering real-time venue-level Best Bid and Offer (BBO) updates between 8:00

PM and 4:00 AM ET across the Sunday-evening to Friday-morning trading week. Combining the two feeds increases overnight depth, redundancy, and continuity of price formation outside regular U.S. cash-equity hours and supports seamless reference-price computation across global trading sessions.

The combined feeds provide 24/5 continuous coverage from the Sunday overnight open to the Friday late-hours close, excluding weekends and U.S. equity public holidays observed by NYSE/Nasdaq. On NYSE/Nasdaq half-day sessions, Kaiko follows the corresponding SIP/ATS schedule.

Session	Hours (ET)	Data Source
Early Hours	4:00 AM – 9:30 AM	NBBO SIP
Regular Hours	9:30 AM – 4:00 PM	NBBO SIP
Late Hours	4:00 PM – 8:00 PM	NBBO SIP
Overnight Hours	8:00 PM – 4:00 AM	BOATS, Bruce ATS

Hong Kong

HKEX runs a morning and afternoon continuous session with a 1-hour midday break and a closing auction for cash equities. It follows the HKEX-published holiday calendar.

Session	Hours (HKT)	Data Source
Pre-Opening Auction	9:00 AM – 9:30 AM	HKEX
Regular Hours - Morning	9:30 AM – 12:00 PM	HKEX
Regular Hours - Afternoon	1:00 PM – 4:00 PM	HKEX
Closing Auction	4:00 PM – 4:10 PM	HKEX

Republic of Korea

KRX trades cash equities continuously with a closing call auction. It follows the KRX-published holiday calendar.

Session	Hours (KST)	Data Source
Pre-Opening Auction	8:30 AM – 9:00 AM	KRX

Regular Hours	9:00 AM – 3:20 PM	KRX
Closing Auction	3:20 PM – 3:30 PM	KRX

Singapore

The Singapore Exchange (SGX) operates the cash-equity market. The cash market trades in SGD with a midday break and a 6-minute closing auction. It follows the SGX-published cash-equity market holiday calendar.

Session	Hours (SGT)	Data Source
Pre-Opening Auction	8:30 AM – 9:00 AM	SGX
Regular Hours - Morning	9:00 AM – 12:00 PM	SGX
Regular Hours - Afternoon	1:00 PM – 5:00 PM	SGX
Closing Auction	5:00 PM – 5:06 PM	SGX

Japan

Tokyo Stock Exchange (TSE) trades cash equities in morning and afternoon sessions with a midday break and a closing auction. It follows the JPX-published holiday calendar.

Session	Hours (JST)	Data Source
Regular Hours - Morning	9:00 AM – 11:30 AM	JPX
Regular Hours - Afternoon	12:30 PM – 3:25 PM	JPX
Closing Auction	3:25 PM – 3:30 PM	JPX

3.1.1.4. Rates Calculation

The rate is calculated from order-book data using the standard aggregation framework described in §2.2.

- Compute the microprice and liquidity weight at each BBO update (§2.2.2 and §2.2.3).
- Aggregate the resulting microprice/liquidity-weight pairs (§2.2.4) using the parameters below.
 - Calculation window (S_{wind}): 15 seconds.
 - Partition size (S_{part}): 3 seconds.

3.1.2. Perpetual Futures-based rates

3.1.2.1. Data Source

The perpetual futures-based commodity rate sources real-time trade data from Hyperliquid, a decentralized perpetual-futures venue offering commodity-linked perpetual contracts. The feed delivers continuous transaction updates reflecting matched activity on the venue.

3.1.2.2. Data Type

Trades

3.1.2.3. Trading Hours and Holiday Calendars

24/7 including weekends and public holidays

3.1.2.4. Rates Calculation

The rate is calculated from order-book data using the standard aggregation framework described in §2.2.

- a. Compute the microprice and liquidity weight at each BBO update (§2.2.2 and §2.2.3).
- b. Aggregate the resulting microprice/liquidity-weight pairs (§2.2.4) using the parameters below.
 - Calculation window (S_{wind}): 15 seconds.
 - Partition size (S_{part}): 3 seconds.

3.1.3. Calendar Futures-based rates

The calendar-futures-based equity rate is applied to underlying assets whose cash-equity venues trade on a limited daily schedule, where listed calendar-futures provide additional price discovery beyond cash market hours. The rate leverages real-time Best Bid and Offer (BBO) updates from venues offering single-stock and equity-index calendar-futures contracts on the relevant underlying. Kaiko implements continuous data-quality monitoring to validate feed integrity, including real-time checks for data completeness, recency, and accuracy, ensuring the reliability of the rate calculation.

