JULY 2022

iSTOXX® BOND INDEX GUIDE

Creating an Investment Intelligence Advantage

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CONTENTS

1. INTRODUCTION TO THE STOXX INDEX GUIDES

The STOXX index guides are separated into the following sub-sets:

- The **STOXX Calculation guide** provides a general overview of the calculation of the STOXX equity indices, the dissemination, the index formulas and adjustments due to corporate actions
- The **STOXX Index Methodology guide** contains the equity index specific rules regarding the construction and derivation of the portfolio based indices, the individual component selection process and weighting schemes
- The **STOXX World Equity Index Methodology guide** contains the index specific rules regarding the construction and derivation of the STOXX World portfolio based indices, the individual component selection process and weighting schemes
- The **STOXX Strategy Index guide** contains the formulas and description of all strategy indices
- The **STOXX DVP Calculation guide** describes the dividend points products
- The **STOXX Distribution Points Calculation guide** describes the distribution points products
- The **STOXX ESG Index Methodology guide** contains the index specific rules regarding the construction and derivation of the ESG indices, the individual component selection process and weighting schemes
- The **iSTOXX Methodology guide** contains the index specific rules regarding the construction and derivation of the iSTOXX indices, the individual component selection process and weighting schemes
- The **STOXX Reference Rates guide** contains the rules and methodologies of the reference rate indices
- The **STOXX Reference Calculations guide** provides a detailed view of definitions and formulas of the calculations as utilized in the reports, factsheets, indices and presentations produced by STOXX
- The **STOXX Bond Index guide** contains the bond index specific rules regarding the construction of the bond indices, the individual component selection process, weighting schemes and overview of the index and bond analytics formulas
- The **STOXX Currency Rates Indices Methodology guide** contains the index specific rules regarding the construction and calculation of the derivation of the STOXX FX Rolling Spot Mid Rate and STOXX FX Rolling Spot Tomorrow Next Open Rate indices
- The **iSTOXX Bond Index guide** contains the bond index specific rules regarding the construction and derivation of the bond indices, the individual component selection process, weighting schemes and overview of the index and bond analytics formulas
- The **Guide to Industry Classifications Used By STOXX** contains general information pertaining to industry classifications used in STOXX indices, together with any references and links to third-parties that create the data.

All rule books are available for download on http://www.stoxx.com/indices/rulebooks.html

2. CHANGES TO THE INDEX GUIDE

2.1. HISTORY OF CHANGES TO THE STOXX BOND INDEX GUIDE

» Apr. 11, 2018: Launch of iSTOXX RiskFirst LDI Bond index family
» March 16, 2021: Clarification of section 4.3.2.2 Bond Prices
» December 1, 2021: Transition from GBP LIBOR to the Sterling Overnight Index-Average (SONIA); adjustments to the formulas, allowing for application of interest rates compounded in-arrears; formatting changes to the legend table for the Total Return Index
» July 12, 2022: Section 1 updated with new guides

3. GENERAL PRINCIPLES

3.1. INDEX RATIONALE

STOXX defines the index rationale as the basis for applying a certain methodology in order to achieve the index objective. STOXX performs intensive research and may conduct conversations with market participants and third parties for this purpose. STOXX discloses the index objective in every case.

3.2. METHODOLOGY REVIEW POLICIES

STOXX constantly monitors the execution of the index calculation rules in order to ensure the validity of the index methodology. STOXX also conducts general methodology reviews in a periodic and ad-hoc basis, to reflect economic and political changes and developments in the investment industry. As result of these activities, STOXX introduces changes to the methodology books. Material changes are notified to subscribers and the media through the usual communication channels. Clarifications of the methodology are updated in the rulebook. All changes are tracked in the section 2.1 History of changes to the STOXX bond index Guide.

3.3. INDEX TERMINATION POLICY

For the termination of an index or index family for which outstanding products are present in the market to the knowledge of STOXX, a market consultation with the involved clients will be initiated by STOXX to take into account their views and concerns related to the termination or transition. A consultation period will be opened. Its duration depends on the specific issue. After the consultation period and in case of further action needed, a notification will be issued and the process defined above will be followed. In the case of a transition, STOXX will launch the alternative index and will notify of its character as a suitable replacement for an existing index whose calculation should be discontinued in the future. This notification advices clients on the alternative recommended by STOXX as replacement. The timeframe in which both indices will be calculated in parallel will be disclosed in the notification's text and will be no shorter than three months.

For the termination of an index or index family for which, to the knowledge of STOXX, no listed financial products are issued in the market, a press release notification or e-mail notification to subscribers will be communicated at least three months before coming into force. Clients or third parties with interest in the index or index family are urged to communicate as soon as possible their concerns to STOXX. Based on the feedback collected, STOXX may alter the index termination decision. For the termination of an index without financial product issued on there will be no market consultation. Changes to the original notification will be communicated in the same manner.

3.4 COMMUNICATION

Notifications are sent out for short-term changes, the periodic review announcements, index calculation and production issues and errors, new index launches and general information from STOXX.

4. iSTOXX® RISKFIRST LDI BOND INDICES

4.1. OVERVIEW

The iSTOXX RiskFirst Liability Driven Investment bond indices are tracking the performance of corporate and government bonds denominated in GBP and optimized to serve investment managers, consultants or plan sponsors to construct more efficient liability-driven investment strategies

4.2. STRUCTURE

For each target liability cashflow profile, an appropriate index is assigned. Three different sets of indices are calculated – nominal bond indices, real bond indices and blended indices as combination of nominal and real bond indices. The nominal bond indices are available separately for gilts and non-gilts, whereas the real bond ones are based on inflation-linked gilts. Using fixed, zero and inflation-linked bonds for index calculation allows an easier tracking of the indices.

