

Index rulebook

Key features of NOMURA-BPI/Ladder

- The NOMURA-BPI/Ladder is an investment return index that reflects the performance of laddered JGBs, Japanese government bonds, which allocate equal amounts to each maturity. The NOMURA-BPI/Ladder index portfolios only cover JGBs.
- The NOMURA-BPI/Ladder is designed as a benchmark of stable durations.
- The index value calculation method and inclusion criteria of the NOMURA-BPI/Ladder are based on those of the NOMURA-BPI.
- Bonds included in the NOMURA-BPI/Ladder are reviewed monthly.

Global Markets Research

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1. Introduction

First released in November 2005, the NOMURA-BPI/Ladder was developed to reflect the performance of nominal-JGB ladder investments, with the aim to provide a benchmark with a stable duration. The index value calculation method and inclusion criteria of the NOMURA-BPI/Ladder are based on those of the NOMURA-BPI¹.

The Index Operations Dept. (IOD) in Nomura Securities Co., Ltd. (NSC) is the Administrator of the NOMURA-BPI/Ladder, and Nomura Research Institute, Ltd. (NRI) serves as the Calculation Agent. The IOD assumes the primary responsibility for the daily calculation of the bond performance indices, as well as their production and operation. Specifically, the IOD, in its role as operations manager:

- Maintains and records the index weightings of all constituents;
- Reviews the index portfolios according to the inclusion/exclusion criteria, and replaces securities in these portfolios as necessary, reflecting these changes in the performance and other indicators; reviews the index portfolio inclusion criteria;
- Announces changes in the securities included in the index portfolios, which are determined as a result of daily operations management and scheduled reviews; and
- Distributes the index portfolio performances, through either NRI's data delivery service or its own.

The NOMURA-BPI/Ladder is meant to be used as:

- A tool for determining investment policies (asset allocation strategies);
- A tool for determining investment manager structure;
- An investment management benchmark;
- A tool for portfolio management;
- An investment performance indicator; and
- A risk management tool.

¹ NOMURA-BPI[®] is a registered trademark of Nomura Securities Co., Ltd. (Registered Number: 4991073)

2. Sub-indices

The NOMURA-BPI/Ladder was initially launched in November 2005 with two indices, 10 years and 20 years, which were classified by maturity of JGBs. Subsequently, the 5 year index was added in February 2006 and the 30 year index in February 2009. Currently, it has the following four portfolio categories in terms of maturity:

- BPI/Ladder 5 years
- BPI/Ladder 10 years
- BPI/Ladder 20 years
- BPI/Ladder 30 years

2.1 Sub-Index portfolios by term to maturity

The NOMURA-BPI/Ladder has sub-index portfolios categorized by term to maturity as of the end of each month and calculates their performance indices and portfolio indicators (Figure 1).

The sub-index portfolios are determined based on term to maturity as of the last day of the month. Once determined, the classification remains unchanged throughout the month.

Fig. 1: Sub-index portfolio classification by term to maturity

Classification	Term to maturity
Short-term (0-3yrs)	0yrs or more and less than 3yrs
Medium-term (3-7yrs)	3yrs or more and less than 7yrs
Long-term (7yrs-)	7yrs or more
Long-term (7-11yrs)	7yr or more and less than 11yrs
Super long-term (11yrs-)	11yrs or more
Super long-term (11-15yrs)	11yrs or more and less than 15yrs
Super long-term (15yrs-)	15yrs or more

Source: NSC

3. Scheduled portfolio reconstitution

The IOD reviews and reconstitutes the NOMURA-BPI/Ladder portfolios every month. Next month's portfolios are determined on the portfolio determination day of each month.

3.1 Scheduled reconstitution date

NOMURA-BPI/Ladder portfolios are reconstituted on the first business day of the month (scheduled reconstitution date), with the inclusion/exclusion implemented after the bond market closes on the business day before the scheduled reconstitution date.

