Guide to the VDAX Volatility Indices

Formerly known as the Volatility Indices of Deutsche Börse

Version 3.4

Valid from 06 July 2021

General Information

With effect to August 2019 Deutsche Börse AG has transferred the administration of the VDAX Volatility Indices formerly known as the Volatility Indices of Deutsche Börse AG to its affiliate STOXX Ltd.

STOXX Ltd. develops, creates and calculates markets and publishes Indices for certain usages, e.g., the issuance of Financial Instruments. In general, an Index is any figure published or made available to the public that is regularly determined by the application of a formula (or any other method of calculation, or by an assessment) on the basis of the value of one or more underlying assets or prices, including estimated prices, actual or estimated interest rates, quotes and committed quotes, or other values or survey.

All VDAX Volatility Indices are governed by the respective index methodology applicable to the respective index or index family. Purpose of this Guide (“Guide”) is to provide for a comprehensible index methodology in continuity of the former Guide to the Equity Indices of Deutsche Börse AG as last amended with effect from 3 December 2018 (version 9.2.3).

In order to ensure the highest quality of each of its indices, STOXX Ltd. exercises the greatest care when compiling and calculating equity indices on the basis of the rules set out in this Guide.

However, STOXX Ltd. cannot guarantee that the various indices, or the various ratios that are required for index compilation and computation purposes, as set out in this Guide, are always calculated free of errors. STOXX Ltd. accepts no liability for any direct or indirect losses arising from any incorrect calculation of such indices or ratios.

The VDAX Volatility Indices in no way represent a recommendation for investment. In particular, the compilation and calculation of the various indices shall not be construed as a recommendation of STOXX Ltd. to buy or sell individual securities, or the basket of securities underlying a given index.

Recent Amendments to the Rules

Effective 06/07/2021	Version 3.4	Enhancement of rulebook wording and structure
Effective 17/06/2020	Version 3.3	Governance Update/ Clarification of Sections 3.2, 4, 5.2.2, 5.3, 5.4.1, 5.4.2
Effective 02/10/2019	Version 3.2	Clarifications relating to changes in the EONIA rate determination
Effective 16/08/2019	Version 3.1	Clarification relating to EU Benchmark Regulation and changes relating to the transfer of index administration to STOXX Ltd.
Effective 03/12/2018	Version 2.7	Removal of EURIBOR 2 and 9 month tenors Widening of conditions for increased maximum spreads from “Fast Market” to “Stressed Market” ion Filtering of Data Change of maximum spreads in Filtering of Data

1 Key Features

1.1 Concept

Volatility is a measure of the level of uncertainty prevailing in certain markets, or with respect to individual underlying instruments. In principle, there are two different approaches for the estimation of volatility: on the one hand, it is possible to determine historical volatility by measuring the standard deviation of prices for any particular security over a given period of time. On the other hand, volatility can be derived implicitly from option prices ('implied volatility'); this kind of volatility represents the expectations of market participants involved in a trade, on the basis of a given option price.

STOXX Ltd. calculates volatility indices that measure implied volatility using a model that has been jointly developed by Goldman Sachs and Deutsche Börse AG.The VDAX-NEW® indices are expressed in volatility percentage points.

The VDAX-NEW® computes the square root of implied variance across at- & out-of-the-money DAX® options of a given time to expiration. The main index (which is not linked to a specific maturity) has a fixed remaining time to expiration of 30 days. The VDAX-NEW® and its various sub-indices are updated every minute.[1]

1.1.1 Basis

The VDAX-NEW® indices measure the volatility implied by the options on the DAX index traded on Eurex.

The twelve VDAX-NEW® main indices are calculated for rolling 30, 60, 90, 120, 150, 180, 210, 240, 270, 300, 330 and 360 days to expiry via linear interpolation of the suiting sub-indices. The VSTOXX main indices are therefore independent of a specific time to expiry, i.e. they do not expire.

Apart from the VDAX-NEW® main indices, 8 sub-indices are calculated and distributed, covering the DAX option expiries ranging from one month to two years. For options with longer time to expiry, no such sub-indices are currently available.

The VDAX-NEW®sub-indices are calculated on the basis of all options available in the Eurex system.

[1] DAX®, Eurex®, VDAX-NEW®, REX® and Xetra® are registered trademarks of STOXX Ltd.