The following main indices are assigned to each of the profiles:

- iSTOXX RiskFirst LDI Real Longer Pre RPI Post RPI
- iSTOXX RiskFirst LDI Real Shorter Post RPI
- iSTOXX RiskFirst LDI Real Cash Pre RPI (0/5)
- iSTOXX RiskFirst LDI Nominal Longer Pre Fixed Post Fixed
- iSTOXX RiskFirst LDI Non-Gilts Nominal Longer Pre Fixed Post Fixed
- iSTOXX RiskFirst LDI Nominal Shorter Post Fixed
- iSTOXX RiskFirst LDI Non-Gilts Nominal Shorter Post Fixed
- iSTOXX RiskFirst LDI Longer Pre Fixed Post CPI (0/3)
- iSTOXX RiskFirst LDI Longer Pre RPI (0/5) Post RPI (0/2.5)
- iSTOXX RiskFirst LDI Longer Pre RPI (0/5) Post Fixed
- iSTOXX RiskFirst LDI Longer Pre RPI (0/5) Post RPI (0/5)
- iSTOXX RiskFirst LDI Shorter Post RPI (0/2.5)
- iSTOXX RiskFirst LDI Shorter Post RPI (0/5)
- iSTOXX RiskFirst LDI Shorter Post CPI (0/3)

The full list of indices can be found below:

ISIN	Index	Currency	Version	Bloomberg Ticker	Reuters RIC
DE000A2GGNH6	iSTOXX RiskFirst LDI Real Longer Pre Fixed Post CPI (0/3)	GBP	Price		.SRFIL3P
DE000A2GGNJ2	iSTOXX RiskFirst LDI Real Longer Pre RPI (0/5) Post RPI (0/2.5)	GBP	Price	SRFILP2P	.SRFILP2P
DE000A2GGNK0	iSTOXX RiskFirst LDI Real Longer Pre RPI (0/5) Post Fixed	GBP	Price		.SRFILPP
DE000A2GGNL8	iSTOXX RiskFirst LDI Real Longer Pre RPI (0/5) Post RPI (0/5)	GBP	Price		.SRFILP5P
DE000A2GGNM6	iSTOXX RiskFirst LDI Real Longer Pre RPI Post RPI	GBP	Price		.SRFILP
DE000A2GGNN4	iSTOXX RiskFirst LDI Real Shorter Post RPI (0/2.5)	GBP	Price		.SRFIS2P
DE000A2GGNP9	iSTOXX RiskFirst LDI Real Shorter Post RPI (0/5)	GBP	Price		.SRFIS5P
DE000A2GGNQ7	iSTOXX RiskFirst LDI Real Shorter Post RPI	GBP	Price		.SRFISP
DE000A2GGNR5	iSTOXX RiskFirst LDI Real Cash Pre RPI (0/5)	GBP	Price		.SRFICPP

4. iSTOXX® RISKFIRST LDI BOND INDICES

ISIN	Index	Currency	Version	Bloomberg Ticker	Reuters RIC
DE000A2GGNS3	iSTOXX RiskFirst LDI Nominal Longer Pre Fixed Post Fixed	GBP	Price		.SRFNLP
DE000A2GGNT1	iSTOXX RiskFirst LDI Non-Gilts Nominal Longer Pre Fixed Post Fixed	GBP	Price		.SRFCNLP
DE000A2GGNU9	iSTOXX RiskFirst LDI Nominal Longer Pre Fixed Post CPI (0/3)	GBP	Price		.SRFNL3P
DE000A2GGNV7	iSTOXX RiskFirst LDI Nominal Longer Pre RPI (0/5) Post RPI (0/2.5)	GBP	Price		.SRFNLP2P
DE000A2GGNW5	iSTOXX RiskFirst LDI Nominal Longer Pre RPI (0/5) Post Fixed	GBP	Price		.SRFNLPP
DE000A2GGNX3	iSTOXX RiskFirst LDI Nominal Longer Pre RPI (0/5) Post RPI (0/5)	GBP	Price		.SRFNLP5P
DE000A2GGNY1	iSTOXX RiskFirst LDI Nominal Shorter Post RPI (0/2.5)	GBP	Price		.SRFNS2P
DE000A2GGNZ8	iSTOXX RiskFirst LDI Nominal Shorter Post Fixed	GBP	Price		.SRFNSP
DE000A2GGN03	iSTOXX RiskFirst LDI Non-Gilts Nominal Shorter Post Fixed	GBP	Price		.SRFCNSP
DE000A2GGN11	iSTOXX RiskFirst LDI Nominal Shorter Post RPI (0/5)	GBP	Price		.SRFNS5P
DE000A2GGN37	iSTOXX RiskFirst LDI Real Longer Pre Fixed Post CPI (0/3)	GBP	Total Return		.SRFIL3T
DE000A2GGN45	iSTOXX RiskFirst LDI Real Longer Pre RPI (0/5) Post RPI (0/2.5)	GBP	Total Return		.SRFILP2T
DE000A2GGN52	iSTOXX RiskFirst LDI Real Longer Pre RPI (0/5) Post Fixed	GBP	Total Return		.SRFILPT
DE000A2GGN60	iSTOXX RiskFirst LDI Real Longer Pre RPI (0/5) Post RPI (0/5)	GBP	Total Return		.SRFILP5T
DE000A2GGN78	iSTOXX RiskFirst LDI Real Longer Pre RPI Post RPI	GBP	Total Return	SRFILT	.SRFILT
DE000A2GGN86	iSTOXX RiskFirst LDI Real Shorter Post RPI (0/2.5)	GBP	Total Return		.SRFIS2T
DE000A2GGN94	iSTOXX RiskFirst LDI Real Shorter Post RPI (0/5)	GBP	Total Return		.SRFIS5T
DE000A2GGPA6	iSTOXX RiskFirst LDI Real Shorter Post RPI	GBP	Total Return	SRFIST	.SRFIST
DE000A2GGPB4	iSTOXX RiskFirst LDI Real Cash Pre RPI (0/5)	GBP	Total Return	SRFICPT	.SRFICPT
DE000A2GGPC2	iSTOXX RiskFirst LDI Nominal Longer Pre Fixed Post Fixed	GBP	Total Return	SRFNLT	.SRFNLT
DE000A2GGPD0	iSTOXX RiskFirst LDI Non-Gilts Nominal Longer Pre Fixed Post Fixed	GBP	Total Return	SRFCNLT	.SRFCNLT
DE000A2GGPE8	iSTOXX RiskFirst LDI Nominal Longer Pre Fixed Post CPI (0/3)	GBP	Total Return		.SRFNL3T
DE000A2GGPF5	iSTOXX RiskFirst LDI Nominal Longer Pre RPI (0/5) Post RPI (0/2.5)	GBP	Total Return		.SRFNLP2T
DE000A2GGPG3	iSTOXX RiskFirst LDI Nominal Longer Pre RPI (0/5) Post Fixed	GBP	Total Return		.SRFNLPT
DE000A2GGPH1	iSTOXX RiskFirst LDI Nominal Longer Pre RPI (0/5) Post RPI (0/5)	GBP	Total Return		.SRFNLP5T
DE000A2GGPJ7	iSTOXX RiskFirst LDI Nominal Shorter Post RPI (0/2.5)	GBP	Total Return		.SRFNS2T
DE000A2GGPK5	iSTOXX RiskFirst LDI Nominal Shorter Post Fixed	GBP	Total Return	SRFNST	.SRFNST
DE000A2GGPL3	iSTOXX RiskFirst LDI Non-Gilts Nominal Shorter Post Fixed	GBP	Total Return	SRFCNST	.SRFCNST
DE000A2GGPM1	iSTOXX RiskFirst LDI Nominal Shorter Post RPI (0/5)	GBP	Total Return		.SRFNS5T
DE000A2GGP35	iSTOXX RiskFirst LDI Real Shorter Post CPI (0/3)	GBP	Price		.SRFIS3P
DE000A2GGP43	iSTOXX RiskFirst LDI Nominal Shorter Post CPI (0/3)	GBP	Price		.SRFNS3P
DE000A2GGP50	iSTOXX RiskFirst LDI Real Shorter Post CPI (0/3)	GBP	Total Return		.SRFIS3T
DE000A2GGP68	iSTOXX RiskFirst LDI Nominal Shorter Post CPI (0/3)	GBP	Total Return		.SRFNS3T
DE000A2GGPP4	iSTOXX RiskFirst LDI Longer Pre Fixed Post CPI (0/3)	GBP	Total Return	SRFBL3T	.SRFBL3T
DE000A2GGPQ2	iSTOXX RiskFirst LDI Longer Pre RPI (0/5) Post RPI (0/2.5)	GBP	Total Return	SRFBLP2T	.SRFBLP2T
DE000A2GGPR0	iSTOXX RiskFirst LDI Longer Pre RPI (0/5) Post Fixed	GBP	Total Return	SRFBLPT	.SRFBLPT
DE000A2GGPS8	iSTOXX RiskFirst LDI Longer Pre RPI (0/5) Post RPI (0/5)	GBP	Total Return	SRFBLP5T	.SRFBLP5T

