STOXX®
STRATEGY
INDEX GUIDE

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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 Strategy guide** contains the formulas and description of all non-equity/strategy indices
- » The **STOXX Dividend Points Calculation guide** describes the dividend points products
- » The **STOXX Distribution Points Calculation guide** describes the distribution points products
- » The **STOXX ESG 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 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 Statistical Calculations** guide provides a detailed view of definitions and formulas of the statistical 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 indices, the individual component selection process, weighting schemes and overview of the index and bond analytics formulas

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

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2. CHANGES TO THE GUIDE BOOK

2.1. HISTORY OF CHANGES TO THE STOXX STRATEGY GUIDE

- May 2012: Update of 7.3.4 Adjustments due to Extreme Market Movements
- December 2012: Update of 5. STOXX Short and Leverage
- February 2013: Update of 5. STOXX Short and Leverage
- May 2013: Introduction of EURO STOXX 50 BuyWrite (100%) index as sub-index of existing EURO STOXX 50 BuyWrite index
- August 2013: Detailed listing of RIC codes used for Interbank Rates in Chapter
- November 2013: Introduction of EURO STOXX 50 Futures Roll
- March 2014: Chapter 5. STOXX Short and Leverage
- April 2014: Reformulation of EURO STOXX 50 Volatility (VSTOXX) methodology
- June 2014: Addition of index flag description to EURO STOXX 50 Volatility (VSTOXX) methodology
- July 2014: Addition of chapter 3 GENERAL PRINCIPLES
- August 2014: Adjustment of Risk Control indices; correction of EURO STOXX 50 Volatility (VSTOXX) main indices formula; addition of components' weights calculation for EURO STOXX 50 Volatility (VSTOXX) main indices; addition of STOXX Global 3D Printing Tradable Daily Short
- September 2014: Clarification of return types of risk control indices
- November 2014: Adjustment of thresholds for reverse splits for STOXX Leverage and Short indices in chapter 7.3.5
- March 2015: Expansion of STOXX Currency Hedged index with the introduction of STOXX Daily Hedged indices
- May 2015: Clarification of distinction between implied and realized volatility in the calculation of EURO STOXX 50 Risk Control indices
- June 2015: Clarification on interest rates applied to Risk Control indices
- June 2015 (2): Clarification regarding real-time calculation of Currency Hedged indices
- July 2015: Clarification regarding the weight capping in the Risk Control indices
- July 2015(2): Introduction of EURO STOXX 50 Protective Put 80% 18m 6/3
- October 2015: Update of real-time calculation rule for Currency Hedged indices
- October 2015 (2): Introduction of EURO STOXX 50 Volatility of Volatility (V-VSTOXX); amendments to EURO STOXX 50 Volatility (VSTOXX)
- April 2016: Introduction of EURO STOXX 50 Traded Futures Roll and EURO STOXX 50 Futures Replication
- May 2016: Introduction of EURO STOXX 50 Multi-Asset indices
- July 2016: Addition of STOXX Futures Roll and Futures Replication indices to sections 18 and 19
- August 2016: Addition of STOXX Global Basket
- August 2016: Enhancement of the EURO STOXX 50 Multi-Asset index family – introduction of EURO STOXX 50 Multi-Asset Momentum Risk Cap indices
- September 2016: Clarification on the inclusion criteria for OESX options in VSTOXX index and OSX options in V-VSTOXX index
- March 2017: Introduction of VSTOXX Short-Term Futures Investable indices
- September 2017: V-VSTOXX: change to options on VSTOXX futures with OVS2 as data source

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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 Strategy 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.

4. EURO STOXX 50 BUYWRITE

4.1. OVERVIEW

The EURO STOXX 50 BuyWrite Index reflects the so-called 'buy-write option' strategy. With this strategy, which is also referred to as covered call, an investor buys the EURO STOXX 50 index (price or total return indeces) as an underlying instrument and simultaneously sells a EURO STOXX 50 call option.

The index is available as the original EURO STOXX 50 BuyWrite Index, with option struck at 105%, and the subsequently added EURO STOXX 50 BuyWrite Index (100%), with option struck at 100%.

The index is based on the EURO STOXX 50 price index or on the EURO STOXX 50 total return index and a EURO STOXX 50 call option traded at Eurex.

4.2. BASIC DATA

Index	ISIN	Symbol
EURO STOXX 50 BuyWrite (Price)	CH0029148886	SX5EBP
EURO STOXX 50 BuyWrite (Net Return)	CH0026600970	SX5EBW
EURO STOXX 50 BuyWrite (100%) (Price)	CH0211959595	SX5EBP2
EURO STOXX 50 BuyWrite (100%) (Net Return)	CH0211959603	SX5EBW2

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4. EURO STOXX 50 BUYWRITE

4.3. CALCULATION

The EURO STOXX 50 BuyWrite index Formula

Two versions of the indices are available, Total Return and Price.

Total Return

The Total Return version of the index combines the EURO STOXX 50 (Net Return) Index and a EURO STOXX 50 call option.
On regular trading days the Total Return version is calculated as follows:

$$BW(TR)_t = \frac{\left[\dfrac{ESTX50(NR)_t}{ESTX50(NR)_{EXP}} \cdot ESTX50(P)_{EXP}\right] - C_t}{ESTX50(P)_{EXP} - C_0} \cdot BW(TR)_{EXP}$$

The rolling is carried out monthly on every third Friday, i.e. on the expiry date (EXP).

$$BW(TR)_{EXP} = \frac{\left[\dfrac{ESTX50(NR)_{EXP}}{ESTX50(NR)_{EXP-1}} \cdot ESTX50(P)_{EXP-1}\right] - C'_{EXP}}{ESTX50(P)_{EXP-1} - C'_0} \cdot BW(TR)_{EXP-1}$$

Where:

$BW(TR)_t$	= EURO STOXX 50 BuyWrite index or EURO STOXX 50 BuyWrite (100%) index at time (t)
$BW(TR)_{EXP}$	= Settlement value of EURO STOXX 50 BuyWrite index or EURO STOXX 50 BuyWrite (100%) index at the previous expiry date (EXP)
$BW(TR)_{EXP-1}$	= Settlement value of EURO STOXX 50 BuyWrite index or EURO STOXX 50 BuyWrite (100%) index at the last expiry date before the previous expiry date(EXP-1)
$ESTX50(NR)_t$	= Last price of EURO STOXX 50 (Net Return) index at time t
$ESTX50(NR)_{EXP}$	= Settlement price of EURO STOXX 50 (Net Return) index at the previous expiry date (EXP)
$ESTX50(NR)_{EXP-1}$	= Settlement price of EURO STOXX 50 (Net Return) index at the last expiry date before the previous expiry date (EXP-1)
$ESTX50(P)_{EXP}$	= Settlement price of EURO STOXX 50 (Price) index at the previous expiry date (EXP)
$ESTX50(P)_{EXP-1}$	= Settlement price of EURO STOXX 50 (Price) index at the last expiry date before the previous expiry date (EXP-1)
C_t	= Last price of the EURO STOXX 50 call option at time t
C_0	= Inclusion price of the EURO STOXX 50 call option; i.e. averages of all best bids quoted on Eurex between 12:15 – 12:45 CET on the last expiry date (EXP)

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4.EURO STOXX 50 BUYWRITE

C'$_{EXP}$	= Settlement price of old EURO STOXX 50 call option at the last expiry date (EXP)
C'$_0$	= Inclusion price of the old EURO STOXX 50 call option; i.e. averages of all best bids quoted on Eurex between 12:15 – 12:45 CET on the last expiry date (EXP-1) before the previous expiry date (EXP)

Price

The Price version of the index combines the EURO STOXX 50 (Price) Index and a EURO STOXX 50 call option.

On regular trading days the Price version of the index is calculated as follows:

$$BW(P)_t = \frac{ESTX50(P)_t - C_t}{ESTX50(P)_{EXP} - C_0} \cdot BW(P)_{EXP}$$

The rolling is carried out monthly on every third Friday, i.e. on the expiry date (EXP).

$$BW(P)_{EXP} = \frac{ESTX50(P)_{EXP} - C'_{EXP}}{ESTX50(P)_{EXP-1} - C'_0} \cdot BW(P)_{EXP-1}$$

Where:

BW(P)$_t$	= EURO STOXX 50 BuyWrite (Price) index or EURO STOXX 50 BuyWrite (100%) (Price) index at time (t)
BW(P)$_{EXP}$	= Settlement value of EURO STOXX 50 BuyWrite (Price) index or EURO STOXX 50 BuyWrite (100%) (Price) index at the previous expiry date (EXP)
BW(P)$_{EXP-1}$	= Settlement value of EURO STOXX 50 BuyWrite (Price) index or EURO STOXX 50 BuyWrite (100%) (Price) index at the last expiry date before the previous expiry date (EXP-1)
ESTX50(P)$_{EXP}$	= Settlement price of EURO STOXX 50 (Price) index at the previous expiry date (EXP)
ESTX50(P)$_{EXP-1}$	= Settlement price of EURO STOXX 50 (Price) index at the last expiry date before the previous expiry date (EXP-1)
C$_t$	= Last price of the EURO STOXX 50 call option at time (t)
C$_0$	= Inclusion price of the EURO STOXX 50 call option; i.e. averages of all best bids quoted on Eurex between 12:15 – 12:45 CET on the last expiry date (EXP)
C'$_{EXP}$	= Settlement price of old EURO STOXX 50 call option at the last expiry date (EXP)
C'$_0$	= Inclusion price of the old EURO STOXX 50 call option; i.e. averages of all best bids quoted on Eurex between 12:15 – 12:45 CET on the last expiry date (EXP-1) before the previous expiry date (EXP)

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4.EURO STOXX 50 BUYWRITE

4.3.1. ROLLING

The EURO STOXX 50 BuyWrite index requires a monthly rollover procedure, whereby the old EURO STOXX 50 call option ceases trading at noon (12:00 CET) on the pre-determined expiry date, i.e. the third Friday of a month, and is replaced by a new EURO STOXX 50 call option whose last trading day falls on the next expiry date. The new one-month EURO STOXX 50 call option must have a remaining lifetime of one month, and must be 5 percent out-of-the-money (i.e. the highest strike price below or equal to the EURO STOXX 50 settlement price plus 5 percent).