	Index	Code	ISIN
Main indices	VDAX-NEW	V1X	DE000A0DMX99
	VDAX-NEW 60	WD0Y	DE000A1A4LH7
	VDAX-NEW 90	WD0Z	DE000A1A4LJ3
	VDAX-NEW 120	WDQ0	DE000A1A4LK1
	VDAX-NEW 150	WDQ1	DE000A1A4LL9
	VDAX-NEW 180	WDQ2	DE000A1A4LM7
	VDAX-NEW 210	WDQ3	DE000A1A4LN5
	VDAX-NEW 240	WDQ4	DE000A1A4LP0
	VDAX-NEW 270	WDQ5	DE000A1A4LQ8
	VDAX-NEW 300	WDQ6	DE000A1A4LR6
	VDAX-NEW 330	WDQ7	DE000A1A4LS4
	VDAX-NEW 360	WDQ8	DE000A1A4LT2
Sub-indices	VDAX-NEW 1M EUR	V4F1	DE000A0G83V9
	VDAX-NEW 2M EUR	V4F2	DE000A0G83W7
	VDAX-NEW 3M EUR	V4F3	DE000A0G83X5
	VDAX-NEW 6M EUR	V4F4	DE000A0G83Y3
	VDAX-NEW 9M EUR	V4F5	DE000A0G83Z0
	VDAX-NEW 12M EUR	V4F6	DE000A0G8300
	VDAX-NEW 18M EUR	V4F7	DE000A0G8318
	VDAX-NEW 24M EUR	V4F8	DE000A0G8326

1.2 Publication

VDAX-NEW® main and sub-indices are calculated on every Eurex® exchange trading day, during the period from 9:15 a.m. to 5:30 p.m. CET[2].

The calculation of a sub-index only commence when all required input data are available. The data required for the index calculation is described in the chapter for calculation (VDAX-NEW®, cf. section 2).

The dissemination of the main indices begins as soon as two sub-indices are available for an interpolation.

The VDAX-NEW® utilize data from the previous trading day (settlement prices) as long as no data from the current day is available.

[2] VDAX-NEW® and the corresponding sub-indices have been calculated since 8:50 a.m. until 20 October 2006.

2 Calculation Method

2.1.1 Input Data

During the calculation hours for the VDAX-NEW® and the sub-indices (9:15 a.m. to 5:30 p.m. CET), the following data is recorded every minute:

DAX® - DAX Index, calculated on the basis of Xetra® prices. For information regarding DAX® please refer to the "DAX Equity Indices".

ODAX® - Best bid, best ask, last trade and settlement price of all DAX options. STOXX Ltd. will exclude from their indices all options as soon as their delisting becomes known (e.g. direct notification from the market, or unavailability of a settlement price).

EONIA - Euro Overnight Index Average – overnight interest rate, calculated as the European short-term rate (€STR) + 8.5 bps.

EURIBOR - Euro Interbank Offered Rates – money market reference rates (calculated once a day, 11:00 a.m. CET, by the European Banking Federation)

REX® - Yield of the 2-year REX (calculated from exchange-traded prices) as the longer-term interest rate. For information regarding REX cf. the "Guide to the REX Bond Indices".

The model for VDAX-NEW® aims at making pure volatility tradable - i.e. it should be possible to replicate the indices with an options portfolio which does not react to price fluctuations, but to changes in volatility only. This is not achieved through direct replication of volatility, but rather of variance. A portfolio of DAX® options with different strike levels and weighting meets this goal: the implied volatilities of all eligible options with a given time to expiry are considered.

2.1.1.1 Preparation of option inclusion prices

First, the trade price, the mid quote and settlement prices of each option and corresponding timestamps are identified. A price filter is applied in that any trade price, mid quote or settlement price below 0.5 points is ignored.

The mid quote is only calculated if the following requirements are fulfilled:

1. both the bid and ask quotes are available and
2. both the bid and ask quotes are equal to or greater than 0.1 points and
3. the bid-ask spread does not exceed the following thresholds:
    a. normal market: 8% of bid quote, with a minimum of 2 points and a maximum of 24 points and
    b. stressed market: 16%, with a minimum value of 4 points and a maximum of 48 points.

If there are two or more options with different strikes and mid quotes that exactly equal the minimum value of 0.5, only the one closer to the at-the-money point is taken into consideration.

For each option used in the calculation of a sub-index, the Inclusion Price is then defined as the most recent among:

1. trade price, or
2. mid quote, or
3. settlement price.

If both a trade price and a mid quote exist with identical timestamp, preference is given to the trade price.