4. iSTOXX® RISKFIRST LDI BOND INDICES

ISIN	Index	Currency	Version	Bloomberg Ticker	Reuters RIC
DE000A2GGPT6	iSTOXX RiskFirst LDI Shorter Post RPI (0/2.5)	GBP	Total Return	SRFBS2T	.SRFBS2T
DE000A2GGPU4	iSTOXX RiskFirst LDI Shorter Post RPI (0/5)	GBP	Total Return	SRFBS5T	.SRFBS5T
DE000A2GGPW0	iSTOXX RiskFirst LDI Longer Pre Fixed Post CPI (0/3)	GBP	Price		.SRFBL3P
DE000A2GGPX8	iSTOXX RiskFirst LDI Longer Pre RPI (0/5) Post RPI (0/2.5)	GBP	Price		.SRFBLP2P
DE000A2GGPY6	iSTOXX RiskFirst LDI Longer Pre RPI (0/5) Post Fixed	GBP	Price		.SRFBLPP
DE000A2GGPZ3	iSTOXX RiskFirst LDI Longer Pre RPI (0/5) Post RPI (0/5)	GBP	Price		.SRFBLP5P

4. iSTOXX® RISKFIRST LDI BOND INDICES

4.3. INDEX METHODOLOGY

The iSTOXX RiskFirst LDI Indices are built to measure the change in value of a portfolio of bonds whose composition is reviewed on a periodic basis (i.e. review date). Therefore, corresponding adjustments to index-tracking portfolios are only required once, i.e. at the respective review date. The weight of each bond is the result of optimizing the bonds' cash flows against predefined target liability profiles.

Weighting scheme: the components are weighted according to a scheme that enables the bonds' cashflows to match the cashflows associated with the relevant liability profile of each index.

Index types and currencies: Price, Total Return in GBP.

Base values and dates: The following base values and dates apply: 100 on December 31, 2010

Dissemination calendar: STOXX Europe Calendar

4.3.1. SELECTION CRITERIA

The selection process is performed in two steps – pre-selection and optimization. The optimization results in the final constituents list and weights. In order to determine the pre-selection bonds list, the following criteria are applied:

- Bond Type
- Currency
- Country
- Credit Rating
- Time to Maturity
- Nominal amount outstanding
- Seniority of debt

Illiquid securities without available data are excluded from the index, thus a precondition for index eligibility is that a bond has reference data and pricing data. Bonds with prices received in amount instead of percentage or with dirty price instead of clean price are not eligible for the index.
The bonds that qualify for the pre-selection are used in the optimization, which determines the final constituents list and weights (for details see Cash Flow Optimizer Methodology section).

4.3.1.1. BOND TYPE

For nominal bond index series, the eligible bond types are:

- Bullet fixed-coupon bonds
- Zero-coupon bonds (exception: stripped bonds are not included)

The following bond types are excluded:

- Bonds with call or put option
- Step-up bonds
- Multi-step and multi-step callable bonds

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- Multi-coupon bonds
- Sinking funds and amortizing bonds
- Fix-to-float bonds
- Extendible bonds
- Private placements
- Perpetual bonds
- Floating rate notes
- Inflation-linked bonds
- Purchase fund bonds
- Convertible bonds
- Securitized (ABS/MBS/CDO)
- Dual-currency bonds
- Pay-in-kind bonds
- Schuldscheine
- Money-market instruments (deposit notes, banker`s acceptance).

For real bond index series, the eligible bond types are:

- Inflation-linked bonds (both, with 8 and 3 months time lag)

The following bond types are excluded:

- Bullet fixed-coupon bonds
- Dual-currency bonds
- Zero-coupon bonds
- Bonds with call or put option
- Step-up bonds
- Multi-steps and multi-step callable bonds
- Multi coupon bonds
- Sinking funds and amortizing bonds
- Fix to float bonds
- Extendible bonds
- Private placements
- Perpetuals
- Floating Rate Notes
- Purchase fund bonds
- Convertible bonds
- Securitized (ABS/MBS/CDO)
- Pay in kind bonds
- Schuldscheine
- Money Market instruments (deposit notes, banker`s acceptance).

4.3.1.2. CURRENCY

Only GBP denominated bonds are eligible.

4.3.1.3. COUNTRY

The country of incorporation for all eligible bonds is United Kingdom (i.e. England and Wales, Scotland, Northern Ireland).