The EURO STOXX 50 BuyWrite (100%) index is subject to the same monthly rolling procedure, but the new one-month EURO STOXX 50 call option must be at-the-money (i.e. the highest strike price below or equal to the EURO STOXX 50 settlement price).

4.3.2. TRADING SUSPENSION

If there is a suspension of the EURO STOXX 50 Index (price or total return) or the EURO STOXX 50 call option that is included in the EURO STOXX 50 BuyWrite Index or EURO STOXX 50 BuyWrite (100%) index, the index will be calculated using the latest prices that were available.

If a suspension occurs on an expiry date during the averaging process, i.e. 12:15 - 12:45 CET, only bids made before the suspension will be considered.

In cases where the averaging procedure does not start at all (i.e. the suspension starts before 12:15 CET) then the averaging will be delayed until the end of the suspension on the same index business day. The averaging process will start 30 minutes after the end of the suspension and it will then take 30 minutes.

If the suspension continues until the end of trading then the averaging will be delayed until the next index business day at 12:15 CET.

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5. EURO STOXX 50 PROTECTIVE PUT 80% 18M 6/3

5.1. OVERVIEW

The EURO STOXX 50 Protective Put 80% 18m 6/3 index aims to replicate a combined investment in the EURO STOXX 50 index and a long position in a put option on the same index. The investment objective of the replicated strategy is to profit from the appreciation of the EURO STOXX 50, while simultaneously limit the losses in falling markets through the put option.
The put option is rolled quarterly in March, June, September and December. On each roll date, the existing option is sold and replaced by a new one with 80% strike. Additionally, the options purchased in June and December will mature in 18 months, while those purchased in March and September in 15 months (i.e., they keep the same maturity of the existing option).

The index is based on the EURO STOXX 50 price index or on the EURO STOXX 50 net return index and a EURO STOXX 50 put option traded at Eurex.

5.2. BASIC DATA

Index	ISIN	Symbol
EURO STOXX 50 Protective Put 80% 18m 6/3 (Price)	CH0283626957	SX5PP8P
EURO STOXX 50 Protective Put 80% 18m 6/3 (Net Return)	CH0283626924	SX5PP8T

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5.EURO STOXX 50 PROTECTIVE PUT 80% 18M 6/3

5.3. CALCULATION

Two versions of the indices are available, Net Return and Price.

Net Return

The Net Return version of the index combines the EURO STOXX 50 (Net Return) Index and a EURO STOXX 50 put option.
On regular trading days the index is calculated as follows:

$$PP(NR)_t = \frac{\left[\dfrac{ESTX50(NR)_t}{ESTX50(NR)_{ROLL}} \cdot ESTX50(P)_{ROLL}\right] + P_t}{ESTX50(P)_{ROLL} + P_0} \cdot PP(NR)_{ROLL}$$

On rolling days the index is calculated as follows:

$$PP(NR)_{ROLL} = \frac{\left[\dfrac{ESTX50(NR)_{ROLL}}{ESTX50(NR)_{ROLL-1}} \cdot ESTX50(P)_{ROLL-1}\right] + P'_{ROLL}}{ESTX50(P)_{ROLL-1} + P'_0} \cdot PP(NR)_{ROLL-1}$$

Price

The Price version of the index combines the EURO STOXX 50 (Price) Index and a EURO STOXX 50 put option.

On regular trading days the index is calculated as follows:

$$PP(P)_t = \frac{ESTX50(P)_t + P_t}{ESTX50(P)_{ROLL} + P_0} \cdot PP(P)_{ROLL}$$

On rolling days the index is calculated as follows:

$$PP(P)_{ROLL} = \frac{ESTX50(P)_{ROLL} + P'_{ROLL}}{ESTX50(P)_{ROLL-1} + P'_0} \cdot PP(P)_{ROLL-1}$$

Where:

$PP(TR)_t$	= EURO STOXX 50 Protective Put (Total Return) index at time (t)
$PP(NR)_{ROLL}$	= Settlement value of EURO STOXX 50 Protective Put (Net Return) index at the previous rolling date (ROLL)
$PP(NR)_{ROLL-1}$	= Settlement value of EURO STOXX 50 Protective Put (Net Return) index at the last rolling date before the previous rolling date(ROLL-1)
$PP(P)_t$	= EURO STOXX 50 Protective Put (Price) index at time (t)
$PP(P)_{ROLL}$	= Settlement value of EURO STOXX 50 Protective Put (Price) index at the previous rolling date (ROLL)

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5. EURO STOXX 50 PROTECTIVE PUT 80% 18M 6/3

$PP(P)_{ROLL-1}$	= Settlement value of EURO STOXX 50 Protective Put (Price) index at the last rolling date before the previous rolling date (ROLL-1)
$ESTX50(NR)_t$	= Last price of EURO STOXX 50 (Net Return) index at time t
$ESTX50(NR)_{ROLL}$	= Settlement price of EURO STOXX 50 (Net Return) index at the previous rolling date (ROLL)
$ESTX50(NR)_{ROLL-1}$	= Settlement price of EURO STOXX 50 (Net Return) index at the last rolling date before the previous rolling date (ROLL-1)
$ESTX50(P)_t$	= Last price of EURO STOXX 50 (Price) index at time t
$ESTX50(P)_{ROLL}$	= Settlement price of EURO STOXX 50 (Price) index at the previous rolling date (ROLL)
$ESTX50(P)_{ROLL-1}$	= Settlement price of EURO STOXX 50 (Price) index at the last rolling date before the previous rolling date (ROLL-1)
P_t	= Mid price of the EURO STOXX 50 put option at time t during the day or Settlement price of the EURO STOXX 50 put option for end-of-day calculation
P_0	= Inclusion price of the EURO STOXX 50 put option on the last ROLL date (ROLL)
P'_{ROLL}	= Exit price of old EURO STOXX 50 put option at the last rolling date (ROLL)
P'_0	= Inclusion price of the old EURO STOXX 50 put option on the last rolling date (ROLL-1) before the previous rolling date (ROLL)

Inclusion price (P_0, P'_0): VWAP of best ask quotes between 12:15:00 and 12:45:00
Intraday price (P_t): mid quote
End-of-day price (P_t): settlement value
Exit price (P'_{ROLL}): VWAP of best bid quotes between 12:15:00 and 12:45:00

5.3.1. ROLLING
The index requires a quarterly rollover procedure, on the pre-determined rolling date, i.e. the third Friday of March, June, September, December where the current option is sold and replaced by a new EURO STOXX 50 put option. If such a day is a non-trading day for EUREX, the preceding trading day is taken.

On each roll date, the purchased EURO STOXX 50 put option must be 20 percent out-of-the-money or less (i.e. the lowest strike price higher than or equal to the settlement price of the EURO STOXX 50 Price index minus 20 percent).

On the roll dates of June and December, the replacing option will mature on the 18th following month; on the roll dates of March and September the maturity will be 15 months ahead.

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6. EURO STOXX 50 PUTWRITE

6.1. OVERVIEW

The EURO STOXX 50 PutWrite Index replicates the performance of a collateralized put option strategy. The index is based on a quarterly scheme with monthly put option tranches, i.e.

» the investment notional is invested into the three-month Euribor market;
» monthly put options are written in three tranches;
» intra-quarter put options are cash settled by borrowing in the one-month Euribor market if necessary.

The index is based on the EURO STOXX 50 put option traded at Eurex and Euribor.

6.2. BASIC DATA

Index	ISIN	Symbol
EURO STOXX 50 PutWrite (Price)	CH0106231670	SX5E3P

6.3. CALCULATION

6.3.1. INDEX FORMULA
At time t

Write a number N_t of puts with price p_t and strike K_t

» Invest $I_t + p_t N_t$ at the three-month EURIBOR rate r_t^3
» The number of puts Nt is given by the condition of total cash collateralization at t+1:

$$\left(I_t + p_t N_t\right)\left(1 + \frac{\Delta_{t,t+1}}{360} \cdot r_t^3\right) = N_t K_t \Rightarrow N_t = \frac{I_t\left(1 + \frac{\Delta_{t,t+1}}{360} \cdot r_t^3\right)}{K_t - p_t\left(1 + \frac{\Delta_{t,t+1}}{360} \cdot r_t^3\right)}$$

Where:

I_t = EURO STOXX 50 PutWrite index at time (t)

$\Delta_{t,t+1}$ = Actual number of calendar days of the first option tranche
The strike K_t is chosen 5 percent out-of-the-money, i.e. it represents the lowest strike of available EUREX put options that is above 95 percent of the EURO STOXX 50 settlement price.

At time t+1

» Write a number N_{t+1} of puts with price p_{t+1} and strike K_{t+1}
» Borrow/lend the cash balance

$$C_{t+1} = \left(N_{t+1}p_{t+1} - N_t p_t^s\right)$$

(can be positive or negative) from settling the N_t put options at price p_t^s (which is zero if the option matures out-of-the-money) of the previous tranche and writing the new tranche at the one-month Euribor market at rate r_{t+1}.