3.1.3.1. Data Source

The Kaiko Capital Market Rates produced under the calendar-futures-based methodology, together with their underlying contracts and source venues, are listed in Appendix A. The appendix is maintained by Kaiko; it is updated whenever a constituent is added, removed, or has its underlying contract or source venue changed.

3.1.3.2. Data Type

Best Bid and Offer (BBO) update

3.1.3.3. Trading Hours and Holiday Calendars

Hong Kong

The Hong Kong Stock Exchange (HKEX) runs a two-session structured derivative trading, T-day session and T+1 after-hours futures trading. It follows the HKEX-published holiday calendar.

Session	Hours (HKT)	Data Source
Regular Hours - Morning	09:15 – 12:00	HKEX
Regular Hours - Afternoon	13:00 – 16:30	HKEX
Late Hours	17:15 – 3:00 (next day)	HKEX

Republic of Korea

The Korea Exchange (KRX) runs derivatives markets with a day session and a KRX-operated after-hours night session covering U.S. trading hours. It follows the KRX-published holiday calendar.

Session	Hours (KST)	Data Source
Pre-Opening Auction	8:30 AM – 9:00 AM	KRX
Regular Hours	9:00 AM – 3:45 PM	KRX
Late Hours	6:00 PM – 5:00 AM (next day)	KRX

Singapore

Singapore Exchange (SGX) derivatives run a day session and a night session extending into an early-morning period. It follows the SGX-published holiday calendar.

Session	Hours (JST)	Data Source
Regular Hours	7:25 AM – 6:30 PM	SGX
Late Hours	6:45 PM – 5:15 AM	SGX

3.1.3.4. Rates Calculation

The rate is calculated from listed calendar-futures orderbook data.

- Select the reference futures contract for each calculation event (§2.2.1). Each contract is rolled over one business day, and the roll completes one business day before the expiry date of the Front Contract.
- Compute the microprice and liquidity weight at each BBO update on the selected contract (§2.2.2 and §2.2.3).
- Aggregate the resulting microprice/liquidity-weight pairs (§2.2.4) using the parameters below.
 - Calculation window (S_{wind}): 15 seconds.
 - Partition size (S_{part}): 3 seconds.

3.1.4. Implied Spot rates with calendar futures

The Implied Spot rate represents the spot-equivalent price implied by the calendar-futures-based rate defined in §3.1.3. Using the cost-of-carry relationship, the implied spot price is derived from the calendar-futures-based rate.

3.1.4.1. Data Source

The Kaiko Capital Market Rates produced under the calendar-futures-based methodology, together with their underlying contracts and source venues, are listed in Appendix A. The appendix is maintained by Kaiko; it is updated whenever a constituent is added, removed, or has its underlying contract or source venue changed.

3.1.4.2. Data Type

Best Bid and Offer (BBO) update

3.1.4.3. Trading Hours and Holiday Calendars

Hong Kong

The Hong Kong Stock Exchange (HKEX) runs a two-session structured derivative trading, T-day session and T+1 after-hours futures trading. It follows the HKEX-published holiday calendar.

Session	Hours (HKT)	Data Source
Regular Hours - Morning	09:15 – 12:00	HKEX
Regular Hours - Afternoon	13:00 – 16:30	HKEX
Late Hours	17:15 – 3:00 (next day)	HKEX

Republic of Korea

The Korea Exchange (KRX) runs derivatives markets with a day session and a KRX-operated after-hours night session covering U.S. trading hours. It follows the KRX-published holiday calendar.

Session	Hours (KST)	Data Source
Pre-Opening Auction	8:30 AM – 9:00 AM	KRX

Regular Hours	9:00 AM – 3:45 PM	KRX
Late Hours	6:00 PM – 5:00 AM (next day)	KRX

Singapore

Singapore Exchange (SGX) derivatives run a day session and a night session extending into an early-morning period. It follows the SGX-published holiday calendar.

Session	Hours (JST)	Data Source
Regular Hours	7:25 AM – 6:30 PM	SGX
Late Hours	6:45 PM – 5:15 AM	SGX

3.1.4.4. Rates Calculation

The rate is calculated from listed calendar-futures orderbook data.

- Select the reference futures contract for each calculation event (§2.2.1). Each contract is rolled over one business day, and the roll completes one business day before the expiry date of the Front Contract.
- Compute the microprice and liquidity weight at each BBO update on the selected contract (§2.2.2 and §2.2.3).
- Aggregate the resulting microprice/liquidity-weight pairs (§2.2.4) using the parameters below.
 - Calculation window (S_{wind}): 15 seconds.
 - Partition size (S_{part}): 3 seconds.
- Convert the aggregated futures price to a derived spot price (§2.2.5).

