NOMURA

# Nomura Crude Oil Index: index construction rulebook

EQUITY QUANTITATIVE RESEARCH (INDEX)

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Japan index products

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### What is the Nomura Crude Oil Index?

• The Nomura Crude Oil Index is an index designed to track movements in crude oil prices.

• The index mimics the performance of investments in crude oil futures and incorporates a rollover mechanism to enable investment that tracks the index.

• From among the crude oil futures contracts traded around the world, the index includes those with high trading volumes and adequate liquidity.

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See Appendix A-1 for analyst certification, important disclosures and the status of non-US analysts.

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# 1. Overview

## 1.1 What is the Nomura Crude Oil Index?

The Nomura Crude Oil Index is an index designed to track movements in crude oil prices. The index mimics the performance of investments in crude oil futures and incorporates a rollover mechanism to enable investment that tracks the index[1]. From among the crude oil futures contracts traded around the world, the index includes those with high trading volumes and adequate liquidity. To respond to the diverse needs of investors, we provide the Nomura Crude Oil Long Index, which mimics investment performance when long positions are taken in crude oil futures, and the Nomura Crude Oil Short Index, which mimics investment performance when short positions are taken in crude oil futures.

## 1.2 Index reviews

From among the crude oil futures contracts traded around the world, the index includes those with high trading volumes and adequate liquidity. The qualification of constituent futures contracts is considered when appropriate and when changes are made to the index, the index value is made to be continuous before and after changes are made to the investment ratio among constituent futures contracts so as to maintain investable continuity of the index. Advanced notice of changes is made on the Nomura Securities website.

[1] The Nomura Crude Oil Index tracks crude oil futures prices, but diverges from the price, used by news outlets, that simply represents the futures price for the latest front-month contract. Futures contracts have expiration dates and the price used by news outlets to discuss market prices are based on the price of the futures contract with an expiration date that is closest to the current date. When the expiration date comes for a futures contract, news outlets quote the price of the next futures contract with the expiration date that is closest to the current date. If the price of the next contract is higher (lower) than the price of the expiring futures contract, the futures price quoted by news outlets appears to rise (fall) abruptly. Futures contracts have time value with the value generally being larger the further the contract is from expiry. As such, when the price switches from one contract to the next it tends to rise, instead of fall. When investing in crude oil futures contracts, investments are made in futures contracts that have expiration dates and at some point the front-month contract needs to be sold and a back-month contract needs to be bought (a process referred to as rolling over). Because the price of a contract in a further-out month tends to be higher than the price of the near-month contract, when rolling over, the volume of contracts held will tend to decline when investing with a given amount of assets. The futures price quoted by news outlets appears to jump when the front-month contract expires and is replaced by another front-month contract, but there is no change in what is being invested in, with the result that investment assets change in a way that diverges from the way the futures price quoted by news outlets changes and this divergence is attributable to the switch in front-month contracts.

# 2. Nomura Crude Oil Long Index calculation methodology

## 2.1 Definition

Tokyo business day: day on which commercial banks in Tokyo settle payments

$t$: business day on exchange specified in Figure 1

$VALUE_i(t)$: the value of funds invested in constituent $i$ for index calculation; see Figure 1 for definition of constituent $i$.

$VOLUME_i^j(t)$: the volume for index calculation purposes of $j$th contract in constituent $i$ (referred to hereafter as the $j$th contract), as calculated from the most recent contract at the beginning of the month that includes $t$

$WEIGHT_i^j(t)$: the value of funds invested in $j$th contract as proportion of value of funds invested in constituent $i$ for index calculation purposes

$PRICE_i^j(t)$: the price of $j$th contract in constituent $i$; Figure 1 gives definition of price. If for some reason the price as defined in Figure 1 cannot be used or if use of this price is considered to be extremely inappropriate, the price may be determined with reference to the price on the preceding business day on the exchange on which constituent $i$ is listed, the price of a similar commodity future, or the market traded price.

## 2.2 Calculation methodology

Nomura Crude Oil Long Index value $INDEX\_L(t)$ is calculated using the following formula.

$$INDEX\_L(t) = \sum_{i \in \text{constituent}} VALUE_i(t)$$

$$VALUE_i(t) = \sum_{j \in \text{contract month}} VOLUME_i^j(t) \times PRICE_i^j(t)$$

$$VOLUME_i^j(t) = \begin{cases} \dfrac{VALUE_i(t-1) \times WEIGHT_i^j(t)}{PRICE_i^{k_j}(t-1)} & (\text{if } t-1 \text{ is a Tokyo business day}) \\ VOLUME_i^{k_j}(t-1) & (\text{if } t-1 \text{ is not a Tokyo business day}) \end{cases}$$

$k_j$ is such that $PRICE_i^j(t)$ and $PRICE_i^{k_j}(t-1)$ refer to the same contract month. However, if $k_j$ cannot be defined, in other words, if it is not possible to refer to the same contract month[2], $VOLUME_i^j(t)$ is 0.

## 2.3 Index base date

The base date for the Nomura Crude Oil Long Index is 31 December 2008. The index value is 1,000. $VOLUME_1^2(t)$ is 22.42152466 and $VOLUME_1^j(t)$ $(j \neq 2)$ is 0, at the base date. Constituent $i$, $WEIGHT_i^j(t)$, and $PRICE_i^j(t)$ on the base date are as shown in Figure 1.