4.3.1.4. CREDIT RATING

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STOXX composite rating is applied in order to determine a bond's rating. The STOXX composite rating is derived by using the issue´s long term ratings from S&P and Moody`s. The following rating values are used within the composition logic: AAA, AA, A, BBB, BB, B, CCC, CC, C. If only one rating is available from a source for a bond, then that rating will be applied. If two ratings are available from the sources for a bond, then the lower of the two will be applied. Bonds which are in default or not rated are not eligible for the indices:

MOODY'S	S&P	STOXX Bond Composite Rating	
Aaa	AAA	AAA	Investment Grade
Aa1	AA+	AA	
Aa2	AA		
Aa3	AA-		
A1	A+	A	
A2	A		
A3	A-		
Baa1	BBB+	BBB	
Baa2	BBB		
Baa3	BBB-		
Ba1	BB+	BB	Non-Investment Grade
Ba2	BB		
Ba3	BB-		
B1	B+	B	
B2	B		
B3	B-		
Caa1	CCC+	CCC	
Caa2	CCC		
Caa3	CCC-		
Ca	CC	CC	
C	C	C	

For all indices a minimum rating of Investment Grade (BBB and higher) is required.

4.3.1.5. TIME TO MATURITY

The time to maturity is measured from the rebalancing date to the maturity date. All eligible bonds must have a remaining time to maturity of at least 1.25 years. This condition is not only valid for bonds to be included into the index, but also for bonds already part of the index (which will be excluded at next rebalancing date, in case the condition is not satisfied). The time to maturity calculation considers the following day count conventions - ACT/360, ACT/365, ACT/ACT, ISMA 30/360.

4.3.1.6. NOMINAL AMOUNT OUTSTANDING

The minimum nominal amount outstanding is GBP 500 million.

4.3.1.7. SENIORITY OF DEBT

Subordinated bonds carry additional risk as higher ranked bonds. Therefore, subordinated bonds are not eligible and excluded from the index.

4. iSTOXX® RISKFIRST LDI BOND INDICES

4.3.1.8. WEIGHTING

The optimization model used to determine the final constituents and their weights is a cashflow matching based model. For each liability profile, bonds from the pre-selection list are selected in order to match the annual liability cashflows, where real and nominal cashflows are considered separately. The liability cashflow profiles are selected in such a way that the duration, inflation sensitivity and tax-free cash component of a typical UK pension scheme can be captured. The table below shows an overview of the different profiles:

Profile name	Member type	Pre-retirement indexation	Post-retirement indexation
Long Nominal (Gilts)	Deferred	Fixed	Fixed
Long Nominal (Non-Gilts)	Deferred	Fixed	Fixed
Long Fixed / CPI(0,3)	Deferred	Fixed	CPI(0,3%)
Long RPI(0,5) / RPI(0,2.5)	Deferred	RPI(0,5%)	RPI(0,2.5%)
Long RPI(0,5) / Fixed	Deferred	RPI(0,5%)	Fixed
Long RPI(0,5) / RPI(0,5)	Deferred	RPI(0,5%)	RPI(0,5%)
Long RPI	Deferred	RPI	RPI
Tax Free Cash	Deferred	RPI(0,5%)	n/a
Short Nominal (Gilts)	Pensioner	n/a	Fixed
Short Nominal (Non-Gilts)	Pensioner	n/a	Fixed
Short CPI(0,3)	Pensioner	n/a	CPI(0,3%)
Short RPI(0,2.5)	Pensioner	n/a	RPI(0,2.5%)
Short RPI(0,5)	Pensioner	n/a	RPI(0,5%)
Short RPI	Pensioner	n/a	RPI

The model algorithm is run on a quarterly basis on each of the four trading days before the end of the last month of each quarter (March, June, September, December). For cashflow profiles that have both a nominal and inflation-linked component, the model is run twice to create two outputs – one using the nominal bonds pre-selection list and one using the inflation-linked bonds pre-selection list.

The set of optimized bond market values is determined by minimizing the sum of squared differences between the annual grouped bond cashflows and the grouped liability cashflows at each year subject to the applicable capping constraint.

The nominal amounts are calculated by dividing the individual bond market values of each constituent bond by its dirty price and are used to weight the individual bonds for each index.

Once the individual bond weights are determined, for cashflow profiles that have both Nominal and Real component, the relative weights of these two sub-indices need to be determined by using the total market value of the two sub-indices.

Additional details and calculation formula related to the optimization algorithm are available upon request.

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4.3.2. INDEX CALCULATION

4.3.2.1. REFERENCE DATA

Bond reference data used for the selection and in the index calculation are sourced from third data providers and verified against offering circulars as appropriate.

4.3.2.2. BOND PRICES

On-going calculation:
The indices are calculated in real time on the basis of bid prices. If no new prices for a particular bond are received, the index will continue to be calculated based on the last available prices. Prices are always clean prices in percentage.

Insertions:
New bonds are factored into the respective index when its composition is updated, using the ask price. From a portfolio perspective, this calculation methodology incorporates transaction costs incurred by investors who want to track the indices and have to buy additional bonds at the respective ask quote.

Cost factor:
Bonds which are already part of the index and their weight increases as a result of rebalancing are valued at the bid price. When tracking the index, those bonds are purchased at ask price, which implies tracking cost. In order to offset this effect and accordingly to reflect the costs, a cost factor is applied to the price and total return indices (for details see 4.3.2.4 Calculation Formulas).

Evaluated prices:
The bond indices use evaluated bond prices in the form of bid and ask prices provided by ICE Data Services for index calculation.
ICE Data Services utilises evaluated pricing models varying by asset class, incorporating available: trades, bid and ask quotes, and other market information, including cash flow and loan performance data for structured securities. Because many fixed income securities do not trade daily, STOXX applies ICE Data Services' evaluated pricing applications through processes including: benchmark curves, benchmarking of like securities, sector groupings and matrix pricing, to prepare evaluations. In addition, ICE Data Services uses model processes to assess interest rate impact and develop prepayment scenarios such as the option adjusted spread model, taking into account market convention. For each asset class, an ICE Data Services team of evaluators gathers information from market sources and integrates relevant credit information, perceived market movements and sector news into the evaluated pricing applications and models.
For certain security types, additional inputs may be used, or some of the standard inputs may not be applicable. ICE Data Services' evaluated prices provide information about the current price level. These evaluations represent the third data provider good faith opinion about the fair price for a security in a current sale, typically in an institutional round lot position.
The quality of the evaluated prices of ICE Data Services is continuously verified by ICE Data Services against a broad client base, ranging from asset managers, investment banks, custodians, insurance companies to central banks. The evaluated prices can be challenged by