» The number of put options N_{t+1} is given by the condition of total cash collateralization at t+2:

$$C_{t+1}\left(1 + \frac{\Delta_{t+1,t+2}}{360}r_{t+1}^1\right) + \left(I_t + p_t N_t\right)\left(1 + \frac{\Delta_{t,t+2}}{360}\cdot r_t^3\right)$$

$$= \left(N_{t+1}p_{t+1} - N_t p_t^s\right)\cdot\left(1 + \frac{\Delta_{t+1,t+2}}{360}\cdot r_{t+1}^1\right) + \left(I_t + p_t N_t\right)\cdot\left(1 + \frac{\Delta_{t,t+2}}{360}\cdot r_t^3\right) = N_{t+1}K_{t+1}$$

$$\Rightarrow N_{t+1} = \frac{-N_t p_t^s\left(1 + \frac{\Delta_{t+1,t+2}}{360}\right) + \left(I_t + p_t N_t\right)\cdot\left(1 + \frac{\Delta_{t,t+2}}{360}\cdot r_t^3\right)}{K_{t+1} - p_{t+1}\left(1 + \frac{\Delta_{t+1,t+2}}{360}\cdot r_{t+1}^1\right)}$$

Where:

$\Delta_{t+1,t+2}$ = Actual number of calendar days of the second option tranche

$\Delta_{t,t+2}$ = Actual number of calendar days of the first and second option tranche
The strike K_{t+1} is chosen 5 percent out-of-the-money, i.e. it represents the lowest strike of available EUREX put options that is above 95 percent of the EURO STOXX 50 settlement price.

At t+1 the index level reads:

$$I_{t+1} = \left(I_t + p_t N_t\right)\left(1 + \frac{\Delta_{t,t+1}}{360}\cdot r_t^3\right) - N_t p_t^s$$

6.EURO STOXX 50 PUTWRITE

At time t+2

» Write a number N_{t+2} of puts with price p_{t+2} and strike K_{t+2}
» Borrow/lend the cash balance

$$C_{t+2} = \left(N_{t+2}p_{t+2} - N_{t+1}p_{t+1}^s\right) + C_{t+1}\left(1 + \frac{\Delta_{t+1,t+2}}{360} \cdot r_{t+1}^1\right)$$

(can be positive or negative) from settling the N_{t+1} put options at price $p_{t+1}s$ (which is zero if the option matures out-of-the-money) of the previous tranche and writing the new tranche at the one-month EURIBOR market at rate r_{t+2}^1.

» The number of option N_{t+2} is given by the condition of total cash collateralization at t+3:

$$C_{t+2}\left(1 + \frac{\Delta_{t+2,t+3}}{360} \cdot r_{t+2}^1\right) + \left(I_t + p_t N_t\right)\left(1 + \frac{\Delta_{t,t+3}}{360} \cdot r_t^3\right) = N_{t+2}K_{t+2}$$

$$\Leftrightarrow \left(\left(N_{t+2}p_{t+2} - N_{t+1}p_{t+1}^s\right) + C_{t+1}\left(1 + \frac{\Delta_{t+1,t+2}}{360} \cdot r_{t+1}^1\right)\right)\left(1 + \frac{\Delta_{t+2,t+3}}{360} \cdot r_{t+2}^1\right) + \left(I_t + p_t N_t\right) \cdot \left(1 + \frac{\Delta_{t,t+3}}{360} \cdot r_t^3\right)$$

$$= N_{t+2}K_{t+2}$$

$$\Rightarrow N_{t+2} = \frac{\left(-N_{t+1}p_{t+1}^s + C_{t+1}\left(1 + \frac{\Delta_{t+1,t+2}}{360} \cdot r_{t+1}^1\right)\right) \cdot \left(1 + \frac{\Delta_{t+2,t+3}}{360} \cdot r_{t+2}^1\right) + \left(I_t + p_t N_t\right) \cdot \left(1 + \frac{\Delta_{t,t+3}}{360} \cdot r_t^3\right)}{K_{t+2} - p_{t+2}\left(1 + \frac{\Delta_{t+2,t+3}}{360} \cdot r_{t+2}^1\right)}$$

Where:

$\Delta_{t+2,t+3}$ = Actual number of calendar days of the second option tranche
$\Delta_{t,t+3}$ = Actual number of calendar days of the first, second and third option tranche
      The strike K_{t+2} is chosen 5 percent out-of-the-money, i.e. it represents the lowest strike of available EUREX put options that is above 95 percent of the EURO STOXX 50 settlement price.

At t+2 the index level reads:

$$I_{t+2} = \left(I_t + p_t N_t\right) \cdot \left(1 + \frac{\Delta_{t,t+2}}{360} \cdot r_t^3\right) + C_{t+1}\left(1 + \frac{\Delta_{t+1,t+2}}{360} \cdot r_{t+1}^1\right) - N_{t+1}p_{t+1}^s$$

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At time t+3

The new index level reads (with $p_{t+2}s$ denoting the settlement price of the third option tranche N_{t+2}):

$$I_{t+3} = \left(I_t + p_t N_t\right) \cdot \left(1 + \frac{\Delta_{t,t+3}}{360} \cdot r_t^3\right) + C_{t+2}\left(1 + \frac{\Delta_{t+2,t+3}}{360} \cdot r_{t+2}^1\right) - N_{t+2}p_{t+2}^s$$

Afterwards, the scheme is applied iteratively.

6.3.2. ROLLING
The EURO STOXX 50 PutWrite index requires a monthly rollover procedure, whereby the old EURO STOXX 50 put option ceases trading at noon (12:00 CET) on the pre-determined expiry date, i.e. the third Friday of a month, and is replaced by a new EURO STOXX 50 put option whose last trading falls on the next expiry date. The new one-month EURO STOXX 50 put option must have a remaining lifetime of one month, and must be 5 percent out-of-the-money (i.e. the lowest strike price above or equal to the EURO STOXX 50 settlement price minus 5 percent).

6.3.3. TRADING SUSPENSION/ NON-TRADING DAYS
If there is a suspension of the EURO STOXX 50 put option which is included in the EURO STOXX 50 PutWrite index, the index will be calculated using the latest prices available.

If a suspension occurs on an expiry date during the averaging process, i.e. 12:15 - 12:45 CET only bids made before the suspension will be considered.

In cases where the averaging procedure does not start at all (i.e. the suspension starts before 12:15 CET), the averaging will be delayed until the end of the suspension on the same index business day. The averaging process will start 30 minutes after the end of the suspension and it will then take 30 minutes.

If the suspension continues until the end of the trading, the averaging will be delayed until the next index business day at 12:15 CET.

Interest is accrued on all calculation dates of the EURO STOXX 50 PutWrite Index.

7. STOXX SHORT AND LEVERAGED INDICES

7.1. OVERVIEW

Leveraged indices are linked to the changes in the underlying index, applying a leverage factor to movements in the underlying index. Therefore, a positive change of the underlying index will result in the corresponding leveraged performance of leveraged indices compared to the closing level from the last rebalancing.

Short indices are linked inversely to the changes in the underlying index, applying a negative leverage factor to movements in the underlying index. Therefore, investing in short indices yields the reverse performance of the underlying index, compared to the closing level from the last rebalancing.

The leverage effect causes a disproportionate change in capital employed during positive and negative market movements. This effect can be achieved by raising additional capital and reinvesting into the underlying index (positive leverage) or by investing capital from purchases and additional interests (negative leverage). Investors can make use of this opportunity to employ a profitable investment strategy with low initial capital in order to multiply the chances of profit considerably. On the other hand this leverage effect carries the inherent risk of a disproportionate capital loss ('downside risk').

7.2. BASIC DATA

Index	ISIN	Symbol	Leverage (L)
EURO STOXX 50 Daily Leverage (Price)	CH0029194906	SX5EL	2
EURO STOXX 50 Daily Leverage (Net Return)	DE000A0Z3K43	SX5TL	2
EURO STOXX 50 Daily Short (Gross Return)	CH0029194971	SX5TS	-1
EURO STOXX 50 Daily Double Short (Gross Return)	CH0048222092	SX5T2S	-2
EURO STOXX 50 Optimal Daily Leverage (Net Return)	CH0123471655	SX5ODLEN	L*
EURO STOXX <Supersector> Daily Leverage x3 (Gross Return)	<see Vendor Code sheet>		3
EURO STOXX <Supersector> Daily Short x3 (Gross Return)	<see Vendor Code sheet>		-3
STOXX Europe 600 Daily Short (Gross Return)	CH0108503878	SXXGRS	-1
STOXX Europe 600 Daily Double Short (Gross Return)	CH0048222100	SXXR2S	-2
STOXX Europe 600 <Supersector> Daily Short (Gross Return)	<see Vendor Code sheet>		-1
STOXX Europe 600 <Supersector> Daily Double Short (Gross Return)	<see Vendor Code sheet>		-2
EURO STOXX 50 Monthly Leverage (Net Return)	CH0116915999	SX5TLM	2
EURO STOXX 50 Monthly Double Short (Gross Return)	CH0116916005	SX5GT2SM	-2
STOXX Global 3D Printing Tradable Daily Short (Gross Return)	CH0252377509	STG3DPS	-1
<further indices as listed in the STOXX vendor code sheet>			

7.3. CALCULATION

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7.STOXX SHORT AND LEVERAGED INDICES

7.3.1. THE STOXX SHORT / LEVERAGE INDEX FORMULA

The Daily Leverage indices are calculated as follows:

$$LevIDX_t = LevIDX_T \cdot \left[\underbrace{1 + L \cdot \left(\frac{IDX_t}{IDX_T} - 1 \right)}_{\text{LEVERAGE TERM}} + \underbrace{((1-L) \cdot IR_T + L \cdot c_M) \cdot \frac{d}{360}}_{\text{FINANCE/INTEREST TERM}} \right]$$

Where:

LevIDX	= Leverage index
IDX	= Underlying index
IR	= Interest rate (IR):

For daily leverage indices, the interest rate term consists of an overnight interest rate plus a liquidity-spread[1].
For daily short and optimal leverage indices, an overnight interest rate is applied.
For monthly leveraged indices, -month interest rates are applied
The actual interest rate applied depends on the respective region. An overview of the interest rates can be found in the tables below.

c_M	= Cost to borrow (considered for European short indices only)
t	= Time of calculation
T	= Time of last rebalancing day prior to t (last trading day for the daily and third Friday for the monthly indices)
d	= Number of calendar days between t and T
L	= Leverage Factor (for details please consult the table on the previous page)

[1] The liquidity Spread is updated on a monthly basis. It is determined using the average over the liquidity spreads of five index calculation days ranging from 5th-last to the last calculation day prior to each monthly rebalancing date (3rd Friday). To calculate the liquidity spread, the closing values of the respective swap rates are taken.