Underlying	Settlement	Bid (time)	Ask (time)	Mid (time)	Last-traded (time)	Price
4,000	383.30	--	--	--	383.5	**383.30**
4,050	333.40	--	--	239.70	383.5 (09:05)	**383.50**
4,100	283.50	287.1 (09:04)	290.0 (09:05)	288.55 (09:05)	--	**288.55**
4,150	233.70	237.2 (09:03)	240.2 (09:05)	239.70 (09:05)	237.2 (09:01)	**239.70**

2.1.1.1 Discount rates

Discount rate	Period	Code	ISIN
EONIA	1 day	EU1D	EU0009659945
EURIBOR 1 month	1 month	EU1M	EU0009659937
EURIBOR 3 months	3 months	EU3M	EU0009652783
EURIBOR 6 months	6 months	EU6M	EU0009652791
EURIBOR 12 months	12 months	EU12	EU0009652809
REX 2-YEAR (PRICE INDEX)	2 years	REX2	DE0008469149

2.1.2 Calculation of VDAX-NEW® main indices

Twelve VDAX-NEW® main indices are calculated with fixed time to expiry.

The main indices are calculated by linear interpolation of the sub-indices whose times to maturity better represent the targeted fixed time to expiry.

If two sub-indices exist whose time to maturity bracket the time to maturity targeted by the main index, then the main index is calculated as interpolation of the two sub-indices.

When the maturity of two sub-indices used in the calculation of a main index approaches, the respective time to maturities may not bracket the fixed time to maturity of the main index: in this case, the algorithm extrapolates between the two sub-indices.

However, as time passes by, as soon as an interpolation between two other sub-indices becomes possible, the algorithm switches to the new sub-index pair.

Each VDAX-NEW® main index is calculated as a time-weighted average of two VDAX-NEW® sub-indices, as shown in the following formula:

$$\text{MainIndex}_{tm} = 100 \cdot \sqrt{\left[\frac{T_{st}}{T_{365}} \cdot \left(\frac{\text{SubIndex}_{st}}{100}\right)^2 \cdot \frac{T_{lt}\text{-}T_{tm}}{T_{lt}\text{-}T_{st}} + \frac{T_{lt}}{T_{365}} \cdot \left(\frac{\text{SubIndex}_{lt}}{100}\right)^2 \cdot \frac{T_{tm}\text{-}T_{st}}{T_{lt}\text{-}T_{st}}\right] \cdot \frac{T_{365}}{T_{tm}}}$$

where:

tm	= Fixed time to maturity, expressed as number of days, targeted by the main index.
MainIndex_{tm}	= VDAX-NEW® main index with fixed time to maturity of tm days.
SubIndex_{st}	= VDAX-NEW® sub-index with shorter maturity used in the inter(extra)polation.
SubIndex_{lt}	= VDAX-NEW® sub-index with longer maturity used in the inter(extra)polation.
T_{st}	= Seconds to expiry of SubIndex_{st}.
T_{lt}	= Seconds to expiry of SubIndex_{lt}.
T_{tm}	= Seconds in tm (1 day = 86,400 sec.).
T_{365}	= Seconds in a standard year of 365 days (31,536,000 sec.).

If one of or both the sub-indices required for the calculation of a main index are not available, the main index is not calculated.

2.1.3 Calculation of VDAX-NEW® sub-indices

Each of the eight VSTOXX sub-indices is calculated according to the formula shown below:

$$\text{SubIndex}_i = 100 \cdot \sqrt{\sigma_i^2}$$

where:

i	= i^{th} sub-index (i = 1, …, 8).
σ_i^2	= Implied variance for the the i^{th} ODAX expiry date:

$$\sigma_i^2 = \frac{2}{T_i/T_{365}} \cdot \sum_j \frac{\Delta K_{i,j}}{K_{i,j}^2} \cdot R_i \cdot M_{K_{i,j}} - \frac{1}{T_i/T_{365}} \cdot \left(\frac{F_i}{K_{i,0}} - 1\right)^2$$

T_i	= Seconds to the i^{th} ODAX expiry date.

F_i = Forward at-the-money price for the i[th] ODAX expiry date, derived from exercise price for which the absolute difference between call and put prices is smallest. If multiple pairs of calls and puts exist with identical price differences, a forward price will be calculated as the simple average of the corresponding implied forward prices:

$$F_i = K_{\min|C-P|} + R_i \cdot (C-P)$$

$K_{i,0}$ = Highest exercise price not exceeding F_i.

$K_{i,j}$ = Exercise price of the j[th] out-of-the-money option, after sorting the options by their exercise prices in ascending order (i.e. call options for exercise prices above $K_{i,0}$, put options otherwise).

$\Delta K_{i,j}$ = Average distance between the exercise prices of the two options struck respectively immediately above and immediately below $K_{i,j}$. On the boundaries, the simple distance between the highest (lowest) and second-highest (lowest) exercise price for call (put) options is used:

$$\Delta K_{i,j} = \frac{1}{2} \cdot \left(K_{i,j+1} - K_{i,j-1}\right)$$

$M_{K_{i,j}}$ = Inclusion price of the out-of-the-money option with exercise price $K_{i,j}$.