3.2. Kaiko FX Reference Rate

3.2.1. Spot-based rate

3.2.1.1. Data Source

The Kaiko FX Reference Rate sources real-time order book data sourced from TP ICAP as its primary data source. The feed delivers continuous Best Bid and Offer (BBO) updates including bid price and ask price reflecting the most competitive executable quotes available across the aggregated wholesale interdealer market.

3.2.1.2. Data Type

Best Bid and Offer (BBO) update

3.2.1.3. Trading Hours and Holiday Calendars

The TP ICAP feed enables continuous coverage across the major global FX trading sessions, providing 24/5 price discovery from the Sunday Sydney open to the Friday New York close, in line with standard wholesale FX market hours.

3.2.1.4. Rates Calculation

The rate is calculated from order-book data using the standard aggregation framework described in §2.2.

- a. Compute the microprice and liquidity weight at each BBO update (§2.2.2 and §2.2.3). As the TP ICAP feed delivers Best Bid and Offer (BBO) updates, bid size and ask size are treated as 1 for the microprice computation; the microprice therefore reduces to the simple mid-price and the liquidity weight is uniform across observations.
- b. Aggregate the resulting microprice/liquidity-weight pairs (§2.2.4) using the parameters below.
 - Calculation window (S_{wind}): 5 seconds.
 - Partition size (S_{part}): 5 seconds.

3.3. Kaiko Commodity Reference Rate

3.3.1. Spot-based rate

3.3.1.1. Data Source

The Kaiko Commodity Reference Rate leverages real-time order-book data sourced from TP ICAP as its primary data source. The feed delivers continuous Best Bid and Offer (BBO) updates including bid price and ask price reflecting the most competitive executable quotes available across the aggregated wholesale interdealer market.

3.3.1.2. Asset Coverage

Gold, Silver

3.3.1.3. Data Type

Best Bid and Offer (BBO) update

3.3.1.4. Trading Hours and Holiday Calendars

Wholesale OTC precious-metals trading operates broadly in line with global gold/silver market hours, providing 24/5 coverage from the Sunday Sydney open to the Friday New York close, with continuous price discovery.

3.3.1.5. Rates Calculation

The rate is calculated from order-book data using the standard aggregation framework described in §2.2.

- a. Compute the microprice and liquidity weight at each BBO update (§2.2.2 and §2.2.3). As the TP ICAP feed delivers Best Bid and Offer (BBO) updates, bid size and ask size are treated as 1 for the microprice computation; the microprice therefore reduces to the simple mid-price and the liquidity weight is uniform across observations.
- b. Aggregate the resulting microprice/liquidity-weight pairs (§2.2.4) using the parameters below.
 - Calculation window (S_{wind}): 15 seconds.
 - Partition size (S_{part}): 3 seconds.

3.3.2. Perpetual futures-based rate

3.3.2.1. Data Source

The perpetual futures-based commodity rate sources real-time trade data from Hyperliquid, a decentralized perpetual-futures venue offering commodity-linked perpetual contracts. The feed delivers continuous transaction updates reflecting matched activity on the venue.

3.3.2.2. Data Type

Trades

3.3.2.3. Trading Hours and Holiday Calendars

24/7 including weekends and public holidays

3.3.2.4. Rates Calculation

The rate is calculated from order-book data using the standard aggregation framework described in §2.2. Aggregate the resulting microprice/liquidity-weight pairs (§2.2.4) using the parameters below.

- Calculation window (S_{wind}): 15 seconds.
- Partition size (S_{part}): 3 seconds.

3.3.3. Swap-based rate

3.3.3.1. Data Source

The swap-based commodity rate leverages real-time indicative quotes for one-month flat-price commodity swaps, sourced from TP ICAP as its primary data source. The feed delivers continuous mid-price updates for the relevant underlying, reflecting indicative levels published by leading interdealer brokers across the aggregated wholesale OTC market.

3.3.3.2. Asset Coverage and Underlying data

- Brent: Flat Price Brent Swap Month # 1
- WTI: Flat Price WTI Swap Month # 1
- European Gas (TTF): TTF HI-CAL Month 1

Tenor and Roll Convention

The Month # 1 (M01) tenor designates the front contract of the relevant underlying, i.e. the listed futures contract with the nearest expiry. The quoted swap references this contract; it does not constitute a calendar-month average swap.