The 'leverage term' describes the effect of Price index movements on the leveraged index portfolio.
The 'financing term' indicates the costs of raising capital and reinvesting in the index portfolio (positive leverage)
The 'interest term' indicates the interest received from lending capital and the cost to borrow the index portfolio (negative leverage)

The interest rate depends on the region:

Region / Country	Interest rate	RICs
Americas	USD LIBOR ON	USDLIBORON=
Europe / Eurozone	EONIA	EONIA=
UK	GBP-LIBOR ON	GBPLIBORON=
Oceania	AUD Domestic Interest Rate	AUCASH=RBAA
Asia	USD LIBOR ON	USDLIBORON=
Latam	USD LIBOR ON	USDLIBORON=

7.STOXX SHORT AND LEVERAGED INDICES

BRIC	USD LIBOR ON	USDLIBORON=
Global	USD LIBOR ON	USDLIBORON=

Liquidity spreads as added for leveraged indices:

Region / Country	Liquidity spread	RICs
Americas	USD LIBOR 1Y – USD 1Y ON Swap Rate	USDLIBOR1Y= - USD1YOIS=
Europe / Eurozone	EURIBOR 1Y – EUR 1Y ON Swap Rate	EURIBOR1YD= - EUREON1Y=
UK	GBP LIBOR 1Y – GBP 1Y ONSwap Rate	GBPLIBOR1Y= - GBP1YOIS=
Oceania	AUD LIBOR 1Y – AUD 1Y Swap Rate	AUD1YD= - AUD1YOIS=
Asia	USD LIBOR 1Y – USD 1Y ON Swap Rate	USDLIBOR1Y= - USD1YOIS=
Latam	USD LIBOR 1Y – USD 1Y ON Swap Rate	USDLIBOR1Y= - USD1YOIS=
BRIC	USD LIBOR 1Y – USD 1Y ON Swap Rate	USDLIBOR1Y= - USD1YOIS=
Global	USD LIBOR 1Y – USD 1Y ON Swap Rate	USDLIBOR1Y= - USD1YOIS=

7.3.2. COST OF BORROWING

The STOXX Daily Short indices are designed to ensure a high degree of tradability and replicability.

Calculation:

$$c_M = \sum_i w_{i,M} \cdot c_{i,M}$$

Where:

n	= Number of shares in the index
c_M	= Cost of borrowing the index at time M
$c_{i,M}$	= Cost of borrowing of company i at time M
$w_{i,M}$	= Weight of the share i in the index

The cost of borrowing will be updated on a monthly basis after the close on the third Friday.

Data source: The data is provided to STOXX by data explorers, the aggregator of stock lending information.

7.3.3. CALCULATION OF THE OPTIMAL LEVERAGE FACTOR

The optimal leverage factor L* is determined every month based on the risk-return profile of the underlying index. Relevant factors are the growth rate of the underlying index and the volatility reflected by the VSTOXX index.

$$L^* = L_T^* = \min\left(4; \max\left(\frac{1}{2}; \frac{1}{2} + \frac{\mu - r}{\sigma^2}\right)\right)$$

Where:

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r $= IR_T$

μ   = growth rate of the underlying index; $\mu = \left(\dfrac{IDX_T}{IDX_0}\right)^{\frac{365}{T-T_0}} - 1$

σ   = volatility of the underlying index; $\sigma = \begin{cases} implied\,volatily : if\ available \\ max\{Vol(20); Vol(60)\} : else \end{cases}$

Vol(n)   = realized volatility over n days; $Vol(n) = \sqrt{\dfrac{252}{n-1} \cdot \sum\limits_{k=T-n+1}^{T} \left(\ln\dfrac{IDX_k}{IDX_{k-1}}\right)^2}$

For the European STOXX indices the implied volatility as measured by the VSTOXX index is considered in the calculation of the optimal leverage.

7.3.4. ADJUSTMENTS DUE TO EXTREME MARKET MOVEMENTS

Daily Leverage and Daily Short Indices: The rebalancing is based on the calculation of average index values over a time window of 10 minutes. The time window to calculate the average starts 5 minutes after and ends 15 minutes after the trigger event occurs. The rebalancing is triggered when the underlying index loses more than x% (leverage indices) or appreciates by more than x% (short indices) compared to its previous day's close. The breach of the trigger is checked on a tick-by-tick basis. During this time window, the average of both the underlying index (IDX) and the Leveraged / Short (LevIDX) index are calculated. The two averages then substitute respectively IDX_T and $LevIDX_T$ in the index calculation formula.
The respective trigger values (x) are given in the following table:

Leverage factor	Trigger value
2	x = -25,00%
3	x = -16,66%
4	x = -12,50%
5	x = -10,00%
6	x = -10,00%
7	x = -10,00%
8	x = -10.00%
-1	x = 50,00%
-2	x = 25,00%
-3	x = 16,66%
-4	x = 12,50%
-5	x = 10,00%
-6	x = 10,00%
-7	x = 10,00%
-8	x = 10.00%

7.STOXX SHORT AND LEVERAGED INDICES

Over the course of the 10 minute period in which the average is determined, the index is not disseminated. The index dissemination ends 5 minutes after the trigger event and is resumed with an index level equal to the determined average 15 minutes after the trigger event.

Should the intraday rebalancing be triggered less than 15 minutes prior to the end of the index calculation day, the regular overnight rebalancing is carried out.

If the strategy index reaches a value of 0 or below over the course of the 15, the index is set to a value of 0 and its calculation / dissemination is discontinued

Monthly Leverage Indices: If the reference index (closing value) rises or falls by more than 40% in the course of the month, the monthly leveraged and short indices will be subject to an extraordinary adjustment. If a breach occurs, the calculation of the leveraged index is suspended for that day. The index levels IDX_T and $LevIDX_T$ for the next day are set equal to the respective closing values on the day on which the breach occurred. . Herewith the risk of a potential total loss is minimized. The monthly leveraged and short indices have a floor value of zero.

Optimal Leverage Indices: If daily leveraged or short indices drop by more than 50 percent at the time of calculation t in comparison to the closing prices on the last adjustment day T then the leverage will be adjusted. During the adjustment those prices are considered which were received last before time t. No additional refinancing costs ("Financing Term") are calculated and no additional interests are credited ("Interest Term").

The rebalancing will be carried out by simulating a new day:

t   :=   T (i.e. $IDX_T = IDX_t$ and $LevIDX_T = LevIDX_t$)

d   :=   0

7.3.5. REVERSE SPLIT

If the closing value of a daily leverage or daily short index drops below 100 index points, a reverse split is carried out. The affected leverage or short index is multiplied with a factor of 1000.

The reverse split is carried out based on the index close ten trading days after the index initially dropped below a closing value of 100 points, notwithstanding whether the index rises above a level of 100 points in the meantime.

For optimal leverage indices as well as for monthly adjusted leverage and short indices, no reverse split is carried out.

7.3.6. TRADING SUSPENSION

The STOXX leverage and short indices are calculated on the same days and during the same time as the underlying STOXX indices are calculated.

If there is suspension of the underlying index, the leveraged and short indices will be calculated with the latest prices available.

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8. EURO STOXX 50 VOLATILITY (VSTOXX)

8.1. OVERVIEW

8.1.1. CONCEPT

Volatility is a measure of the level of uncertainty prevailing in certain markets. In principle, there are two different approaches to estimate volatility. Historical volatility involves measuring the standard deviation of historical closing prices for any particular security over a given period of time. Implied volatility, on the other hand, is derived from option prices. This kind of volatility represents the estimates and assumptions of market participants involved in a trade, on the basis of a given option price.

The EURO STOXX 50 Volatility Index (VSTOXX) does not measure implied volatilities of at-the-money EURO STOXX 50 options, but the implied variance across all options of a given time to expiry. The option contracts on the EURO STOXX 50 are among the Eurex products with highest trading volume.

The VSTOXX model has been jointly developed by Goldman Sachs and Deutsche Börse. It offers great advantages in terms of trading, hedging and introducing derivative products on this index.

8.1.2. BASIC DATA

Index	Code	ISIN
VSTOXX	V2TX	DE000A0C3QF1
VSTOXX 60 days	VSTX60	DE000A1A4LU0
VSTOXX 90 days	VSTX90	DE000A1A4LV8
VSTOXX 120 days	VSTX120	DE000A1A4LW6
VSTOXX 150 days	VSTX150	DE000A1A4LX4
VSTOXX 180 days	VSTX180	DE000A1A4LY2
VSTOXX 210 days	VSTX210	DE000A1A4LZ9
VSTOXX 240 days	VSTX240	DE000A1A4L00
VSTOXX 270 days	VSTX270	DE000A1A4L18
VSTOXX 300 days	VSTX300	DE000A1A4L26
VSTOXX 330 days	VSTX330	DE000A1A4L34
VSTOXX 360 days	VSTX360	DE000A1A4L42
VSTOXX 1M	V6I1	DE000A0G87B2
VSTOXX 2M	V6I2	DE000A0G87C0
VSTOXX 3M	V6I3	DE000A0G87D8
VSTOXX 6M	V6I4	DE000A0G87E6
VSTOXX 9M	V6I5	DE000A0G87F3
VSTOXX 12M	V6I6	DE000A0G87G1
VSTOXX 18M	V6I7	DE000A0G87H9
VSTOXX 24M	V6I8	DE000A0G87J5

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8.EURO STOXX 50 VOLATILITY (VSTOXX)

8.1.3. VSTOXX MAIN INDICES AND SUB-INDICES

The 12 VSTOXX 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. This helps to eliminate effects that typically result in strong volatility fluctuations close to expiry.

