

## Nomura Crude Oil Index: index construction rulebook

EQUITY QUANTITATIVE RESEARCH (INDEX)

### 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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# 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<sup>1</sup>. 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.

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<sup>1</sup> 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.

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

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

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

$k_j$  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<sup>2</sup>,  $VOLUME_i^j(t)$  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.

<sup>2</sup> 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:

$$\begin{aligned} &INDEX\_S(t) \\ &= (1 - \text{return on Nomura Crude Oil Long Index } (t)) \\ &\times INDEX\_S(t - 1) \\ &\text{Return on Nomura Crude Oil Long Index } (t) \\ &= \frac{INDEX\_L(t)}{INDEX\_L(t - 1)} - 1 \end{aligned}$$

### 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)	<p>Weight <math>i^j(t)</math>, depending on the date of <math>t</math>, is determined as follows.</p> <ol style="list-style-type: none"> <li>The start of the month to which <math>t</math> belongs – the first Tokyo trading day from the fifth EXCHANGE trading day onward:  <math>WEIGHT_1^1(t) = 1.0, WEIGHT_1^j(t) = 0 (j &gt; 1)</math></li> <li>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):  <math>WEIGHT_1^1(t) = 0.5, WEIGHT_1^2(t) = 0.5,</math>  <math>WEIGHT_1^j(t) = 0 (j &gt; 2)</math></li> <li>The day after the second Tokyo trading day from the fifth EXCHANGE trading day onward – the end of the month to which <math>t</math> belongs:  <math>WEIGHT_1^1(t) = 0, WEIGHT_1^2(t) = 1.0,</math>  <math>WEIGHT_1^j(t) = 0 (j &gt; 2)</math></li> </ol> <p>The “day after” includes EXCHANGE and Tokyo holidays.</p>

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

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# Appendix A-1

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Transactions involving Japanese equities (including Japanese REITs, Japanese ETFs, and Japanese ETNs) are subject to a sales commission of up to 1.404% of the transaction amount (or a commission of ¥2,808 for transactions of ¥200,000 or less). When Japanese equities are purchased via OTC transactions (including offerings), only the purchase price shall be paid, with no sales commission charged. However, Nomura Securities may charge a separate fee for OTC transactions, as agreed with the customer. Japanese equities carry the risk of losses

owing to price fluctuations. Japanese REITs carry the risk of losses owing to fluctuations in price and/or earnings of underlying real estate. Japanese ETFs carry the risk of losses owing to fluctuations in the underlying indexes or other benchmarks.

Transactions involving foreign equities are subject to a domestic sales commission of up to 1.026% of the transaction amount (which equals the local transaction amount plus local fees and taxes in the case of a purchase or the local transaction amount minus local fees and taxes in the case of a sale) (for transaction amounts of ¥750,000 and below, maximum domestic sales commission is ¥7,668). Local fees and taxes in foreign financial instruments markets vary by country/territory. When foreign equities are purchased via OTC transactions (including offerings), only the purchase price shall be paid, with no sales commission charged. However, Nomura Securities may charge a separate fee for OTC transactions, as agreed with the customer. Foreign equities carry the risk of losses owing to factors such as price fluctuations and foreign exchange rate fluctuations.

Margin transactions are subject to a sales commission of up to 1.404% of the transaction amount (or a commission of ¥2,808 for transactions of ¥200,000 or less), as well as management fees and rights handling fees. In addition, long margin transactions are subject to interest on the purchase amount, while short margin transactions are subject to fees for the lending of the shares borrowed. A margin equal to at least 30% of the transaction amount and at least ¥300,000 is required. With margin transactions, an amount up to roughly 3.3x the margin may be traded. Margin transactions therefore carry the risk of losses in excess of the margin owing to share price fluctuations. For details, please thoroughly read the written materials provided, such as listed securities documents or documents delivered before making a contract.

Transactions involving convertible bonds are subject to a sales commission of up to 1.08% of the transaction amount (or a commission of ¥4,320 if this would be less than ¥4,320). When convertible bonds are purchased via OTC transactions (including offerings), only the purchase price shall be paid, with no sales commission charged. However, Nomura Securities may charge a separate fee for OTC transactions, as agreed with the customer. Convertible bonds carry the risk of losses owing to factors such as interest rate fluctuations and price fluctuations in the underlying stock. In addition, convertible bonds denominated in foreign currencies also carry the risk of losses owing to factors such as foreign exchange rate fluctuations.

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 J117 and subsequent issues, the maturity value shall not undercut the face amount. Purchases of investment trusts (and sales of some investment trusts) are subject to a purchase or sales fee of up to 5.4% of the transaction amount. Also, a direct cost that may be incurred when selling investment trusts is a fee of up to 2.0% of the unit price at the time of redemption. Indirect costs that may be incurred during the course of holding investment trusts include, for domestic investment trusts, an asset management fee (trust fee) of up to 5.4% (annualized basis) of the net assets in trust, as well as fees based on investment performance. Other indirect costs may also be incurred. For foreign investment trusts, indirect fees may be incurred during the course of holding such as investment company compensation.

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.

In interest rate swap transactions and USD/JPY basis swap transactions ("interest rate swap transactions, etc."), only the agreed transaction payments shall be made on the settlement dates. Some interest rate swap transactions, etc. may require pledging of margin collateral. In some of these cases, transaction payments may exceed the amount of collateral. There shall be no advance notification of required collateral value or collateral ratios as they vary depending on the transaction. Interest rate swap transactions, etc. carry the risk of losses owing to fluctuations in market prices in the interest rate, currency and other markets, as well as reference indices. Losses incurred as such may exceed the value of margin collateral, in which case margin calls may be triggered. In the event that both parties agree to enter a replacement (or termination) transaction, the interest rates received (paid) under the new arrangement may differ from those in the original arrangement, even if terms other than the interest rates are identical to those in the original transaction. Risks vary by transaction. Please thoroughly read the written materials provided, such as documents delivered before making a contract and disclosure statements.

In OTC transactions of credit default swaps (CDS), no sales commission will be charged. When entering into CDS transactions, the protection buyer will be required to pledge or entrust an agreed amount of margin collateral. In some of these cases, the transaction payments may exceed the amount of margin collateral. There shall be no advance notification of required collateral value or collateral ratios as they vary depending on the financial position of the protection buyer. CDS transactions carry the risk of losses owing to changes in the credit position of some or all of the referenced entities, and/or fluctuations of the interest rate market. The amount the protection buyer receives in the event that the CDS is triggered by a credit event may undercut the total amount of premiums that he/she has paid in the course of the transaction. Similarly, the amount the protection seller pays in the event of a credit event may exceed the total amount of premiums that he/she has received in the transaction. All other conditions being equal, the amount of premiums that the protection buyer pays and that received by the protection seller shall differ. In principle, CDS transactions will be limited to financial instruments business operators and qualified institutional investors.

No account fee will be charged for marketable securities or monies deposited. Transfers of equities to another securities company via the Japan Securities Depository Center are subject to a transfer fee of up to ¥10,800 per issue transferred depending on volume.

## Nomura Securities Co., Ltd.

Financial instruments firm registered with the Kanto Local Finance Bureau (registration No. 142)

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