$M_{K_{i,0}}$ = Simple arithmetic average of put and call prices of the option with exercise price $K_{i,0}$.

R_i = Refinancing factor for the i[th] ODAX expiry date:

$$R_i = e^{r_i \cdot T_i / T_{365}}$$

r_i = Interpolated risk-free interest rate valid for the i[th] ODAX expiry date:

$$r_i = \frac{T_{lt} - T_{tm}}{T_{lt} - T_{st}} \cdot r_{st} + \frac{T_{tm} - T_{st}}{T_{lt} - T_{st}} \cdot r_{lt}$$

If less than five options can be used for the calculation of a sub-index, that sub-index is not calculated.

The sub-indices are calculated up to two days prior to expiry. Each new sub-index, i.e. an index calculated with newly issued options, is disseminated for the first time on the second trading day of the relevant DAX® options.

<u>Example:</u>

Index calculation: 25 November 2004 at 11:00 a.m. CET

Expiration (i = 1): 17 December 2004 at 1:00 p.m. CET

$$T_1 = \frac{1{,}908{,}000}{365 \cdot 60 \cdot 60 \cdot 24} = 0.0605022831$$

$r(T_k)$ = 2.05% (EONIA)

$r(T_{k+1})$ = 2.18% (EURIBOR, 1 month)

$r(T_i)$ = 2,14%

$R_1 = e^{r \cdot t} = 1.001298$

$K_{min|C\text{-}P|}$ = 4,150

F_1 = 4,151.401817

Exercise Price $K_{i,j}$	$\Delta K_{i,j}$	Call	Put	|Call – Put|	$M(K_{i,j})$	$\frac{\Delta K_{i,j}}{K_{i,j}^2} R_i M(K_{i,j})$
~~3,350~~	~~50~~	~~793.90~~	~~0.30~~	~~**793.60**~~	~~0.30~~	
3,400	50	734.70	0.60	**734.10**	0.60	0.0000025985
3,450	50	684.80	0.80	**684.00**	0.80	0.0000033649
3,500	50	635.00	0.90	**634.10**	0.90	0.0000036782
3,550	50	585.30	1.10	**584.20**	1.10	0.0000043698
3,600	50	535.60	1.20	**534.40**	1.20	0.0000046355
3,650	50	486.00	1.70	**484.30**	1.70	0.0000063883
3,700	50	436.60	1.80	**434.80**	1.80	0.0000065825
3,750	50	387.40	2.90	**384.50**	2.90	0.0000103242
3,800	50	355.00	2.90	**352.10**	2.90	0.0000100543
3,850	50	290.10	5.50	**284.60**	5.50	0.0000185765
3,900	50	249.00	6.40	**242.60**	6.40	0.0000210656
3,950	50	202.90	10.50	**192.40**	10.50	0,0000336913
4,000	50	165.70	15.20	**150.50**	15.20	0.0000475605
4,050	50	120.50	24.80	**95.70**	24.80	0.0000756946
4,100	50	90.00	38.70	**51.30**	38.70	0.0001152567
4,150	50	59.00	57.60	**1.40**	58.30	0.0001694710
4,200	50	36.20	85.00	**48.80**	36.20	0.0001027385
4,250	50	20.30	130.00	**109.70**	20.30	0.0000562654
4,300	50	11.10	174.80	**163.70**	11.10	0.0000300545
4,350	50	6.00	212.75	**206.75**	6.00	0.0000158743
4,400	75	3.00	267.50	**264.50**	3.00	0.0000116367
4,500	100	1.20	365.60	**364.40**	1.20	0.0000059335
~~4,600~~	~~100~~	~~0.40~~	~~497.70~~	~~**497.30**~~	~~0.40~~	
					Σ	**0.0007558154**

$$\sigma_i^2 = 0.024984689 - 0.000001886 = 0.024986576$$

$$\text{VDAX-NEW}_1 = 100 \cdot \sqrt{0.024986576} = 15.8071$$

2.2 Calculation of Index Settlement Index

A Settlement Day is defined, for each main index, as the 30th calendar day preceding the expiry of the DAX® options.

The Settlement Level of each main index is calculated on the Settlement Day as the average of all valid ticks that index produced during an expanding time window starting at 12:30:00 CET up to the current calculation time and not later than 13:00:00 CET:

$$\text{Settle}_{\text{index}} = \frac{1}{n_t} \sum_{i=1}^{n_t} \text{tick}_{\text{index},i}$$

where $\text{tick}_{\text{index},i}$ indicates the i^{th} tick for the relevant main index up to calculation time t.