Apart from the VSTOXX main indices, 8 sub-indices are calculated and distributed, covering the EURO STOXX 50 option expiries ranging from one month to two years. For options with longer time to expiry, no such sub-indices are currently available.

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

8.2. CALCULATION OF INDEX TICKS

The model for VSTOXX 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 EURO STOXX 50 options with different exercise prices and weighting, meets this goal: the implied volatilities of all eligible options with a given time to expiry are considered.

8.2.1. INPUT DATA

During the calculation hours for the VSTOXX and the eight corresponding sub-indices (09:15 to 17:30 CET), the following data is used via snapshots every five seconds:

EURO STOXX 50	- EURO STOXX 50 Index
OESX	- Best bid, best ask, last trade and settlement price of all EURO STOXX 50 options - STOXX will exclude from their indices all options as soon as their delisting becomes known to STOXX (e.g. direct notification from the market, or unavailability of a settlement price)
EONIA	- Euro Overnight Index Average - overnight interest rate
EURIBOR	- EURIBOR - Euro Interbank Offered Rates – money market reference rates for 1, 2, … 12 months (calculated once a day, 11:00 CET, by the European Banking Federation)
REX	- Yield of the 2-year REX as the longer-term interest rate

8.2.1.1. PREPARATION OF OPTION PRICES

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

The mid price is only calculated when the following requirements are fulfilled:
  a.   both the bid and ask price are available and
  b.   both the bid and ask price are equal to or greater than 0.1 points and
  a.   the bid-ask spread does not exceed the following thresholds:

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8.EURO STOXX 50 VOLATILITY (VSTOXX)

    i.   normal market: 8% of bid price, with a minimum of 1.2 points and a maximum of 18 points and

    ii.   fast market: 16%, with a minimum value of 2.4 points and a maximum of 32 points.

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

a. trade price, or
b. mid price, or
c. settlement price.

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

Example:

Strike	Settlement	Bid (time)	Ask (time)	Mid (time)		Last-traded (time)		Price
4050	76.70	-	-	-				76.70
4100	53.71	-	-		-	54.01	(09:05)	54.01
4150	37.51	33.70 (09:04)	34.40 (09:05)	34.05	(09:05)			34.05
4200	22.54	17.29 (09:04)	19.53 (09:05)	18.41	(09:05)	20.21	(09:01)	18.41

8.2.1.2. DISCOUNT RATES

Discount Rate	Period	Code	ISIN
EONIA	1 day	EU1D	EU0009659945
EURIBOR 1 month	1 month	EU1M	EU0009659937
EURIBOR 2 months	2 months	EU2M	EU0009652841
EURIBOR 3 months	3 months	EU3M	EU0009652783
EURIBOR 6 months	6 months	EU6M	EU0009652791
EURIBOR 9 months	9 months	EU9M	EU0009652890
EURIBOR 12 months	12 months	EU12	EU0009652809
REX 2-year (Price index)	2 years	REX2	DE0008469149

8.2.2. CALCULATION OF VSTOXX MAIN INDICES

Twelve VSTOXX 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.

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8.EURO STOXX 50 VOLATILITY (VSTOXX)

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

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

where:

tm	= Fixed time to maturity, expressed as number of days, targeted by the main index.
MainIndex_{tm}	= VSTOXX main index with fixed time to maturity of tm days.
SubIndex_{st}	= VSTOXX sub-index with shorter maturity used in the inter(extra)polation.
SubIndex_{lt}	= VSTOXX 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.

8.2.3. CALCULATION OF VSTOXX 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 ith OESX 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 ith OESX expiry date.
F_i	= Forward at-the-money price for the ith OESX 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 jth 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:

8.EURO STOXX 50 VOLATILITY (VSTOXX)

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

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

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

R_i = Refinancing factor for the ith OESX expiry date:

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

r_i = Interpolated risk-free interest rate valid for the ith OESX 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 EURO STOXX 50 options.

Example:

T_i = 0.0605022831

r_i = 1.41296%

$R_i = e^{1.41296\% \times 0.0605022831} = 1.0008552403$

$K_{i,j}$	$\Delta K_{i,j}$	Call	Put	Call-Put	$M_{Ki,j,}$	$\frac{\Delta K_{i,j}}{K_{i,j}^2} \cdot R_i \cdot M_{K_{i,j}}$
2350	50	472.00	0.60	471.40	0.60	0.0000054370
2400	50	422.30	1.00	421.30	1.00	0.0000086880
2450	50	372.80	1.50	371.30	1.50	0.0000125055
2500	50	322.40	2.30	320.10	2.30	0.0000184157
2550	50	273.50	3.30	270.20	3.30	0.0000253966
2600	50	225.15	4.60	220.55	4.60	0.0000340528
2650	50	177.85	6.70	171.15	6.70	0.0000477446
2700	50	132.40	12.00	120.40	12.00	0.0000823749
2750	50	90.90	21.00	69.90	21.00	0.0001389617
2800	50	57.90	35.40	22.50	46.65	0.0002977672
2850	50	29.50	58.25	28.75	29.50	0.0001817497
2900	50	13.10	92.00	78.90	13.10	0.0000779501
2950	50	5.00	134.10	129.10	5.00	0.0000287520
3000	50	1.50	180.90	179.40	1.50	0.0000083405
3050	50	0.70	229.55	228.85	0.70	0.0000037656
3100	50	0.60	230.00	229.40	0.60	0.0000031244

$K_{i,min|C-P|}$ = 2800

F_i = 2800 + 1.0008552403 x (57.90 – 35.40) = 2822.51924290675

$K_{i,0|}$ = 2800

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$$\sigma_i^2 = \frac{2}{0.0605022831} \cdot 0.0009750263 - \frac{1}{0.0605022831} \cdot \left(\frac{2822.51924290675}{2800} - 1\right)^2 = 0.0311619545863044$$

$$\text{SubIndex}_i = 100 \cdot \sqrt{0.0311619545863044} = 17.65274896$$

8.3. CALCULATION OF INDEX SETTLEMENT LEVEL

A Settlement Day is defined, for each main index, as the 30th calendar day preceding the expiry of the EURO STOXX 50 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 11:30:00 CET up to the current calculation time and not later than 12:00:00 CET:

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

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

Interim settlement values, i.e. values calculated on the expanding window before 12:00:00 CET, are disseminated with an "V" flag.
The final settlement value is marked as "F".

8.4. VERIFICATION 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.

8.5. CALCULATION OF COMPONENTS' WEIGHTS

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8.EURO STOXX 50 VOLATILITY (VSTOXX)

The weight of the individual options composing a VSTOXX main index can be obtained by simply expanding the index formula and rearranging its terms.

By neglecting the AtM adjustment term in the sub-index formula, variance can be approximated as:

$$\sigma_i^2 \approx \frac{2}{T_i/T_{365}} \cdot \sum_j \frac{\Delta K_{i,j}}{K_{i,j}^2} \cdot R_i \cdot M_{K_{i,j}} = \frac{2}{T_i/T_{365}} \cdot S_{K_{i,j}}$$

This expression can be plugged in the main index formula to obtain:

$$MainIndex_{tm} \approx 100 \cdot \sqrt{\left[\frac{T_{st}}{T_{365}} \cdot \frac{2}{T_{st}/T_{365}} \cdot S_{K_{st,j}} \cdot \frac{T_{lt}-T_{tm}}{T_{lt}-T_{st}} + \frac{T_{lt}}{T_{365}} \cdot \frac{2}{T_{lt}/T_{365}} \cdot S_{K_{lt,j}} \cdot \frac{T_{tm}-T_{st}}{T_{lt}-T_{st}} \right] \cdot \frac{T_{365}}{T_{tm}}}$$

which simplifies in:

$$MainIndex_{tm} \approx 100 \cdot \sqrt{2 \cdot \left[S_{K_{st,j}} \cdot \frac{T_{lt}-T_{tm}}{T_{lt}-T_{st}} + S_{K_{lt,j}} \cdot \frac{T_{tm}-T_{st}}{T_{lt}-T_{st}} \right] \cdot \frac{T_{365}}{T_{tm}}}.$$

By defining:

$$WS_{st} = \frac{N_{st}}{N_{tm}} \cdot \left(\frac{N_{lt}-N_{tm}}{N_{lt}-N_{st}} \right)$$

$$WS_{lt} = \frac{N_{lt}}{N_{tm}} \cdot \left(\frac{N_{tm}-N_{st}}{N_{lt}-N_{st}} \right)$$

and

$$RS_{st} = 2 \cdot S_{K_{st,j}} \cdot WS_{st} \cdot \frac{T_{365}}{T_{st}}$$
$$RS_{lt} = 2 \cdot S_{K_{lt,j}} \cdot WS_{lt} \cdot \frac{T_{365}}{T_{lt}}$$

the main index approximation can be restated as:

$$MainIndex_{tm} \approx 100 \cdot \sqrt{RS_{st} + RS_{lt}}.$$

Terms RS_{st} and RS_{lt} represent the value of the two sub-portfolios of options in the main index: the main index is given by the time-weighted sum of all options' market values.