3.2 Portfolio determination date

In principle, next month's portfolio determination date is one of the following dates, whichever is the earlier:

- The business day after the 25th day of the month
- The three business days before the last business day of the month

However, the portfolio determination date may be changed if a JGB auction that may have a non-negligible impact is held between the day after the determination date and the last day of the month. Any such changes will be announced in advance.

3.3 Scheduled reconstitution base date

Next month's portfolio is determined on the day before the portfolio determination date based on disclosed information available as of the scheduled reconstitution base date.

3.4 Portfolio reconstitution announcement

Information about scheduled portfolio reconstitution is announced through NRI's data delivery service and other media, except in cases where definite information on new portfolios is unavailable due to unexpected circumstances.

4. Portfolio inclusion/exclusion method

4.1 Portfolio inclusion criteria for next month

The NOMURA-BPI/Ladder incorporates all securities that meet the inclusion criteria as of the scheduled portfolio reconstitution base date into the following month's index portfolios.

Fig. 2: NOMURA-BPI/Ladder inclusion criteria for all

Coupon	Fixed
Issue date	Issues until the portfolio determination date ²
Term to maturity	None (all bonds are held until maturity)

Source: NSC

Fig. 3: NOMURA-BPI/Ladder inclusion criteria as for each index

BPI/Ladder 5yrs	Include 5-years JGBs maturing in March, June, September and December which is issued the earliest in each maturity.
BPI/Ladder 10yrs	Include 10-years JGBs maturing in March, June, September and December which is issued the earliest in each maturity.
BPI/Ladder 20yrs	Include 20-years JGBs ³ maturing in September which is issued the earliest in each maturity.
BPI/Ladder 30yrs	Include 30-years JGBs ⁴ which is issued the earliest in each term classified into H1(Apr.-Sep.) and H2(Oct.-Mar.)

Source: NSC

4.2 Face value amount for inclusion

Each index portfolio includes constant amount for each issue (JPY10bn).

4.3 inclusion timing

The index portfolio includes the first-issued JGB of all eligible bonds in each of the designated periods.

If there is no eligible issue suitable to be included for the month following any constituent reaching maturity, no issue will be added to the index portfolio until there is a new issue eligible for inclusion. This means the number of issues included in the index portfolios is not necessarily consistent. Figure 3 shows how the number of NOMURA-BPI/Ladder 30yr constituents can vary due to a lack of eligible JGBs.

² This rule was introduced at the May 2018 portfolio determination (implemented on 24 April 2018). Previously, JGB issues until the last day of the month of the portfolio determination date were eligible for the following month's index portfolio inclusion.

³ Although the portfolio was designed to consist of only 20yr JGBs, portfolios prior to September 2006 have substituted 10yr JGBs for bonds whose life was shorter than 20yr JGB number 2.

⁴ Although the portfolio was designed to consist of only 30yr JGBs, portfolios prior to March 2010 have substituted 10yr and 20yr JGBs for bonds whose life was shorter than 30yrs JGB number 1, and those after the April 2010 portfolio likewise substitute 20yr JGBs.

6. Calculating index value and return

6.1 Method for calculating index

6.1.1 Total investment return index (Total index)

This is an index of investment return including capital and income gains. Assuming the index portfolio was purchased on the last business day of the previous month at a value including accrued interest, coupon payments and redemptions are added to the market value amount (including accrued interest), and this is announced as the index value for the day. All coupon payments and redemptions are assumed to be received in cash without interest on the day they are made, and reinvested at the following portfolio reconstitution. Coupon payments made on weekends and holidays are assumed to be made on the following business days.

$$TI_{(today)} = TI_{(e.l.m)} \times \frac{MVLt_{(today)} + CF_{(e.l.m,today)}}{MVLt_{(e.l.m)}}$$

Where $MVLt_{(i)} = P_{(i)} \times Amount_{(i)} \times \frac{1}{100}$.