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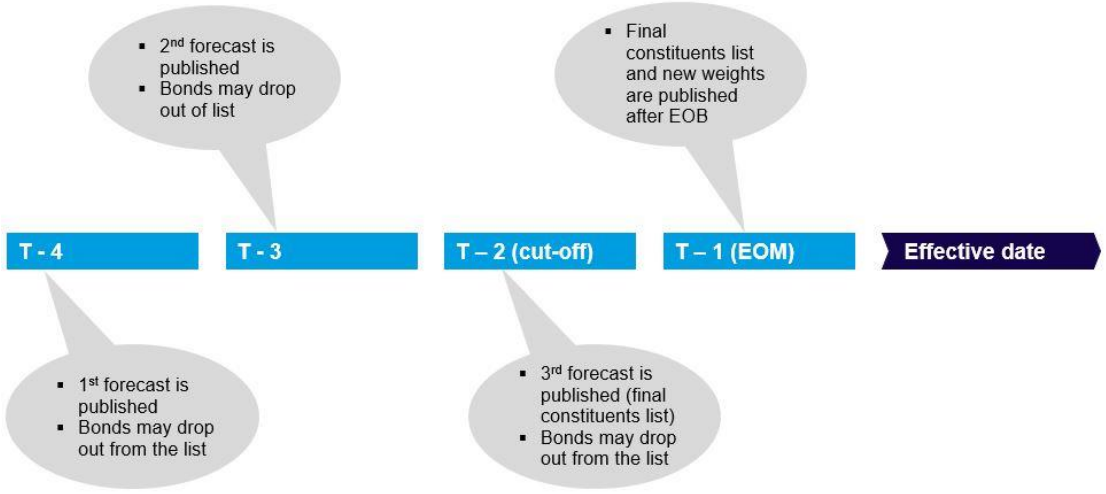
STOXX if there is a reason to believe that a certain price does not correspond to the appropriate current price level.
The hierarchy of data inputs used by ICE Data Services for the evaluated prices is the following: benchmark yields, reported trades, broker/dealer quotes, issuer spreads, two-sided markets, benchmark securities, bids, offers, and reference data including market research publications. ICE Data Services may prioritize inputs differently, and not all inputs listed above may be available for use in the evaluation process.

4.3.2.3. PERIODICAL ADJUSTMENT

4.3.2.3.1. Rebalancing timeframe

The indices are rebalanced on a quarterly basis, at the end of March, June, September and December.
Four trading days before the end of the last month of the quarter the index constituents list is published (a forecast file is published). Three and two trading days before end of the last month of the period, bonds may drop out of this list due to changes in rating or other relevant reference data (a second and third forecast file is published). The cut-off date for the final membership list for the following period is two trading days before end of the last month of the period.
On the last business day of each period, the new membership list with closing prices and weights of all bonds after close of business is published. The prices are bid prices for current index constituents or ask prices for insertions. The list is effective from the first trading day of the following month.



4.3.2.3.2. Weighting adjustments

Within an index, each bond is weighted according to the optimization model results. Intra-month changes of the weight for each bond are reflected in the index only through the rebalancing procedure.

4.3.2.3.3. Coupon adjustments

In case coupon changes, those changes are taken into account in the calculation of the indices from the exact date on which the coupon was altered.

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4.3.2.3.4. Monthly bond exclusions between scheduled rebalancing

Bonds can become intra-month not eligible for the index. In this case they will be kept in the index until end of month and the proceeds from the sale will be invested in cash. Following scenarios are applicable:
- Bond or issuer default
- Rating downgrade of the bond to non-investment grade (i.e. below threshold)
- Reduction of the amount outstanding
- other changes in bond reference data, which would make the bond not eligible applying again the selection criteria

4.3.2.3.5. Monthly cash reinvestment between scheduled rebalancing

Cash from coupon payments and from bonds which exit the index will be invested at the end of each month in the money market for one month. The rate to be used is SONIA or zero in case of negative interest levels (i.e. floor at 0%).

4.3.2.3.6. Index size

Indices have no limitation in regards to the size. As limitation in regards to number of bonds, indices based on gilts should have at least 6 constituents.

4.3.2.3.7. Cap Limit

Capping prevents single bonds or issuers from dominating the index. The capping procedure is part of the optimization process and follows the following logic:
- If the index constituents are gilts, the weight of each bond within an index should not exceed 30%.
- If the index constituents are non-gilts, the combined weight of all bonds from any individual issuer within the index should not exceed 20%.

4.3.2.4. CALCULATION FORMULAS

For all calculation formulas the following rule regarding inflation factor applies:

$$IF_{i,t} = \begin{cases} 1, & for\ nominal\ bonds \\ 1, & for\ 8\ months\ time\ lag\ inflation-linked\ bonds \\ IR_{i,t}^{3m}, & for\ 3\ months\ time\ lag\ inflation-linked\ bonds \end{cases}$$

$$IFA_{i,t} = \begin{cases} 1, & for\ nominal\ bonds \\ IR_{i,t}^{8m}, & for\ 8\ months\ time\ lag\ inflation-linked\ bonds \\ 1, & for\ 3\ months\ time\ lag\ inflation-linked\ bonds \end{cases}$$

Whereby:

Parameter	Legend
$IF_{i,t}$	Index inflation factor for bond i at time t
$IFA_{i,t}$	Analytics inflation factor for bond i at time t

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Parameter	Legend
$IR_{i,t}^{3m}$	Index ratio for bond i at time t, for bonds with 3 months' time lag (for details see Index Ratio section below)
$IR_{i,t}^{8m}$	Index ratio for bond i at time t, for bonds with 8 months' time lag (for details see Index Ratio section below)

4.3.2.4.1. Price Index

Price indices are calculated as follows:

$$PI_t = PI_{t-s} \cdot \frac{\sum_{i=1}^{n} P_{i,t} \cdot N_{i,t-s} \cdot IF_{i,t} + cash_{t-s}}{\sum_{i=1}^{n} P_{i,t-s} \cdot N_{i,t-s} \cdot IF_{i,t-s} + cash_{t-s}} \cdot CF_{PI}$$

Where, in case of non-rebalancing month:

$$CF_{PI} = 1$$

Else, in case of rebalancing month:

$$CF_{PI} = \frac{\sum_{i=1}^{n} N_i^+ \cdot P_i^{PI} \cdot IF + cash_{t-si}^+}{\sum_{i=1}^{n} N_i^- \cdot P_i^{PI} \cdot IF_i + cash_{t-s}^-} \cdot \frac{\sum_{i=1}^{n} N_i^- \cdot P_i^{B/A} \cdot IF_i + cash_{t-s}^-}{\sum_{i=1}^{n} N_i^+ \cdot P_i^{B/A} \cdot IF_i + cash_{t-s}^+}$$

$$P_i^{A/B} \begin{cases} = P_i^A, & \frac{N_i^+ \cdot P_i^{PI} \cdot IF_i}{\sum_{i=1}^{n} N_i^+ \cdot P_i^{PI} \cdot IF_i + cash_{t-s}^+} > \frac{N_i^- \cdot P_i^{PI} \cdot IF_i}{\sum_{i=1}^{n} N_i^- \cdot P_i^{PI} \cdot IF_i + cash_{t-s}^-} \Leftrightarrow w_i^+ > w_i^- \\ = P_i^B, & \text{else} \end{cases}$$

$$P_i^{PI} \begin{cases} = P_i^A, & for\ insertions \\ = P_i^B, & else \end{cases}$$