The contribution of each jth option to the total market value of the portfolio is simply the portion of that option's RS_j over the total $RS_{st} + RS_{lt}$:

$$RS_{j \in st} = 2 \cdot R_{st} \cdot \left(\frac{\Delta K_{st,j}}{K_j^2} \cdot S_{K_j} \right) \cdot WS_{st} \cdot \frac{T_{365}}{T_{st}}$$

8.EURO STOXX 50 VOLATILITY (VSTOXX)

$$RS_{j\in lt}=2\cdot R_{lt}\cdot\left(\frac{\Delta K_{lt,j}}{K_j^2}\cdot S_{K_j}\right)\cdot WS_{lt}\cdot\frac{T_{365}}{T_{lt}}$$

and an individual option's weight is then obtained as:

$$w_j=\frac{RS_j}{RS_{st}+RS_{lt}}.$$

9. EURO STOXX 50 VOLATILITY OF VOLATILITY (V-VSTOXX)

9.1. OVERVIEW

9.1.1. CONCEPT

The EURO STOXX 50 Volatility of Volatility Index (V-VSTOXX) measures the implied volatility of the option contracts on the VSTOXX futures, traded on the Eurex Exchange. In general terms, the algorithm is the same as the one applied in the calculation of the VSTOXX index, but some differences exist, reflecting the specifications of the underlying contracts. For instance, the sub- and main indices cover different maturities and the options' price filters are applied with different thresholds. The following paragraphs will refer to the VSTOXX methodology and differentiate where required.

9.1.2. BASIC DATA

Index	Code	ISIN
V-VSTOXX	VV2TX	DE000A13PCG9
V-VSTOXX 60 days	VVSTX60	DE000A13PCH7
V-VSTOXX 90 days	VVSTX90	DE000A13PCJ3
V-VSTOXX 120 days	VVSTX120	DE000A13PCK1
V-VSTOXX 150 days	VVSTX150	DE000A13PCL9
V-VSTOXX 180 days	VVSTX180	DE000A13PCM7
V-VSTOXX 210 days	VVSTX210	DE000A13PCN5
V-VSTOXX 1 month	VV6I1	DE000A13PCQ8
V-VSTOXX 2 months	VV6I2	DE000A13PCR6
V-VSTOXX 3 months	VV6I3	DE000A13PCS4
V-VSTOXX 4 months	VV6I4	DE000A13PCT2
V-VSTOXX 5 months	VV6I5	DE000A13PCU0
V-VSTOXX 6 months	VV6I6	DE000A13PCV8
V-VSTOXX 7 months	VV6I7	DE000A13PCW6
V-VSTOXX 8 months	VV6I8	DE000A13PCX4

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9. EURO STOXX 50 VOLATILITY OF VOLATILITY (V-VSTOXX)

9.1.3. V-VSTOXX MAIN INDICES AND SUB-INDICES

The 7 V-VSTOXX main indices are calculated for rolling 30, 60, 90, 120, 150, 180, 210 days to expiry via linear interpolation of the suiting sub-indices. The V-VSTOXX main indices are therefore independent of a specific time to expiry, i.e. they do not expire. This helps to eliminate effects that typically result in strong volatility fluctuations close to expiry.

Apart from the VSTOXX main indices, 8 sub-indices are calculated and distributed, covering the VSTOXX option expiries ranging from one month to eight months.

The V-VSTOXX sub-indices are calculated on the basis of all options available in the Eurex system.

9.2. CALCULATION OF INDEX TICKS

Please refer to VSTOXX methodology.

9.2.1. INPUT DATA

During the calculation hours for the V-VSTOXX sub- and main indices (09:15 to 17:30 CET), the following data is used via snapshots every five seconds:

OVS2	- Best bid, best ask, last trade and settlement price of all VSTOXX futures options - STOXX will exclude from their indices all options as soon as their delisting becomes known to STOXX (e.g. direct notification from the market, or unavailability of a settlement price)
EONIA	- Euro Overnight Index Average - overnight interest rate
EURIBOR	- EURIBOR - Euro Interbank Offered Rates – money market reference rates for 1, 2, … 12 months (calculated once a day, 11:00 CET, by the European Banking Federation)

9.2.1.1. PREPARATION OF OPTION PRICES

First, the trade, mid and settlement prices of each option and corresponding timestamps are identified. A price filter is applied in that any price below 0.1 points is ignored.

The mid price is only calculated when the following requirements are fulfilled:
  c. both the bid and ask price are available and
  d. both the bid and ask price are equal to or greater than 0.05 points and
  b. the bid-ask spread does not exceed the following thresholds:
      iii. normal market: 20% of bid price, with a minimum of 0.4 points and a maximum of 4 points and
      iv. fast market: 40%, with a minimum value of 0.8 points and a maximum of 8 points.

For each option used in the calculation of a sub-index, the Inclusion Price is then defined as the most recent among:
  d. trade price, or
  e. mid price, or

9. EURO STOXX 50 VOLATILITY OF VOLATILITY (V-VSTOXX)

  f. settlement price.

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

9.2.1.2. DISCOUNT RATES

Please refer to VSTOXX methodology.

9.2.2. CALCULATION OF V-VSTOXX MAIN INDICES

Please refer to VSTOXX methodology.

9.2.3. CALCULATION OF VSTOXX SUB-INDICES

Please refer to VSTOXX methodology.

9.3. CALCULATION OF INDEX SETTLEMENT LEVEL

Please refer to VSTOXX methodology.

9.4. VERIFICATION OF INDEX TICKS

Please refer to VSTOXX methodology.

9.5. CALCULATION OF COMPONENTS' WEIGHTS

Please refer to VSTOXX methodology.

10. EURO STOXX 50 VOLATILITY-BALANCED

10.1. OVERVIEW

The EURO STOXX 50 Volatility-Balanced index aims to provide superior risk-adjusted returns relative to the EURO STOXX 50 Index by coupling a base investment in EURO STOXX 50 with a dynamic allocation to equity volatility (VSTOXX Short-Term Futures Index) depending on the prevailing volatility regime.

The index is based on the EURO STOXX 50 Net Return (Symbol: SX5T) and the VSTOXX Short-Term Futures Excess Return Index (Symbol: VST1ME).

The volatility regime on any index business day is determined on the basis of Realised Volatility for the period of past 20-days ("RV") and 1-month Implied Volatility 1-month back ("IV") as reflected by the VSTOXX Index. The current volatility regime determines the Equity and Volatility Exposure.

Daily Indicator	Volatility Regime	Equity Exposure	Volatility Exposure
RV < IV - 1%	Stable Volatility Regime	97.5%	2.5%
IV - 1% ≤ RV ≤ IV + 1%	Unpredictable Volatility Regime	90%	10%
RV > IV + 1%	Increasing Volatility Regime	70%	30%

In addition a stop-loss criterion is applied: if the weekly performance of the Excess Return Index shows a loss of 5% or more, both equity and volatility allocations are moved completely into a cash position.

10.2. BASIC DATA

Index	ISIN	Symbol
EURO STOXX Volatility-Balanced (Excess Return)	CH0128045587	SX5EVBE
EURO STOXX Volatility-Balanced (Total Return)	CH0128045595	SX5EVBT

10.3. CALCULATION

The EURO STOXX 50 Volatility-Balanced index is calculated as excess and total return index on every Index Business Day ("t") where an Index Business Day is each Eurex VSTOXX futures trading day which is also a EURO STOXX 50 Index Publication Day.

10.3.1. INDEX FORMULAS

Excess Return Index ("ERI")

$$ERI(t) = ERI(t-1) \cdot \left[1 + EE(t-2) \cdot \left(\frac{EI(t)}{EI(t-1)} - 1 - RI(t-1) \cdot \frac{d}{360} \right) + VE(t-2) \cdot \left(\frac{VI(t)}{VI(t-1)} - 1 \right) \right]$$

Where:
EI = equity index (EURO STOXX 50)
VI = volatility index (VSTOXX Short-Term Futures index)

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10.EURO STOXX 50 VOLATILITY-BALANCED

EE	= Equity Exposure
VE	= Volatility Exposure
RI	= Interest Rate (1 month Euribor)
d	= number of calendar days between index business day t-1 and t

Total Return Index ("TRI")

$$TRI(t) = TRI(t-1) \cdot \left[\frac{ERI(t)}{ERI(t-1)} + RI(t-1) \cdot \frac{d}{360} \right]$$

10.3.2. EQUITY AND VOLATILITY EXPOSURE

Current 1-month Implied Volatility ("CIV")

$$CIV(t) = \frac{VSTOXX(t)}{100}$$

Where:

VSTOXX   = VSTOXX index

Current 1-month Realised Volatility ("CRV")

$$CRV(t) = \sqrt{\frac{252}{20} \cdot \sum_{j=0}^{19} \left[\ln\left(\frac{EI(t-j)}{EI(t-j-1)} \right)^2 \right]}$$

Target Volatility Exposure ("TVE")

$$TVE(t) = \begin{cases} 2.5\% & : CRV(t) < CIV(t-20) - 1\% \\ 30\% & : CRV(t) > CIV(t-20) + 1\% \\ 10\% & : else \end{cases}$$

Stop loss

$$SL(t) = \begin{cases} 1 & : \dfrac{ERI(t)}{ERI(t-5)} - 1 \le -5\% \\ 0 & : else \end{cases}$$

Volatility Exposure

$$VE(t) = \begin{cases} \max[0, VE(t-1) - 10\%] & : SL(t) = 1 \\ \max[TVE(t), VE(t-1) - 10\%] & : SL(t) = 0 \wedge TVE(t) < VE(t-1) \\ \min[TVE(t), VE(t-1) + 10\%] & : SL(t) = 0 \wedge TVE(t) \ge VE(t-1) \end{cases}$$

Equity Exposure

$$EE(t) = \begin{cases} 1 - VE(t) & : SL(t) = 0 \\ 0 & : else \end{cases}$$

10.EURO STOXX 50 VOLATILITY-BALANCED

11.   EURO STOXX 50 DVP FUTURES

11.1. OVERVIEW

Dividends offer new opportunities to investors – either asset or retail managers – as they:

» are considered on a long-dated horizon as one of the main sources of performance in a portfolio;
» are considered as a good hedge against inflation;
» offer on a long-dated horizon some diversification against pure equity exposure;
» offer an attractive upside due to a structural imbalance in flows: the longer end of the curve tends to be under the net selling pressure coming from the issuance of structured products;
» tend to exhibit lower volatility than equities.

