NOMURA

NOMURA-BPI/Ladder Index Rulebook

CROSS-ASSET

Global Markets Research

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Research analysts

Japan Bond Indices

Index Operations Dept. - NSC
idx_mgr@jp.nomura.com
+81 3 6703 3986

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.

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

Contents

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 of providing a benchmark whose duration is stable. The index value calculation method and inclusion criteria of the NOMURA-BPI/Ladder are based on those of the NOMURA-BPI[1].

Nomura Securities' Index Operation Dept. (IOD) is the Administrator of the NOMURA-BPI/Ladder, and Nomura Research Institute (NRI) serves as the Calculation Agent. The IOD assumes the primary responsibility for the daily calculation of the bond performance indices, 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. Sector Classification

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

Nomura Securities' 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 criteria

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

Security type	BPI/Ladder 5yrs:	5-year JGBs
	BPI/Ladder 10yrs:	10-year JGBs
	BPI/Ladder 20yrs:	20-year JGBs[2]
	BPI/Ladder 30yrs:	30-year JGBs[3]
Coupon	Fixed	
Issue date	Issues until the portfolio determination date[4]	
Term to maturity	None (all bonds are held until maturity)	
Inclusion timing	One month following issuance	
Eligible issues	BPI/Ladder 5yrs:	Issues maturing in Mar, Jun, Sep and Dec of each year
	BPI/Ladder 10yrs:	Issues maturing in Mar, Jun, Sep and Dec of each year
	BPI/Ladder 20yrs:	Issues maturing in Sep of each year
	BPI/Ladder 30yrs:	Issues maturing in H1(Apr-Sep) and H2 (Oct-Mar) of each year[5]
Face value amount for inclusion	Constant amount for each issue (JPY10 billion)	

Source: NSC

[2] 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.

[3] 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.

[4] 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.

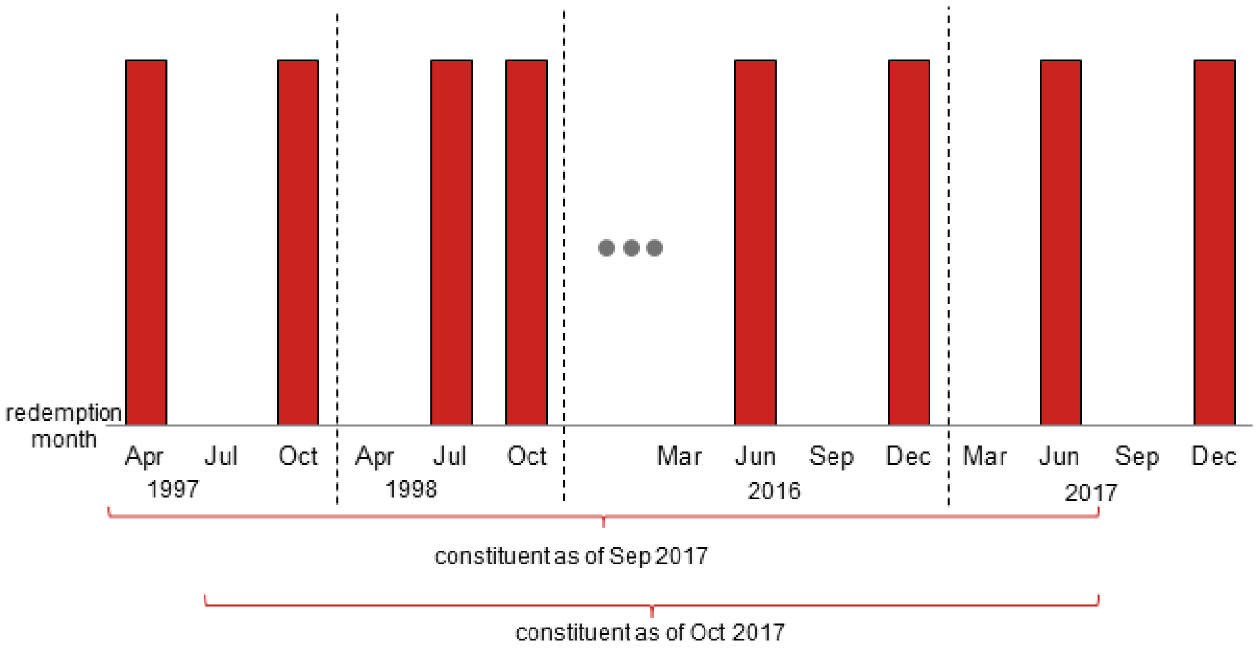
[5] For each period, including on a first-issued-first-included basis.

4.1.1 Eligible issues

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.

Fig. 3: Example of number variation of the NOMURA-BPI/Ladder 30yr constituents



Source: NSC

4.1.2 Other potential for inclusion

If an event that is material in terms of portfolio inclusion occurs after the portfolio determination date, the issue in question may be included in the next month's portfolio. Any such change would be announced in advance.

5. Unscheduled portfolio reconstitution

In principle, index portfolios, as determined on the portfolio determination date, will remain unchanged until the last business day of the month following the portfolio determination date. However, these portfolios may be subject to an unscheduled reconstitution, which will be implemented on a predetermined date, if a material event occurs which affects any of the JGBs included.

5.1 Announcement of unscheduled portfolio reconstitution

Information about unscheduled portfolio reconstitution is announced through NRI's data delivery service, except in cases where definite information on such a change is unavailable until it actually takes place due to unexpected circumstances.

6. Calculating index value and return

6.1 Method for calculating index

6.1.1 Total investment return index (Total index)

This is the index of total investment return during a given period, including capital and income gains. Assuming that 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
$P_{(i)}$	:	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 during a given period in terms of capital gains. Assuming that 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)

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

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[6]
- Nomura Securities final mid-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.

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. 4: 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

[6] Bond market data provided jointly by the Nikkei Inc., Financial Technology Research Institute Inc., Nomura Research Institute, Ltd. and Nomura Securities Co., Ltd. Data are intended primarily for use as reference in marked-to-market valuation of bond portfolios.

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

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

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

- Simple yield

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

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

- Compound yield

Multiple *r* (%) fit formula below:

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

P	:	Dirty price
r	:	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

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

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

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

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

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

CF_i	:	*i* th future cash flow
$DF(t_i)$	:	Discount coefficient at point *ti*[7]
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

[7] The 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

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

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

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 *ti*[8]
t_i	:	Number of years until CF_i occurs
P	:	Dirty price

[8] 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 maturity[9]. 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: $\mathrm{m}D = \frac{Yr}{1+SY\times Yr}$

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.

[9] 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. 5: 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 *T-spread*[10]	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

[10] 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.

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/jp/bpil/index.html (Japanese page)

- Quick

NRIJ001	NOMURA Indices guidance
NRIJ120-NRIJ123	NOMURA-BPI/Ladder

- Nomura Research Institute Integrated Data Services (IDS)

+81-45-613-7200

ids-sales@nri.co.jp

Contact for further inquiries

For inquiries on the use of NOMURA-BPI/Ladder as an investment benchmark, please see the contact details below:

Nomura Securities Co., Ltd

Global Research Division, Financial Engineering & Technology Research Center

Index Operations Dept.

Tel：+81-3-6703-3986

e-mail ：bpi@jp.nomura.com

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Appendix A-1

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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.
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.
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.
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