$TI_{(today)}$: Total index value, today
$TI_{(e.l.m)}$: Total index value, the last business day of the previous month
$MVLt_{(today)}$: Market value amount (including accrued interest) of index portfolio, today
$MVLt_{(e.l.m)}$: Market value amount (including accrued interest) of index portfolio, the last business day of the previous month
$CF_{(e.l.m,today)}$: Total income gains and redemptions paid from the last business day of the previous month through today
	: "Dirty price" at point i
$Amount_{(i)}$: Outstanding face value at point i

6.1.2 Capital investment return index (Capital index)

This is an index of investment return in terms of capital gains. Assuming the index portfolio was purchased on the last business day of the previous month at the "dirty price", redemptions that have occurred through the valuation date are added to the market value amount (excluding accrued interest), and this is announced as the index value for the day. All redemptions are assumed to be received in cash without interest on the day they are made, and reinvested at the following portfolio reconstitution.

$$CI_{(today)} = CI_{(e.l.m)} \times \left(1 + \frac{MVLc_{(today)} - MVLc_{(e.l.m)} + RD_{(e.l.m,today)}}{MVLt_{(e.l.m)}} \right)$$

Where $MVLc_{(i)} = SP_{(i)} \times Amount_{(i)} \times \frac{1}{100}$.

$CI_{(today)}$: Capital index value, today
$CI_{(e.l.m)}$: Capital index value, the last business day of the previous month
$MVLc_{(today)}$: Market value amount (excluding accrued interest) of index portfolio, today
$MVLc_{(e.l.m)}$: Market value amount (excluding accrued interest) of index portfolio, the last business day of the previous month
$MVLt_{(e.l.m)}$: Market value amount (including accrued interest) of index portfolio, the last business day of the previous month
$RD_{(e.l.m,today)}$: Mid-term redemptions arising from the last business day of the previous month through today
$SP_{(i)}$: Clean price at point i
$Amount_{(i)}$: Outstanding face value at point i

6.2 Return

6.2.1 Total return (annualized)

$$RT_{(m,n)} = \left(\frac{TI(n)}{TI(m)} - 1 \right) \times \frac{365}{\Delta t_D}$$

Point m is assumed to precede point n in a given timeline.

$RT_{(m,n)}$: Total return from point m through point n

$TI(i)$: Total index value at point i

$\Delta t_D (> 0)$: Days between point m and point n (not counting in the settlement date)

6.2.2 Capital return (annualized)

$$RC_{(m,n)} = \left(\frac{CI(n)}{CI(m)} - 1 \right) \times \frac{365}{\Delta t_D}$$

Point m is assumed to precede point n in a given timeline.

$RC_{(m,n)}$: Capital return from point m through point n

$CI(i)$: Capital investment index return index at point i

$\Delta t_D (> 0)$: Days between point m and point n (not counting in the settlement date)

6.2.3 Income return (annualized)

$$RI(m, n) = RT(m, n) - RC(m, n)$$

Point m is assumed to precede point n in a given timeline.

$RI_{(m,n)}$: Income return from point m through point n

$RT_{(m,n)}$: Total return from point m through point n

$RC_{(m,n)}$: Capital return from point m through point n

6.3 Reference for obtaining market data

The NOMURA-BPI/Ladder references bond market pricing data for the marked-to-market valuation of the index portfolios (listed in descending order of priority):

- JS Price
- Nomura price

These values are provided on a settlement-day basis, and should be converted to trade-day basis for use as reference in calculating portfolio and performance indicators.

JS Price is evaluated and calculated by Nomura Securities Co., Ltd. and later examined by Nikkei Inc., Financial Technology Research Institute Inc. and Nomura Research Institute, Ltd. JS Prices are reliable for a variety of purposes, including mark-to-market accounting. JS Prices are calculated by the reasonable and consistent methodology with passing through the process which examines validations to detect relative/absolute outlier by the methodology designed by Nikkei Inc., Financial Technology Research Institute Inc., Nomura Research Institute, Ltd., and Nomura Securities Co., Ltd.

Besides, JS Price lists more than 12,000 bonds in total (mainly publicly offered and private placement domestic bonds) and covers almost 100% of index portfolios. In addition, JS Price offers daily prices with good continuity.