With the EURO STOXX 50 DVP Futures Index, STOXX Ltd. provides investors with synthetic exposure to the gross return (including income from interest) of the EURO STOXX 50 DVP futures listed for trading on Eurex.

The EURO STOXX 50 DVP Futures Index is designed to benefit from the characteristics of the dividends cycle and the dividends market.

» From the December expiry of year (n - 1) to the December expiry of year n, the index notional is invested in equal numbers of EURO STOXX 50 DVP futures corresponding to the years n, n+1, n+2, n+3, n+4, (Fn, Fn+1, Fn+2, Fn+3, Fn+4).
» The cash position is invested at EONIA.
» In December of year n, when the future Fn expires, the index notional would be invested in the contract Fn+5, such that the adjusted numbers of contracts of Fn+1, Fn+2, Fn+3, Fn+4, Fn+5 are the same. For instance, in December 2010, when all the 2010 dividends have been paid, the index will get a new exposure to 2015 dividends.
» In line with the expiry structure of the EURO STOXX 50 DVP Futures, each of the five future contracts is assigned to a specific expiry. Ten maturities are available for dividend futures. The index only considers the five nearest maturities simultaneously.

11.2. BASIC DATA

Index	ISIN	Symbol
EURO STOXX 50 DVP Futures (Price)	CH0109185402	SX5EDFT

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11.EURO STOXX 50 DVP FUTURES

11.3. CALCULATION

11.3.1.   INPUT DATA

During the calculation hours of the EURO STOXX 50 DVP Futures Index, the following data is used via snapshots every 15 seconds:

» Eurex futures prices (first five year contracts) on the EURO STOXX 50 DVP
» EONIA - overnight interest rate - money market investment

If one or more Eurex DVP futures included in the index is no longer listed, STOXX Ltd. may decide on the appropriate measures in consultation with the STOXX management board and notify at that time.

11.3.2.   INDEX FORMULA

From the December expiry of year (n-1) to the December expiry of year n:

$$\text{Index}_t = \text{Index}_{t-1}\left[1 + EONIA(t-1)/360 \cdot d\right] + N_t \begin{bmatrix} F_n(t) - F_n(t-1) + F_{n+1}(t) - F_{n+1}(t-1) + \\ F_{n+2}(t) - F_{n+2}(t-1) + F_{n+3}(t) - F_{n+3}(t-1) + \\ F_{n+4}(t) - F_{n+4}(t-1) \end{bmatrix}$$

Where:

t	= Time of calculation
d	= Number of calendar days between t and t-1
n	= Maturity tranche
F	= Trade price of the futures contracts
EONIA	= Overnight interest rate[*]
N_t	= $\text{index}_{t-1}/[F_n(t-1) + F_{n+1}(t-1) + F_{n+2}(t-1) + F_{n+3}(t-1) + F_{n+4}(t-1)]$ is the numbers of contracts

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[*]Euro Overnight index Average (EONIA) is the effective reference rate computed daily as a weighted average of all overnight unsecured lending transactions undertaken in the interbank market by the European Central Bank.

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11.EURO STOXX 50 DVP FUTURES

11.3.3.   ROLLING

On December expiry of year n, the number of contracts has to be adjusted by a rolling factor RF_{N-N+1} so that the index notional is invested in a new number of contracts in the next five EURO STOXX 50 DVP futures after the roll. The rolling factor RF_{N-N+1} is calculated as follows:

$$RF_{N-N+1} = \frac{F_n(t) + F_{n+1}(t) + F_{n+2}(t) + F_{n+3}(t) + F_{n+4}(t)}{F_{n+1}(t) + F_{n+2}(t) + F_{n+3}(t) + F_{n+4}(t) + F_{n+5}(t)}$$

Consequently, on the roll date in December, the switch of contract has no impact on the value of the index:

$$Index_t = EONIA + N_t \cdot [F_n(t) + F_{n+1}(t) + F_{n+2}(t) + F_{n+3}(t) + F_{n+4}(t)] \, with \, EONIA$$

$$= Index_{t-1} \cdot EONIA(t-1)/360 \cdot d$$

$$= EONIA + RF_{N-N+1} \cdot N_t \cdot [F_{n+1}(t)F_{n+2}(t) + F_{n+3}(t) + F_{n+4}(t) + F_{n+5}(t)]$$

On the following day, the index is computed normally, invested in year n+1 to n+5, thus we have entered a new period until the next expiry.

For instance, let's assume that the final close of the index on December expiry of year n is 500, EONIA is zero and that each of the DVP futures corresponding to the years n, n+1, n+2, n+3, n+4 is equal to 100:
$F_n(t) = F_{n+1}(t) = F_{n+2}(t) = F_{n+3}(t) = F_{n+4}(t) = 100$ i.e. this means $N_t = 1$

On this particular date, the index switches its indexation from the DVP futures corresponding to the year n to the indexation of year n+5. If we assume that $F_{n+5}(t) = 50$, we have a rolling factor equal to

$$RF_{N-N+1} = \frac{500}{450}$$

11.3.4.   CONSEQUENCES OF AN INDEX DISRUPTION EVENT

If an index disruption event in relation to the Eurex futures contract occurs on index dissemination days, then STOXX Ltd. will calculate the value of the index based on the most recent prior futures prices published by the Eurex.

If an exchange fails to open due to unforeseen circumstances, STOXX Ltd. may determine not to publish the index for that day.

In situations where an exchange introduces a holiday during the month of the index calculation, the index will not be published on such a holiday.

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12.   STOXX VOLATILITY FUTURES

12.1. OVERVIEW

The EURO STOXX 50 Volatility (VSTOXX) Short-Term Futures Index replicates the performance of a long position in constant-maturity one-month forward, one-month implied volatilities on the underlying EURO STOXX 50 Index. The EURO STOXX 50 Volatility Mid-Term Futures Index replicates a constant 5-month forward, one-month implied volatility.

Both indices constantly roll over each month on a daily basis: the EURO STOXX 50 Volatility Short-Term Futures Index from the first month of the Eurex VSTOXX Futures contract to the second month, and the EURO STOXX 50 Volatility Mid-Term Futures Index from the fourth month to the seventh month..

The VSTOXX Short-Term Futures index is intended to provide a return of a long position in constant-maturity one-month forward one-month implied volatilities on the underlying EURO STOXX 50 Index.

The VSTOXX Short-Term Futures Index comprises the following:

VSTOXX Short-Term/Mid-Term Futures Excess Return Index: VSTOXX Short-Term Futures Index ER returns are calculated from a long Eurex VSTOXX futures position that is continuously rolled over the period between the first and second or fourth and seventh month Eurex VSTOXX Futures contracts.

VSTOXX Short-Term/Mid-Term Futures Total Return Index: VSTOXX Short-Term Futures Index TR returns are calculated from a long Eurex VSTOXX futures position that is continuously rolled over the period between the first and second or fourth and seventh month Eurex VSTOXX futures contracts. The VSTOXX Short-Term Futures Index TR also incorporates interest accrual on the notional value and reinvestment into the index.

12.2. BASIC DATA

Index	ISIN	Symbol
EURO STOXX 50 Volatility Mid-Term Futures (Total Return)	CH0115971191	VMT5MT
EURO STOXX 50 Volatility Mid-Term Futures (Excess Return)	CH0115971233	VMT5ME
EURO STOXX 50 Volatility Short-Term Futures (Total Return)	CH0109515863	VST1MT
EURO STOXX 50 Volatility Short-Term Futures (Excess Return)	CH0110459747	VST1ME

12.3. CALCULATION

12.3.1.   INPUT DATA
If one or more Eurex VSTOXX futures included in the index are no longer listed, STOXX Ltd. may decide on appropriate measures in consultation with the STOXX management board and notify at that time.

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12.3.2. INDEX FORMULA
Excess Return Calculation

$$IndexER_t = IndexER_{t-1} \cdot \frac{\sum_{i=1}^{2} w_{i,t-1} \cdot F_{i,t}}{\sum_{i=1}^{2} w_{i,t-1} \cdot F_{i,t-1}}$$

Where:

$IndexER_t$	= VSTOXX Short-Term Futures Excess Return Index value on index business day t
T	= index business day on which the index is computed
$W_{i,t}$	= Weight of the ith futures contract on index business day t
$F_{i,t}$	= Middle price of ith futures contract on index business day t
Index Business Day	= A Eurex VSTOXX futures business day

Total Return Calculation

$$IndexTR_t = IndexTR_{t-1} \cdot \left[\frac{\sum_{i=1}^{2} w_{i,t-1} \cdot F_{i,t}}{\sum_{i=1}^{2} w_{i,t-1} \cdot F_{i,t-1}} + \frac{d}{360} \cdot EONIA_{t-1} \right]$$

Where:

$IndexTR_t$	= VSTOXX Short-Term Futures Total Return Index value on index business day t
d	= Number of calendar days between index business day t and preceding index business day t-1
$EONIA_{t-1}$	= The Euro Overnight Index Average (EONIA) is the effective reference rate (expressed as a percentage) computed daily as a weighted average of all overnight unsecured lending transactions undertaken in the interbank market by the European Central Bank on the preceding index business day t-1

12.3.3. ROLLING

The VSTOXX Short-Term Futures Index rolls futures positions on a daily basis. The roll period starts from, and includes, the monthly EUREX VSTOXX futures settlement date and runs up to, but excludes, the subsequent monthly Eurex VSTOXX futures settlement date.