Interim settlement values, i.e. values calculated on the expanding window before 13:00:00 CET, are disseminated with an "V" flag. The final settlement value is marked as "F".

2.3 Certification of index ticks

With reference to both sub- and main indices, each index tick is verified before being published. The process will result in the addition of a flag to the individual index tick, showing its status.

Status flags are updated at every index tick, i.e. they reflect the status of the tick they are associated to.

A tick can be flagged as either "A" (for "Approved" tick) or "U" (for "Unapproved" tick).

Any tick exceeding a certain deviation tolerance limit from the previous tick is flagged as "U".

The maximum deviation allowed is set respectively to ±20% for sub- and ±8% for main indices.

A sub-index tick flagged as "U" will still be used in the calculation of any derived main index. Any main index derived from an "Unapproved" sub-index will inherit the "U" status flag.

Index ticks flagged as "U" are displayed for information purpose only and are not meant to be considered as valid values.

However, main index ticks marked as “U” are used in the calculation of the respective index settlement level.

3 Calculation Correction

This section outlines the rules and procedures applicable in case of a calculation error meaning the provision of index values, usage of index constituents or other elements or the application of weightings, capping, or other aspects of the index methodology in a manner that is not line with this index methodology, e.g. due to a mistake, incorrect input data, etc.

3.1 Rule-based Correction

STOXX Ltd. corrects a Calculation Error without delay on the dissemination day it occurred, provided that STOXX Ltd. becomes aware of such Calculation Error before 15:30 CET of that dissemination day and insofar as technically and operationally feasible. STOXX Ltd. does not change intraday index composition of an index.

If STOXX Ltd. became aware of a Calculation Error at or after 15:30 CET, STOXX Ltd. aims at correcting the Calculation Errors as of the end of the next dissemination day, including corrections to index constituents.

STOXX Ltd. amends without undue delay previous incorrect index values or input data only if they are required for the subsequent index values calculation. Incorrect real-time index values disseminated before the effective time of the correction are not restated.

3.2 Non-rule based Correction

If the above-outlined rule-based error correction cannot be applied, the relevant STOXX Committee assesses without undue delay:

- if and how the Calculation Error should be corrected, including if the index shall be restated, and/or
- if the dissemination of index values shall be suspended (Discretionary Rule, see Section 5.4.1).

An index should be restated, when the performance of the index (other than Selection Indices) can no longer be replicated. A suspension of index dissemination is triggered when the relevantSTOXX Committee decides that the correction will take significant time during which misleading index values could lead to financial, legal and reputational risks (Discretionary Rule, see Section 5.4.1**Error! Reference source not found.**).

STOXX Ltd. suspends the dissemination of an index at the latest at the end of the dissemination day after it became aware of a Calculation Error, if the Calculation Error has not been corrected by then.

STOXX Ltd. will resume the dissemination of the index as soon as the correct index calculation is feasible, and the correct historical values are available.

3.3 Notifications

In general, notifications take the form of an announcement on the DAX website (http://www.dax-indices.com). Announcements can (but need not, , depending on the decision of STOXX Ltd.) be published via financial relevant media.

With regard to Calculation Errors, STOXX Ltd. issues notifications in accordance with the following rules:

- STOXX Ltd. will publish a notification before correcting a Calculation Error. Notifications are effective immediately following their issuance, unless otherwise specified in the notification.
- The notification will specify if a Calculation Error will be corrected retrospectively. In case of retrospective correction, STOXX Ltd. will publish the notification using the new end of day closing price.
- If STOXX Ltd. decides under Calculation Correction (Section 3.2) that index dissemination is suspended until the Calculation Error is corrected, a resume notification is published specifying the point in time when index dissemination is resumed and the correction will take place.

STOXX Ltd. will refrain from the issuance of a notification if it reaches the view that the issuance of a notification is not in line with the applicable laws and may decide to issue such Notification at a later point in time when such reasons have lapsed (Discretionary Rule, see Section 5.4.1). By reason of force majeure or other events beyond the control of STOXX Ltd. it might become impossible for STOXX Ltd. to issue a notification in due time or by the means set out herein. In such cases STOXX Ltd. may exceptionally issue the notification either subsequently immediately following such event or in any case by other means (Discretionary Rule, see Section 5.4.1).