NSC dealers in the front office trading desk at Global Market Division value Nomura prices for its own daily valuation process, and the NSC is one of the key financial instruments firms in the yen bond market, and is actively engaged in transactions with other financial instruments firms and its clients. For this reason, NSC is on a good position to obtain traded prices and/or quotations in the secondary market.

6.4 Data released and base date of each index

Base dates and publication start dates of the indices belonging to the NOMURA-BPI/Ladder are as follows:

Fig. 5: Base date of each index

Index	Base date (= Base index value)	Publication start date
BPI/Ladder 10yrs	27 Dec 1986 (= 100)	Nov 2005
BPI/Ladder 20yrs	30 Dec 1996 (= 100)	Nov 2005
BPI/Ladder 5yrs	30 Dec 2004 (= 100)	Feb 2006
BPI/Ladder 30yrs	30 Dec 2008 (= 100)	Feb 2009

Source: NSC

7. Definition of NOMURA-BPI/Ladder indicators

7.1 Definition of issue-specific return-risk indicators

In the NOMURA-BPI/Ladder, the issue-specific risk-return indicators are defined as described below. Note that redeemed issues are not considered in calculating risk-return indicators.

- Current yield

$$CY = \frac{Cpn \times FV}{SP}$$

<i>CY</i>	: Current yield (%)
<i>SP</i>	: Clean price
<i>Cpn</i>	: Coupon rate (%)
<i>FV</i>	: Face value(JPY100)

- Simple yield

$$SY = \frac{Cpn + \frac{FV - SP}{Yr}}{SP} \times 100$$

<i>SY</i>	: Simple yield (%)
<i>SP</i>	: Clean price
<i>Cpn</i>	: Coupon rate (%)
<i>FV</i>	: Face value(JPY100)
<i>Yr</i>	: Term to maturity (scheduled redemption)

- Compound yield

Multiple r (%) fit formula below:

$$P = \sum_i CF_i \times \left(1 + \frac{r}{100} \times \frac{1}{2}\right)^{-2t_i}$$

<i>P</i>	: Dirty price
<i>r</i>	: Compound yield (%)
CF_i	: i th future cash flow
t_i	: Number of years until CF_i occurs

Future cash flow CF_i includes principal and interest payments (unless otherwise specified)

- T-spread

$$Tspd = r - \bar{r}$$

Assume \bar{P} is the dirty price of a JGB issue that has the same cash flow as the one for which Tspd is calculated:

$$\bar{P} = \sum_i CF_i \times DF(t_i)$$

Calculate \bar{r} (compound yield) for \bar{P} as:

$$\bar{P} = \sum_i CF_i \times \left(1 + \frac{\bar{r}}{100} \times \frac{1}{2}\right)^{-2t_i}$$

- CF_i : i th future cash flow
 $DF(t_i)$: Discount coefficient at point t_i^5
 t_i : Number of years until CF_i occurs

- Duration

$$D = \sum_i \frac{CF_i \times \left(1 + \frac{r}{100} \times \frac{1}{2}\right)^{-2t_i} \times t_i}{P}$$

- D : Duration
 r : Compound yield (%)
 CF_i : i th future cash flow
 t_i : Number of years until CF_i occurs
 P : Dirty price

- Modified duration

$$mD = \frac{D}{1 + \frac{r}{100} \times \frac{1}{2}} \left(= -\frac{1}{P} \frac{dP}{dr} \right)$$

- mD : Modified duration
 D : Duration
 r : Compound yield (%)
 P : Dirty price

⁵The JGB discount factor is calculated using the NOMURA Par Yield Model.