Whereby:

Parameter	Legend
PI_t	Price index value at time t
PI_{t-s}	Price index value on the last calendar day of the previous month
$P_{i,t}$	Price bond i at time t
$P_{i,t-s}$	Closing price of bond i on the last trading day of the previous month

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Parameter	Legend
$N_{i,t-s}$	Capped nominal of bond i on the last trading day of the previous month
n	Number of bonds in the index
t-s	Last calendar day of the previous month
t	Calculation date
CF_{PI}	Cost factor price index, valid since last rebalancing date
N_i^+	Nominal of bond i after rebalancing
N_i^-	Nominal of bond i before rebalancing
w_i^+	Weight of bond i after rebalancing
w_i^-	Weight of bond i before rebalancing
$P_i^{A/B}$	Either closing ask or bid price of bond i depending on the change in the weight resulting of the re-composition
P_i^A	Closing ask price of bond i on the rebalancing day
P_i^B	Closing bid price of bond i on the rebalancing day
$cash_{t-s}$	Cash at the end of last month
$cash_{t-s}^-$	Cash before rebalancing
$cash_{t-s}^+$	Cash after rebalancing

4.3.2.4.2. Total Return Index

For total return indices, the monthly adjustment involves the reinvestment of coupon payments in the overall portfolio at the rebalancing date fixed for any adjustment of the index composition. Consequently, total return indices are calculated as follows:

$$\boldsymbol{TR_t} = \boldsymbol{TR_{t-s}} \frac{\sum_{i=1}^{n}\left(\boldsymbol{P_{i,t}} + \boldsymbol{A_{i,t}} + \boldsymbol{XD_{i,t-s}} \cdot (\boldsymbol{CP_{i,t}} + \boldsymbol{G_{i,t}})\right) \cdot \boldsymbol{N_{i,t-s}} \cdot \boldsymbol{IF_{i,t}} + \boldsymbol{cash}_{t-s} . \prod_{t-s<\tau\leq t}\left(1 + r_{\tau-1}^{1d} . \frac{days_{\tau-1,\tau}}{365}\right)}{\sum_{i=1}^{n}(\boldsymbol{P_{i,t-s}} + \boldsymbol{A_{i,t-s}} + \boldsymbol{XD_{i,t-s}} \cdot \boldsymbol{CP_{i,t-s}}) \cdot \boldsymbol{N_{i,t-s}} \cdot \boldsymbol{IF_{i,t-s}} + \boldsymbol{cash_{t-s}}} \cdot \boldsymbol{CF_{TR}}$$

Where, in case of non-rebalancing month:

$$CF_{PI} = 1$$

Else, in case of rebalancing month:

$$CF_{TR} = \frac{\sum_{i=1}^{n} N_i^+ \cdot \left(P_i^{TR} + A_i\right) \cdot IF_i + cash_{t-s}^+}{\sum_{i=1}^{n} N_i^- \cdot \left(P_i^{TR} + A_i\right) \cdot IF_i + cash_{t-s}^- \cdot \prod_{t-s<\tau\leq t}\left(1 + r_{\tau-1}^{1d} \cdot \frac{days_{\tau,\tau-1}}{365}\right) + \sum_i N_i^- \cdot G_{i,t} \cdot IF_i} \cdot \frac{\sum_{i=1}^{n} N_i^- \cdot \left(P_i^{B/A} + A_i\right) \cdot IF_i + cash_{t-s}^- \cdot \prod_{t-s<\tau\leq t}\left(1 + r_{\tau-1}^{1d} \cdot \frac{days_{\tau,\tau-1}}{365}\right) + \sum_i N_i^- \cdot G_{i,t} \cdot IF_i}{\sum_{i=1}^{n} N_i^+ \cdot \left(P_i^{B/A} + A_i\right) \cdot IF_i + cash_{t-s}^+}$$

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$$P_i^{A/B}\begin{cases}=P_i^A, & \frac{N_i^+.(P_i^{TR}+A_i)\cdot IF_i}{\sum_{i=1}^n N_i^+\cdot(P_i^{TR}+A_i)\cdot IF_i+cash_{t-s}^+} > \frac{N_i^-.(P_i^{TR}+A_i)\cdot IF_i}{\sum_{i=1}^n N_i^-\cdot(P_i^{TR}+A_i)\cdot IF_i+cash_{t-s}^-.\prod_{t-s<\tau\le t}\left(1+r_{\tau-1}^{1d}.\frac{days_{\tau,\tau-1}}{365}\right)+\sum_i N_i^-.G_{i,t}\cdot IF_i} \Leftrightarrow w_i^+ > w_i^- \\ =P_i^B, & \text{else}\end{cases}$$

$$P_i^{TR}\begin{cases}=P_i^A, & for\ insertions\\ =P_i^B, & else\end{cases}$$

Whereby (in addition to the denotations above):

Parameter	Legend
$A_{i,t}$	Accrued interest of bond i at time t
$A_{i,t-s}$	Accrued interest of bond i on the last calendar day of the previous month
$G_{i,t}$	Value of a coupon payment of bond i at time t, made at the coupon date or within the period s. If there has been no payment within the respective month, the value equals zero
TR_t	Total return index value at time t
TR_{t-s}	Total return index value on the last calendar day of the previous month
$CP_{i,t}$	Value of the next coupon payment of bond i at date t during an ex-dividend period (as the next coupon payment of bond i is not included in the dirty price calculation at date t because of the ex-dividend period). Outside the ex-dividend period, the value is 0
$CP_{i,t-s}$	Value of the next coupon payment of bond i at rebalancing date during an ex-dividend period (as the next coupon payment of bond i is not included in the dirty price calculation at date t because of the ex-dividend period). Outside the ex-dividend period, the value is 0
$XD_{i,t-s}$	Flag that ensures the correct treatment of bond i with ex-dividend features at the last rebalancing (during the ex-dividend period the buyer of a security will not receive the next coupon payment): If the bond enters the index within the ex-dividend period, flag is set to 0 If bond is not ex-dividend, or has not entered the index during an ex-dividend period, or entered the index during a previous ex-dividend period, flag is set to 1