[2] For example, if a new contract is listed.

# 3. Nomura Crude Oil Short Index calculation methodology

## 3.1 Calculation methodology

Nomura Crude Oil Short Index value $INDEX\_S(t)$ is calculated using the following formula:

$$INDEX\_S(t) = \left(1 - return\ on\ Nomura\ Crude\ Oil\ Long\ Index\ (t)\right) \times INDEX\_S\ (t-1)$$

$$Return\ on\ Nomura\ Crude\ Oil\ Long\ Index\ \ (t) = \frac{INDEX\_L(t)}{INDEX\_L(t-1)} - 1$$

## 3.2 Index base date

The base date for the Nomura Crude Oil Short Index is 31 December 2008 (= 1,000).

# 4. Data on constituent futures contracts

## 4.1. Constituent futures contracts, etc

The $price\,{}_{i}^{j}(t)$ and $weight\,{}_{i}^{j}(t)$ for constituent futures contract $i$ on 31 December 2008 and beyond are as follows.

**Fig. 1: Constituent futures contracts, etc**

| $i$ | Constituent $i$ | $PRICE\,{}_{i}^{j}(t)$ | $WEIGHT\,{}_{i}^{j}(t)$ |
|---|---|---|---|
| 1 | Light Sweet Crude Oil listed on the New York Mercantile Exchange (referred to hereafter as EXCHANGE) | EXCHANGE settlement price (US$/bbl) | $\text{Weight}\,{}_{i}^{j}(t)$, depending on the date of $t$, is determined as follows.<br>1. The start of the month to which $t$ belongs – the first Tokyo trading day from the fifth EXCHANGE trading day onward:<br>$WEIGHT_1^1(\mathrm{t}) = 1.0,\ WEIGHT_1^j(\mathrm{t}) = 0\ (j > 1)$<br>2. The day after the first Tokyo trading day from the fifth EXCHANGE trading day onward – the second Tokyo trading day from the fifth EXCHANGE trading day onward (one day when the day after the first Tokyo trading day is a Tokyo trading day):<br>$WEIGHT_1^1(t) = 0.5,\ WEIGHT_1^2(t) = 0.5,$<br>$WEIGHT_1^j(\mathrm{t}) = 0\ (j > 2)$<br>3. The day after the second Tokyo trading day from the fifth EXCHANGE trading day onward – the end of the month to which $t$ belongs:<br>$WEIGHT_1^1(t) = 0,\ WEIGHT_1^2(t) = 1.0,$<br>$WEIGHT_1^j(\mathrm{t}) = 0\ (j > 2)$<br>The “day after” includes EXCHANGE and Tokyo holidays. |

Source: Nomura

# 5. Index data providers

## 5.1. Publication of index values

Nomura Crude Oil Index values are published on a Nomura webpage.

The address is

http://qr.nomuraholdings.com/en/oil/index.html.

Bloomberg

Nomura Crude Oil Long Index: NMLSCOIL Index

Quick

Nomura Crude Oil Long Index: COILL/NCI

Nomura Crude Oil Short Index: COILS/NCI

## 5.2. Data on constituent futures contracts

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# Appendix A-1

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#### STOCKS

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When bonds are purchased via public offerings, secondary distributions, or other OTC transactions with Nomura Securities, only the purchase price shall be paid, with no sales commission charged. Bonds carry the risk of losses, as prices fluctuate in line with changes in market interest rates. Bond prices may also fall below the invested principal as a result of such factors as changes in the management and financial circumstances of the issuer, or changes in third-party valuations of the bond in question. In addition, foreign currency-denominated bonds also carry the risk of losses owing to factors such as foreign exchange rate fluctuations.
When Japanese government bonds (JGBs) for individual investors are purchased via public offerings, only the purchase price shall be paid, with no sales commission charged. As a rule, JGBs for individual investors may not be sold in the first 12 months after issuance. When JGBs for individual investors are sold before maturity, an amount calculated via the following formula will be subtracted from the par value of the bond plus accrued interest: (1) for 10-year variable rate bonds, an amount equal to the two preceding coupon payments (before tax) x 0.79685 will be used, (2) for 5-year and 3-year fixed rate bonds, an amount equal to the two preceding coupon payments (before tax) x 0.79685 will be used.
When inflation-indexed JGBs are purchased via public offerings, secondary distributions (uridashi deals), or other OTC transactions with Nomura Securities, only the purchase price shall be paid, with no sales commission charged. Inflation-indexed JGBs carry the risk of losses, as prices fluctuate in line with changes in market interest rates and fluctuations in the nationwide consumer price index.The notional principal of inflation-indexed JGBs changes in line with the rate of change in nationwide CPI inflation from the time of its issuance. The amount of the coupon payment is calculated by multiplying the coupon rate by the notional principal at the time of payment. The maturity value is the amount of the notional principal when the issue becomes due. For JI17 and subsequent issues, the maturity value shall not undercut the face amount.
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Investment trusts invest mainly in securities such as Japanese and foreign equities and bonds, whose prices fluctuate. Investment trust unit prices fluctuate owing to price fluctuations in the underlying assets and to foreign exchange rate fluctuations. As such, investment trusts carry the risk of losses. Fees and risks vary by investment trust. Maximum applicable fees are subject to change; please thoroughly read the written materials provided, such as prospectuses or documents delivered before making a contract.
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