4 Limitations

This section applies in the event of Limitations that occur due to:

- insufficient rules, meaning the absence of a methodology rule, provision or procedure which leads to a failure when determining the respective index value or which leads to an index value that does not properly reflect the concept / nature of the index, e.g.:
    - performance of the index can no longer be physically replicated;
    - insufficiently available index constituents to fulfil the requirements of the Index Methodology;
- unclear rules, meaning a situation in which the rules leave multiple possible interpretations on how a certain rule shall be applied to a specific situation;

- data insufficiency, meaning a scenario in which the calculation of an index is no longer possible due to insufficient data quantity or quality;
- failure to produce index values as intended;

  market disruption which results in the performance of the index being unable to be tracked,
- events with a market impact that by their nature could reasonably not be foreseen, or events whose impact on an index or the economic reality the index intends to represent, cannot be determined in advance. Events covered in this section include, but are not limited to, events of natural, social, political, economic nature that may negatively impact regional or global societies or economies. Examples may be, but are not limited to, the following: (i) change to currency convertibility or restriction on capital flows announced by a country; (ii) market disruption, e.g. an event that materially negatively influences the aggregated liquidity, capitalization or tradability of an entire market; (iii) exchange closure, (iv) government intervention, (v) pandemic, (vi) natural catastrophe.

If a Limitation has occurred, the IGC shall decide if and how the Limitation shall be rectified (Discretionary Rule, see Section 5.4.1). Any such rectification may comprise deviations from the index methodology which may apply as long as the Limitation persists (Discretionary Rule, see Section 5.4.1).

In this context, STOXX may also decide to cancel an index review.

If a Limitation that could justify the cancellation of an index review occurs two or fewer dissemination days before the scheduled review implementation day, the review will be performed as planned, if reasonably possible. This aims to avoid last minute changes and not undermine the trading activity that may have already been performed.

If a review is cancelled, STOXX aims to perform it at the next scheduled review of the index or at the next quarterly review date (3rd Friday of March, June, September and December), whichever comes first and subject to the then prevailing market conditions.

If a decision to deviate from the index methodology is taken, it will be communicated as soon as possible in form of an Announcement or Press Release. STOXX Ltd. will refrain from the issuance of a notification if it reaches the view that the issuance of a notification is not in line with applicable laws and may decide to issue such notification at a later point in time when such reasons have lapsed (Discretionary Rule, see Section 5.4.1). By reason of force majeure or other events beyond the control of STOXX Ltd. it might become impossible for STOXX Ltd. to issue a notification in due time or by the means set out herein. In such cases STOXX Ltd. may exceptionally issue the notification either subsequently immediately following such event or in any case by other means.

Any measures will be implemented two dissemination days later and will enter into effect the next dissemination day after implementation, unless a different effective date is specified in the notification.

5 Methodology Review

The purpose of the methodology review is to ensure integrity of the index, i.e. that the index methodology remains executable and results in an accurate and reliable representation of the market / economic realities the index seeks to measure.

5.1 Frequency of Review

In order to ensure the index integrity is maintained at all times, the methodology is reviewed annually and ad hoc if a Limitation has occurred. If a Limitation cannot be properly dealt with by a methodology review, this may give rise to an index cessation or index transition. STOXX Ltd. shall not be liable for any losses arising from any decisions taken as part of a methodology review.

5.2 Review Procedure

5.2.1 Initiation of Methodology Review

The IMC proposes an annual methodology review schedule for approval by the IGC (Discretionary Rule, see Section 5.4.1).

The IMC is in charge of initiating ad hoc methodology reviews in case of a Limitation or based on recommendations to initiate a Methodology Review by other STOXX Ltd. Committees (Discretionary Rule, see Section 5.4.1).

5.2.2 Decision and Escalation

The following STOXX. Committees are responsible for making the decisions on amendments to an index methodology:

The IMC decides on changes to the index methodology, unless

a) a material change to the index methodology is proposed (see Section 5.3 below),
b) the change is triggered by an Unclear Rule or Insufficient Rule (as part of a Limitation, Section 4), or
c) it relates to a request for a market consultation
d) financial products relating to the index have a notional value/notional amount of more than EUR 100 mn.

If any of the conditions a) to d) above is met, the decision is taken by IGC.

5.3 Material Changes with Consultation

As described in the STOXX Changes to Methodology Policy and in STOXX Consultation Policy (publicly available on STOXX website) , prior to proposed material changes to the index methodology, a consultation will be performed.

A change to an index methodology shall be considered material in the event of:

a) a substantial change in the index objective or market/economic reality the index aims to represent (e.g. market leader components vs. mid cap companies), or
b) a substantial change of the index methodology in aspects such as, but not limited to, the ones listed below and that would result in altering the overall concept or the nature of the index:
   i. calculation methods or formulas with a substantial impact on the index performance, or
   ii. rules regarding the determination of index constituents by application of the index methodology, or
   iii. rules regarding the determination of the weights of index constituents by application of the index methodology,
   iv. rules regarding the treatment of corporate actions.