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Parameter	Legend
CF_{TR}	Cost factor total return index, valid since last rebalancing date
N_i^+	Nominal amount outstanding issue size of bond i after rebalancing
N_i^-	Nominal amount outstanding issue size of bond i before rebalancing
w_i^+	Weight of bond i after rebalancing
w_i^-	Weight of bond i before rebalancing
$P_i^{A/B}$	Either closing ask or bid price of bond i depending on the change in the weight resulting of the re-composition
P_i^A	Closing ask price of bond i on the rebalancing day
P_i^B	Closing bid price of bond i on the rebalancing day
A_i	Accrued interest of bond i on the rebalancing day
$r_{\tau-1}^{1d}$	SONIA published on day τ in respect of day $\tau - 1$
$days_{\tau-1,\tau}$	Calendar days between τ and $\tau - 1$

4.3.2.4.1. Blended Index

Some of the pension scheme profiles require a combination of nominal and real indices. These are combined using weights, resulting from the optimizer´s cash flow matching model. Therefore, blended indices are rebalanced as well on a quarterly basis, so sub-index weights are fixed at each rebalancing date at the last trading day of March, June, September and December. The indices are calculated as follows:

$$IV_t = IV_{reb} \times \sum_{i=1}^{2} w_{reb,i} \times \frac{U_{t,i}}{U_{reb,i}}$$

Parameter	Legend
$W_{reb,i}$	Weight of sub-index i at rebalancing date
$U_{reb,i}$	Close value of sub-index i at rebalancing date
$U_{t,i}$	Value of sub-index i today at time t
IV_t	Index value today at time t

4.3.2.4.2. Index Analytics

There are several analytics that are calculated in addition to the index values. The following analytics are calculated and distributed for each index separately:

4.3.2.4.2.1. Average Yield

The average yield is calculated by weighting the yield of each bond by the market capitalization and duration of the respective bond.

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$$RY_t = \frac{\sum_{i=1}^{n} Y_{i,t} \cdot \left(P_{i,t} + A_{i,t}\right) \cdot N_{i,t-s} \cdot IF_{i,t} \cdot D_{i,t}}{\sum_{i=1}^{n} \left(P_{i,t} + A_{i,t}\right) \cdot N_{i,t-s} \cdot IF_{i,t-s} \cdot D_{i,t}}$$

Whereby:

Parameter	Legend
RY_t	Average yield at time t
$Y_{i,t}$	Yield of bond i at time t
$D_{i,t}$	Duration of bond i at time t

4.3.2.4.2.2. Average Duration

The average duration is calculated by weighting the duration of each bond by the market capitalization of the respective bond.

$$DU_t = \frac{\sum_{i=1}^{n} D_{i,t} \cdot \left(P_{i,t} + A_{i,t}\right) \cdot N_{i,t-s} \cdot IF_{i,t}}{\sum_{i=1}^{n} \left(P_{i,t} + A_{i,t}\right) \cdot N_{i,t-s} \cdot IF_{i,t-s}}$$

Whereby:

Parameter	Legend
DU_t	Average duration at time t
$D_{i,t}$	Duration of bond i at time t

4.3.2.4.2.3. Average Modified Duration

The average modified duration is calculated by weighting the modified duration of each bond by the market capitalization of the respective bond.

$$MDU_t = \frac{\sum_{i=1}^{n} MD_{i,t} \cdot \left(P_{i,t} + A_{i,t}\right) \cdot N_{i,t-s} \cdot IF_{i,t}}{\sum_{i=1}^{n} \left(P_{i,t} + A_{i,t}\right) \cdot N_{i,t-s} \cdot IF_{i,t-s}}$$

Whereby:

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Parameter	Legend
MDU_t	Average modified duration at time t
$MD_{i,t}$	Modified duration of bond i at time t

4.3.2.4.2.4. Average Convexity

The average convexity is calculated by weighting the convexity of each bond by the market capitalization of the respective bond.

$$CX_t = \frac{\sum_{i=1}^{n} X_{i,t} \cdot \left(P_{i,t} + A_{i,t}\right) \cdot N_{i,t-s} \cdot IF_{i,t}}{\sum_{i=1}^{n} \left(P_{i,t} + A_{i,t}\right) \cdot N_{i,t-s} \cdot IF_{i,t-s}}$$

Whereby:

Parameter	Legend
CX_t	Average convexity at time t
$X_{i,t}$	Convexity of bond i at time t

4.3.2.4.2.5. Average Coupon

The average coupon is calculated by weighting the coupon of each bond by its nominal issue size.

$$CO_t = \frac{\sum_{i=1}^{n} C_{i,t} \cdot IF_{i,t} \cdot N_{i,t-s}}{\sum_{i=1}^{n} N_{i,t-s}}$$

Whereby:

Parameter	Legend
CO_t	Average coupon at time t
$C_{i,t}$	Coupon of bond i at time t

4.3.2.4.2.6. Average Remaining Years to Maturity

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The average remaining years to maturity is calculated by weighting the remaining years to maturity of each bond by its nominal issue size.

$$LF_t = \frac{\sum_{i=1}^{n} L_{i,t} \cdot N_{i,t-s}}{\sum_{i=1}^{n} N_{i,t-s}}$$

Whereby:

Parameter	Legend
LF_t	Average remaining years to maturity at time t
$L_{i,t}$	Remaining years to maturity of bond i at time t

4.3.2.4.2.7. Nominal Value

The nominal value of the index is calculated by adding nominal issue size of each bond together:

$$\mathrm{NV} = \sum_{i=1}^{n} N_{i,t-s}$$

4.3.2.4.2.8. Market Value

The market value of the index at time t is calculated as follows:

$$MV_t = \sum_{i=1}^{n} \left(P_{i,t} + A_{i,t} + XD_{i,t-s} \cdot (CP_{i,t} + G_{i,t})\right) \cdot N_{i,t-s} \cdot IF_{i,t}$$

4.3.2.4.2.9. Base Market Value

The base market value (i.e. market value as at the base date) of the index is calculated as follows:

$$MV_0 = \sum_{i=1}^{n} (P_{i,t-s} + A_{i,t-s} + XD_{i,t-s} \cdot CP_{i,t-s}) \cdot N_{i,t-s} \cdot IF_{i,t-s}$$

4.3.2.4.3. Bond Analytics

There are several bond analytics that are calculated in addition to the index values and index analytics. In this chapter, the following annotations are used throughout the bond analytics formulas:

4.3.2.4.3.1. Index Ratio

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An index ratio is calculated for all inflation-linked bonds at every calculation date. The two different types (8 month lag vs. 3 month lag) of index-linked bonds are having different index ratio logic:

$$IR_{i,t}^{3m} = round\left(\frac{RefRPI_{i,t}}{BaseRPI_i^{3m}}, 5\right)$$

$$RefRPI_{i,t} = round\left[UKRPI_{i,t-3m} + \left(\frac{day_t - 1}{days_t}\right) \cdot \left(UKRPI_{i,t-2m} - UKRPI_{i,t-3m}\right), 5\right]$$

$$IR_{i,t}^{8m} = \frac{UKRPI_{i,NCD-8m}}{BaseRPI_i^{8m}}$$

Whereby:

Parameter	Legend
$RefRPI_{i,t}$	Reference RPI for bond i at time t
$BaseRPI_i^{3m}$	Base RPI for bond i accordingly to the RefRPI formula on bond issue date
$BaseRPI_i^{8m}$	RPI for bond i relating to the month eight months before the bond issue date
$UKRPI_{i,t-3m}$	RPI for bond i relating to the month three months before t
$UKRPI_{i,t-2m}$	RPI for bond i relating to the month two months before t
day_t	Day of month relating to t
$days_t$	Number of days of the month relating to t
$UKRPI_{i,NCD-8m}$	RPI for bond i relating to the month eight months before the next coupon date following t

4.3.2.4.3.2. Yield

The yield of a bond at time t is calculated as follows:

$$\frac{P_{i,t} + A_{i,t}}{IFA_{i,t}} = \sum_{j=1}^{n} CashFlow_{i,j}^{r} \cdot L_{i,t,j} \cdot (1 + Y_{i,t})^{-L_{i,t,j}}$$

The Newton iteration method is used to solve the equation for Yi,t.

Whereby:

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Parameter	Legend
$CashFlow_{i,j}$	Cash flow of bond i within period j without inflation adjustment
Li,t,j	Time in coupon periods for bond i between date t and the jth cash flow
n	Number of future cash flows

4.3.2.4.3.3. Duration

The duration of a bond at time t is calculated as follows:

$$D_{i,t} = \frac{IFA_{i,t}}{P_{i,t} + A_{i,t}} \cdot \sum_{j=1}^{n} CashFlow^{r}_{i,t} \cdot L_{i,t,j} \cdot (1 + Y_{i,t})^{-L_{i,t,j}}$$

4.3.2.4.3.4. Modified Duration

The modified duration of a bond at time t is calculated as follows:

$$MD_{i,t} = D_{i,t} \cdot \frac{1}{1 + Y_{i,t}}$$

4.3.2.4.3.5. Convexity

The convexity of a bond at time t is calculated as follows:

$$X_{i,t} = \frac{IFA_{i,t}}{P_{i,t} + A_{i,t}} \cdot \sum_{j=1}^{n} L_{i,t,j} \cdot \left(L_{i,t,j} + 1\right) \cdot CashFlow^{r}_{i,t} \cdot \left(1 + Y_{i,t}\right)^{-(L_{i,t,j}+2)}$$

4.3.2.5. SETTLEMENT CONVENTIONS

The indices are calculated assuming t+0 settlement.

4.3.2.6. CALCULATION PERIODS

The indices are calculated and distributed every minute in real-time, between 8:00 a.m. and 16:15 p.m. UK time.

4.3.2.7. REPORTING

A snapshot of the indices taken at 12:00 a.m. UK time is published on each STOXX calendar trading day. Index closing values, corresponding bond prices and analytics are published daily on STOXX website, after the close of business. In cases where the last trading day of any given month does not coincide with the last calendar day, separate index levels, will be published for that day.

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All data concerning the up-to-date index final composition is published at the evening of index rebalancing. Forecast composition files are available every day starting four trading days before the end of the last month of the rebalancing period. In case of early close days, which depends on the pricing data availability the reports will be produced close of business, as usual.

4.3.3. INDEX CORRECTION POLICIES

In the event of index value changes more than 2% against the previous index value, the corresponding index is labelled with "U" (unchecked). The calculated index value is subsequently checked for errors. In the case of a deviation in excess of 2% where no error occurred, the index is revalidated (i.e. labelled in line with its corresponding status).

4.3.3.1. INTERNAL ERRORS

If STOXX becomes aware of internal index calculation errors within a trading day, intraday values of the respective index are corrected for that specific day, if technically feasible and econo mically reasonable. Intraday values, which are not detected within the same trading day are not corrected but will retroactively be flagged as invalid.
If there are deviations that are considered significant by STOXX, index close values also will be corrected retroactively, if technically feasible and economically reasonable.

4.3.3.2. EXTERNAL ERRORS

Calculation errors that are based on incorrect external data are corrected as soon as possible, if technically feasible and economically reasonable. If there are deviations that are considered significant by STOXX, index close values will also be corrected retroactively, if technically feasible and economically reasonable. Intraday values that are not corrected will retroactively be flagged as invalid.

4.3.3.3. CORRECTION OF INDEX PARAMETER VALUES

All index parameters that are published by STOXX in the context of the index review are only corrected or adjusted at the subsequent rebalancing date. This rule applies regardless of when STOXX became aware of facts that would change the index parameter values during the index review process.

4.3.4. EXCEPTIONAL RULES

4.3.4.1. HANDLING OF UNFORSEEABLE EVENTS

In the case of an exceptional unforeseeable event that is not considered in this rulebook, STOXX may under consideration of the respective facts, apply procedures that differ from the aforementioned rules in this rulebook. This holds true especially in cases where i) there are no applicable rules, ii) the application of present rules does not lead to a clear result, iii) the rules contradict each other, and/or iv) the application of these rules lead to an inappropriate situation in the bond market. An example of an inappropriate situation is if the strict application of the rules heavily influences the liquidity of a company's emissions in the bond market. In the case that STOXX makes a decision that is outside the parameters of the rulebook, the decision will be published within an appropriate notice period.

4.3.4.2. CONSIDERATION OF EXTREME ECONOMIC SITUATIONS AND MARKET DISRUPTIONS

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In times of extreme economic situations and market disruptions, especially in cases where the price source is unavailable (e.g. market suspension or restriction), STOXX will generally use the last available price data.
Also in times of extreme economic cases, additional exceptions from this rulebook can be made, e.g. postponement of an ordinary review date.
All changes will be published within an appropriate notice period.

4.3.5. HISTORICAL DATA

Historical data is available since December, 31st 2010. The base value for all indices is 100 on that date.