- Convexity

$$CV = \sum_i \frac{CF_i \times \left(1 + \frac{r}{100} \times \frac{1}{2}\right)^{-2t_i - 2} \times t_i \times \left(t_i + \frac{1}{2}\right)}{P} \quad \left(= -\frac{1}{P} \frac{d^2P}{dr^2}\right)$$

CV	:	Convexity
CF_i	:	i th future cash flow
t_i	:	Number of years until CF_i occurs
r	:	Compound yield (%)
P	:	Dirty price

- Effective duration, effective convexity

$$EffD = \frac{1}{P} \sum_i t_i \times CF_i \times DF(t_i) \times \exp(-\alpha t_i)$$

$$EffCV = \frac{1}{P} \sum_i t_i^2 \times CF_i \times DF(t_i) \times \exp(-\alpha t_i)$$

Where α (yield curve spread) satisfies the following formula

$$P = \sum_i CF_i \times DF(t_i) \times \exp(-\alpha t_i)$$

$EffD$:	Effective duration
$EffCV$:	Effective convexity
CF_i	:	i th future cash flow
$DF(t_i)$:	Discount coefficient at point t_i^6
t_i	:	Number of years until CF_i occurs
P	:	Dirty price

⁶ The JGB discount factor is calculated using the NOMURA Par Yield Model.

• Calculating indicators for issues less than half a year to maturity

The method for calculating simple and compound yields in the NOMURA-BPI may lead to a discrepancy between the two for issues with less than half a year to maturity⁷. This becomes particularly apparent as it approaches maturity. As the market convention, JGBs are traded on a simple yield basis. Hence, compound yields for bonds nearing maturity may differ significantly from their simple yield and may not match actual market levels.

The NOMURA-BPI, which does not contain issues with less than half a year to maturity, does not suffer from the problem described above. However, the NOMURA-BPI/Ladder which holds all issues until maturity, will face such a discrepancy. To address this, simple yields are used for issues with a term to maturity of less than a half year. Duration and other risk measures are calculated by the formulas below, where SY represents simple yield and Yr is term to maturity.

Duration: $D = Yr$

Modified duration: $mD = \frac{Yr}{1+SY \times Yr}$

Convexity: $CV = 2 \times mD^2$

Effective duration: $EffD = Yr$

Effective convexity: $EffCV = EffD^2$

Please also note that T-spreads are not calculated for issues that are so close to maturity since the spread is calculated based on compound yields.

⁷ More precisely, issues with only one future cash flow, a payment at maturity. In case of semi-annual payment bonds, this means its term to maturity becomes shorter than half a year.

7.2 Definition of portfolio indicators

Portfolio indicators are calculated using the issue-specific indicators of all issues in the index portfolio. The weighted average is used in the calculation, as shown in Figure 5.

Fig. 6: Portfolio indicator calculation method

Indicator	Calculation method
Coupon rate Terms to maturity (scheduled redemption) Market value amount (including accrued interest) Market value amount (excluding accrued interest)	Outstanding face value amount weighted average
Current yield Simple yield Compound yield <i>T-spread</i> ⁸	Market value amount (excluding accrued interest) weighted average
Duration Modified duration Convexity Effective duration Effective convexity	Market value amount (including accrued interest) weighted average

Source: NSC

⁸ As noted in "Calculating indicators for JGB issues with six months or less remaining maturity," T-spreads are not calculated for issues with six months or less to maturity. This means T-spreads are calculated by weighted-averaging index portfolios excluding these short-dated issues.

Appendix: Data delivery services

Data on performance indices, such as the total investment return index, and portfolio indicators are available from the following sources:

NOMURA-BPI/Ladder data providers

- Nomura Securities' Securities Market Benchmarks' website

<http://qr.nomura.co.jp/bpil/index.html> (Japanese page)

- Quick

NRIJ001 NOMURA Indices guidance

NRIJ120-NRIJ123 NOMURA-BPI/Ladder

- Nomura Research Institute Integrated Data Services (IDS)

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Contact for further inquiries

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See the following link for details:

<http://gr.nomura.co.jp/en/guides/index.html>

- Index Calculation Policy
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- Glossary (Fixed Income)
- Index Governance Framework
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Appendix A-1

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- Technical factors such as regulatory changes, changes to risk appetite in the market, unexpected rating actions, primary market activity and supply/ demand considerations.

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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 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.

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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.

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