On the contrary, index methodology updates resulting from the application of existing methodology principles or minor clarifications of existing rules or corrections without altering the overall concept or the nature of the index are generally considered non-material.

The IMC determines whether an amendment is material as defined above. In case such determination is not possible, the proposed amendment shall be treated as material.

(Discretionary Rule, see Section 5.4.1).

In case of Changes to Methodology as described in STOXX Changes to Methodology Policy a STOXX consults with reasonably affected stakeholders ("Stakeholders") prior to take decision.

Stakeholders mean (a) persons or entities who have an index license with STOXX regarding a benchmark administered by STOXX (Subscribor) and/or as far as STOXX is reasonable aware (b) persons or entities and/or third parties who own contracts or financial instruments that reference a benchmark administered by STOXX (Investors)

Taking into account the Principle of Proportionality, STOXX informs affected Stakeholders as follows:

- either via public consultation open to the entire market and performed via STOXX website;
- or, when the relevant Stakeholders are known, on a restricted basis directly on the Stakeholders e-mail address.

STOXX shall inform in writing the Stakeholders on:

- the key elements of the proposed relevant changes
- the rationale for any proposed relevant changes
- the specific questions to be answered
- the deadline for receiving feedback
- the timeline of implementation of the Relevant Changes
- contact details where to provide feedback
- relevant definitions

The consultation shall enable Stakeholders to submit comments.

The standard consultation period shall be 1 month with the option to shorten or extend this period.

The IGC may decide to shorten the 1-month period in the following cases:

- in extreme or exceptional market conditions or analogous extraordinary situations
- in urgent cases, such as a situation in which the Index cannot be replicated anymore;
- in situations where there is no known Stakeholders impact or only a limited number of Stakeholders;
- in order to align the effective date of a proposed changed with Index Maintenance; e.g. an Equity/Bond Index Rebalancing, Index Review, and Corporate Action Adjustment, or
- any other similar cases applying the principle of proportionality.

The IGC s will consider the feedback received and decide whether the relevant changes shall become effective.

The IGC is not bound by any feedback received. Moreover, if the received feedback is ambiguous, or if no Stakeholders participated, the IGC may decide to conduct another consultation, which again will not be binding.

If the IGC decides that relevant changes shall become effective, STOXX will communicate a timeline on the implementation of the relevant changes, if not already communicated in the consultation material.

STOXX will after the consultation make available the Stakeholders feedback received in the consultation and STOXX's summary response to those comments, except where confidentiality has been requested by the respective Stakeholders.

The decision will be communicated as soon as possible in the form of an Announcement or Press Release.

STOXX Ltd. will refrain from issuance of a notification if it reaches the view that the issuance of a notification is not in line with applicable laws and may decide to issue such notification at a later point in time when such reasons have lapsed.

By reason of force majeure or other events beyond the control of STOXX Ltd. it might become impossible for STOXX Ltd. to issue a notification in due time or by the means set out herein. In such cases STOXX Ltd. may exceptionally issue the notification either subsequently immediately following such event or in any case by other means.

At the end of each consultation STOXX Ltd. will make available the feedback received from Stakeholders in the consultation together with a summary of its response to that feedback, except where confidentiality has been requested by the respective Stakeholders. (Discretionary Rule, see Section 5.4.1).

5.4 Discretion

Save for the cases expressly described in this Guide, the index methodology is entirely rule-based and automatic. Discretion only applies if expressly stated and must be exercised as provided for in this Guide.

5.4.1 Exercise of Discretion

Discretion may only be exercised by STOXX Committee(s) (as defined hereafter) with a view to resolve issues arising in maintaining the prevailing index methodology in response to events, with an overarching aim to accurately and reliably measure the market or economic realities as defined in this Guide.

Discretion shall be exercised in line with the following principles:

- The body or person(s) exercising discretion must not be affected by a conflict of interest;
- The body or person(s) exercising discretion must have the requisite skills, knowledge and experience to exercise such discretion;
- All facts and circumstances relevant for the exercise of discretion must have been established and properly documented prior to the exercise of discretion;
- The exercise of discretion must comply with all applicable laws and regulations;

- The body or person(s) exercising discretion must act on the basis of the relevant facts and circumstances only, must give proper weight to the various considerations and ignore irrelevant facts and circumstances;
- The body or person(s) exercising discretion must act with a view to maintain the integrity of the market or economic reality by aiming to ensure that indices remain representative and can be replicated, taking into account, inter alia, some, or all of the following:
  - Relevance of the event to the DAX indices
  - Trading accessibility of the affected market
  - Availability of alternative markets
  - Ability of market participants to replicate the index or, where applicable, the results of the index review
  - Public information related to the events and their development in the foreseeable future
-
- The body or person(s) exercising discretion must act honestly, reasonably, impartially and in good faith.