The M01 reference rolls to the next contract month on the first business day following the last trading day of the front contract which follows ICE Futures expiry calendar. The rate therefore reflects a contract roll on each such date, and the published series may exhibit a price discontinuity attributable to the difference between the expiring and incoming contract months.

Underlying	Last trading of the front contract	Roll timing
Brent	Last business day of the second month preceding the contract month	Month-end
WTI	Approximately the 20th calendar day of the month preceding the contract month	Mid-month
European Gas (TTF)	Two business days prior to the first calendar day of the contract month	Month-end

3.3.3.3. Data Type

Indicative mid-quote for the one-month flat-price swap on the relevant underlying.

3.3.3.4. Trading Hours and Holiday Calendars

TP ICAP publishes indicative quotes during the active wholesale broker session for the relevant commodity, broadly aligned with London and New York oil-broker hours (approximately 01:00 – 22:00 London time, Monday to Friday). The published rate reflects the most recent indicative quote available during this session.

3.3.3.5. Rates Calculation

The rate is calculated from one-month flat-price swap quote data using the standard aggregation framework described in §2.2.

- a. Compute the microprice and liquidity weight at each quote update (§2.2.2 and §2.2.3). As the TP ICAP feed delivers Best Bid and Offer (BBO) updates, bid size and ask size are treated as 1 for the microprice and liquidity weight computation.
- b. Aggregate the resulting microprice/liquidity weight pairs (§2.2.4) using the parameters below.
 - Calculation window: 15 seconds.
 - Partition size: 3 seconds.

Disclaimer

This document and all of the information contained in it, including without limitation all text, data, graphs, charts (collectively, the “Information”) is the property of Challenger Deep SAS or its subsidiaries (collectively, “Kaiko”) and is provided for informational purposes only. The Information may not be modified, reverse-engineered, reproduced or disseminated in whole or in part without prior written permission from Kaiko. All rights in the Information are reserved by Kaiko. The Information may not be used to create derivative works or to verify or correct other data or information. For example (but without limitation), the Information may not be used to create indexes, databases, risk models, analytics, software, or in connection with the issuing, offering, sponsoring, managing or marketing of any securities, portfolios, financial products or other investment vehicles utilizing or based on, linked to, tracking or otherwise derived from the Information or any other Kaiko data, information,

products or services. The user of the Information assumes the entire risk of any use it may make or permit to be made of the Information. KAIKO DOES NOT MAKE ANY EXPRESS OR IMPLIED WARRANTIES OR REPRESENTATIONS WITH RESPECT TO THE INFORMATION (OR THE RESULTS TO BE OBTAINED BY THE USE THEREOF), AND TO THE MAXIMUM EXTENT PERMITTED BY APPLICABLE LAW, KAIKO EXPRESSLY DISCLAIMS ALL IMPLIED WARRANTIES (INCLUDING, WITHOUT LIMITATION, ANY IMPLIED WARRANTIES OF ORIGINALITY, ACCURACY, TIMELINESS, NON-INFRINGEMENT, COMPLETENESS, MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE) WITH RESPECT TO ANY OF THE INFORMATION.

Third-Party Data and Trademarks. Certain Kaiko Reference Rates reference, as underlying data, listed futures contracts whose underlying indices, products, or trading venues are the property of third parties. All trademarks, service marks, trade names, and index names referenced in this document, including without limitation “MSCI” and the MSCI index names (property of MSCI Inc. and its affiliates); “Hang Seng”, “Hang Seng Index”, “HSCEI”, and “Hang Seng TECH Index” (property of Hang Seng Data Services Limited, licensed to Hang Seng Indexes Company Limited); “KRX”, “KOSPI”, “KOSPI 200”, “KOSDAQ”, “KOSDAQ 150”, and “V-KOSPI” (property of Korea Exchange, Inc.); “FTSE” and the FTSE index names (property of FTSE International Limited and/or its affiliates); “STI” and “Straits Times Index” (property of Singapore Press Holdings Limited and FTSE International Limited); “Nikkei” and “Nikkei 225” (property of Nikkei Inc.); “SORA” (property of the Monetary Authority of Singapore); and “TONA” (property of the Bank of Japan), are the property of their respective owners. Kaiko uses publicly available market data from the relevant listed venues and makes no claim of ownership in, license to, or affiliation with any such third-party marks, indices, or products. The Kaiko Reference Rates are not sponsored, endorsed, sold, promoted, issued, or in any way affiliated with the owners of the underlying indices or their respective licensors, and no such owner or licensor makes any representation or warranty, express or implied, regarding the advisability of investing in, or the results to be obtained from the use of, any Kaiko Reference Rate.