As part of the decision-making process, STOXX may consult with external stakeholders.

Discretionary Rule: *Any exercise of discretion must take into account the rationale of the index, the purpose of the rules with regard to which discretion is exercised, the objective to preserve market integrity and reliability of the index calculation to avoid undue market impact, the technical feasibility and economic reasonability, and the interest of licensees or investors.*

The cases in which STOXX Ltd. may exercise discretion regarding the index methodology and its application are noted in the respective rules of this Guide.

The following bodies (hereafter each of them separately also referred to as “STOXX Committee”) are involved in the decision-making process relevant for the indices governed by this Guide:

- Product Initiation Committee (PIC),
- Product Approval Committee (PAC),
- Index Operations Committee (IOC),
- Index Management Committee (IMC),
- Index Governance Committee (IGC),
- Oversight Committee (OC),
- Management Board (MB).

The following table summarizes the cases in which STOXX Committee(s) may exercise discretion regarding the index methodology and its application:

Case	Responsible STOXX Committee

Index Termination and Transition	IGC
Sector Affiliation	IGC
Exclusion from Rankings	IGC
Deviation from Fast Exit/Fast Entry rules and Regular Exit/Regular Entry rules in exceptional cases	IGC
Procedure in case of a breach of the Basic Criteria	IGC
Determination of expected price to new shares in case of Subscription Rights on Other Share Classes	IGC
Procedure for Subscription Rights on Instruments with Embedded Options	IGC
Limitations	IGC
Review and approve treatment of Calculation Errors. Non-rule-based Correction.	IOC, IGC
Annual methodology review schedule	IGC
Initiation of ad hoc methodology reviews	IMC
Determination regarding materiality of changes to the index methodology	IMC,
Deviation from standard consultation period in case of material changes of the index methodology	IGC
Deviations from notification procedure in case of non-material changes of the index methodology	IMC
Extreme or exceptional market conditions or analogous extraordinary situations to be addressed in a fast track way (e,g, Pandemic)	IGC
Periodic review of current index methodologies (e.g. matching of underlying interest) including initiation of ad-hoc reviews of benchmarks or benchmark families and clarification of methodologies (if required).	IGC
(Annual) Review of the control framework (including identification of operational risks and definition of measures that address operational risks).	IOC, IMC
Review and approve reports on monitoring of outsourced service providers, contributors, risks and incidents reporting (Art. 10 BMR relevant)	IGC
Consideration and follow-up on the implementation of remedial actions based on results of internal and external audits.	IGC
Monitoring of input data (including input data from contributors).	IOC, IGC, OC

Review and approval of special cases identified during index review	IOC, IMC, IGC
Review and approval of complex corporate actions (disagreement on treatment of corp. action or application of rules)	IOC, IMC, IGC
Decisions with respect to complaints.	IGC
Review and approve periodic reporting requirements under the Periodic Review Policy.	IGC
Review and approve changes in case thresholds of significant or critical benchmarks exceeded and notify competent authority	IGC
Approval of introduction of new internal or strategic projects for new product ideas.	PIC
Responsibilities for clients requests: Decision to proceed or not or further analysis required.	PIC
Approval of launch of new products, including checks on suitability based on Positioning Paper .(including Regulatory Checklist, financial products that will be used and confirmation that any maintenance tool will be delivered by the launch date).	PAC, IGC
Responsibilities for clients, strategic or internal requests: -Final estimation of costs and revenues and final launch date -Final Positioning Paper (including Regulatory Checklist, financial products that will be used and confirmation that any maintenance tool will be delivered by the launch date).	PAC, IGC

5.4.2 Index Termination Policy

For termination of an index or an index family that underlie financial products issued on the market, to the knowledge of STOXX Ltd., a market consultation will be conducted by STOXX Ltd. in advance of the termination in line with STOXX Transition Policy and STOXX Consultation Policy (publicly available on STOXX website).The length of the consultation period will be defined in advance based on the specific issues of each proposed termination subject to STOXX Benchmark Transition Policy (Discretionary Rule, see Section 5.4.1). During the consultation period, clients and third parties will have the chance to share their concerns regarding the termination of the index or index family. Based on the collected feedback, STOXX Ltd. may rethink its decision to terminate an index or an index family (Discretionary Rule, see Section 5.4.1). At the end of the consultation period, STOXX Ltd. will publicly announce its final decision about the termination. A transition period will be granted in the event of termination (Discretionary Rule, see Section 5.4.1).

For termination of an index or an index family that do not underlie financial products issued on the market, no market consultation will be conducted.

6 Contact

- Information on prices, index concepts and licenses

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