Rolling between the first month future (F1) and the second month future (F2) takes place over n index business days. The weights allocated to each F1 and F2 on any given index business day t are determined as follows:

$$w_{1,t} = 100 \cdot \frac{p_t}{n}$$

$$w_{2,t} = 100 \cdot \frac{n-p_t}{n}$$

Where:

Roll period	= The period from, and including, the most recent Eurex VSTOXX futures settlement date up to, but excluding, the subsequent Eurex VSTOXX futures settlement date
n	= The total number of index business days in the current roll period
p_t	= The number of index business days remaining in the current roll period, starting with the following index business date up to and including the last index business day in the current roll period (Note:, on the last index business date of the period, $p_t = 0$)

At the close of the last index business day of any roll period (the index business day immediately preceding a Eurex VSTOXX futures settlement date) all of the weight is allocated to the second month Eurex VSTOXX futures contract. On the Eurex VSTOXX futures settlement date, the second month contract position becomes the first month contract at settlement. On the Eurex VSTOXX futures settlement date and on each subsequent index business day of the new roll period, a fraction of the first month contract is sold and an equal notional amount of the second month Eurex VSTOXX futures contract is bought. This way the allocation to the first month contract is progressively rolled into the following month contract over the roll period.

12.3.4. CONSEQUENCES OF AN INDEX DISRUPTION EVENT

If an index disruption event in relation to the Eurex futures contract occurs on index dissemination days, then the following applies:

STOXX Ltd. will calculate the value of the index based on the most recent middle futures prices published by Eurex and the roll for that day will be carried to the next index business day, as described in the roll period section.

If an exchange fails to open due to unforeseen circumstances, STOXX Ltd. may determine not to publish the index for that day.

In situations where an exchange introduces a holiday during the month of the index calculation, the index will not be published ,and the roll for that day will be carried to the next index business day, as described in the roll period section.

13. VSTOXX SHORT-TERM FUTURES INVESTABLE INDICES

13.1. VSTOXX SHORT-TERM FUTURES INVESTABLE INDEX

13.1.1. OVERVIEW

The VSTOXX Short-Term Futures Investable Index replicates the performance of a long position in constant-maturity one-month forward, one-month implied volatilities on the underlying EURO STOXX 50 Index taking into account the bid-ask spread in the roll procedure.

The index continuously rolls over on a daily basis from the first month VSTOXX Futures contract to the second month contract.

13.1.2. BASIC DATA

Index	ISIN	Symbol
VSTOXX Short-Term Futures Investable EUR (Excess Return)	CH0354759968	VST1MSE
VSTOXX Short-Term Futures Investable USD (Excess Return)	CH0354873926	VST1MSL

13.1.3. CALCULATION

13.1.3.1. INDEX FORMULA

The daily index level is defined as

$$IV_t = C_{1t}^{Post} P_{1t}^M + C_{2t}^{Post} P_{2t}^M$$

where

C_{xt}^{Post} = number of contracts of future x held at the end of day t after the roll[1]

P_{xt}^M = mid-price of future x on day t based on last bid and ask at 17:30:00 CET

The index base value is 10'000 as of December 30, 2016.

13.1.3.2. ROLL PROCEDURE

The roll period starts from, and includes, the monthly Eurex VSTOXX futures settlement date and runs up to, but excludes, the subsequent monthly Eurex VSTOXX futures settlement date.

The daily roll has to satisfy both the target allocation constraint and the self-financing constraint, as explained below:

Target allocation constraint (I)

$$w_{1t} = \frac{C_{1t}^{Post}}{C_{1t}^{Post} + C_{2t}^{Post}}$$

After the roll, the number of contracts of each future has to satisfy the target weights with $w_{1t} + w_{2t} = 1$.

The target weight after the roll on day *t* of contract 1, w_{1t}, is defined as $\frac{d}{T}$ where

d = number of index business days between t and the next settlement date excluding day t and excluding the next settlement date

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[1] On final settlement days the first and second futures refer to the contracts with one month and two months to expiration respectively.

13.VSTOXX SHORT-TERM FUTURES INVESTABLE INDICES

T = the total number of index business days in the current roll period including the previous final settlement date and excluding the next

The futures' final settlement dates are as defined by Eurex[2]:
Final settlement day is 30 calendar days prior to the expiration day of the underlying options (i.e. 30 days prior to the third Friday of the expiration month of the underlying options, if this is an exchange day). This is usually the Wednesday prior to the second last Friday of the respective maturity month, if this is an exchange day; otherwise the exchange day immediately preceding that day.

Self-financing constraint (II)

$$C_{1t}^{Post}P_{1t}^M + C_{2t}^{Post}P_{2t}^M = C_{1t}^{Pre}P_{1t}^M + C_{2t}^{Pre}P_{2t}^M - (C_{1t}^{Post} - C_{1t}^{Pre})(P_{1t}^B - P_{1t}^M) - (C_{2t}^{Post} - C_{2t}^{Pre})(P_{2t}^A - P_{2t}^M)$$

The post-roll index level has to be equal to the pre-roll index level minus the cost of trading (selling contract 1 at bid and buying contract 2 at ask).

C_{xt}^{Pre} = number of contracts of future x held at the end of day t before the roll; equivalent to number of contracts of the same futures contract held on day t-1 post roll

P_{xt}^B = bid price, last available at 17:30:00 CET

P_{xt}^A = ask price, last available at 17:30:00 CET

Determination of the Number of Contracts

The target allocation (I) and self-financing (II) constraint equations can be solved for the post-roll number of contracts:

$$C_{1t}^{Post} = \frac{C_{1t}^{Pre}P_{1t}^B + C_{2t}^{Pre}P_{2t}^A}{P_{1t}^B + \dfrac{1 - w_{1t}}{w_{1t}}P_{2t}^A}$$

$$C_{2t}^{Post} = \frac{C_{1t}^{Pre}P_{1t}^B + C_{2t}^{Pre}P_{2t}^A}{\dfrac{w_{1t}}{1 - w_{1t}}P_{1t}^B + P_{2t}^A}$$

At the close of the last index business day of any roll period (the index business day immediately preceding a Eurex VSTOXX futures settlement date) all of the weight is allocated to the second month Eurex VSTOXX futures contract:

$$C_{1t}^{Post} = 0$$

$$C_{2t}^{Post} = \frac{C_{1t}^{Pre}P_{1t}^B + C_{2t}^{Pre}P_{2t}^A}{P_{2t}^A}$$

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[2] See http://www.eurexchange.com/exchange-en/products/vol/vstoxx/vstoxx--futures-and-options/VSTOXX--Futures/14566, subject to any change by Eurex

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13.VSTOXX SHORT-TERM FUTURES INVESTABLE INDICES

On the Eurex VSTOXX futures settlement date, the second month contract position becomes the first month contract at settlement. On the settlement date the post-roll number of contracts is calculated by:

$$C_{1t}^{Post} = \frac{C_{1t}^{Pre} P_{1t}^B}{P_{1t}^B + \dfrac{1 - w_{1t}}{w_{1t}} P_{2t}^A}$$

$$C_{2t}^{Post} = \frac{C_{1t}^{Pre} P_{1t}^B}{\dfrac{w_{1t}}{1 - w_{1t}} P_{1t}^B + P_{2t}^A}$$

On the final settlement date, C_{1t}^{Pre} refers to the Eurex VSTOXX future which at the end of the settlement date is the contract with one-month to expiration which on the the prior day had been the second month contract, C_2.

13.2. VSTOXX SHORT-TERM FUTURES INVERSE INVESTABLE INDEX

13.2.1. OVERVIEW

The VSTOXX Short-Term Futures Inverse Investable Index replicates the performance of a short position in constant-maturity one-month forward, one-month implied volatilities on the underlying EURO STOXX 50 Index taking into account the bid-ask spread in the roll procedure.
The index continuously rolls over on a daily basis from a short position in the first month VSTOXX Futures contract to a short position in the second month contract.

13.2.2. BASIC DATA

Index	ISIN	Symbol
VSTOXX Short-Term Futures Inverse Investable EUR (Excess Return)	CH0354760123	VST1MISE
VSTOXX Short-Term Futures Inverse Investable USD (Excess Return)	CH0354874031	VST1MISL

13.2.3. CALCULATION
13.2.3.1. INDEX FORMULA

The daily index level is defined as

$$IV_t^{Post} = -(C_{1t}^{Post} P_{1t}^M + C_{2t}^{Post} P_{2t}^M)$$

where

C_{xt}^{Post} = number of contracts of future x held at the end of day t after the roll[3]

P_{xt}^M = mid-price of future x on day t based on last bid and ask at 17:30:00 CET

The index is available in EUR and USD.

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[3] On final settlement days the first and second futures refer to the contracts with one month and two months to expiration respectively.

13. VSTOXX SHORT-TERM FUTURES INVESTABLE INDICES

The index base value is 10'000 as of December 30, 2016.

The pre-roll index level is calculated to replicate the performance of a hypothetical short selling of the contracts as

$$IV_t^{Pre} = IV_{t-1}^{Post} + C_{1t}^{Pre}\left(P_{1t}^M - P_{1,t-1}^M\right) + C_{2t}^{Pre}\left(P_{2t}^M - P_{2,t-1}^M\right)$$

C_{xt}^{Pre} = number of contracts of future x held at the end of day t before the roll; equivalent to number of contracts of the same futures contract held on day t-1 post roll

Substituting the post-roll index level formula, using the identity $C_{xt-1}^{Post} = C_{xt}^{Pre}$, and reordering yields:

$$IV_t^{Pre} = -C_{1t}^{Pre}\left(2P_{1,t-1}^M - P_{1t}^M\right) - C_{2t}^{Pre}\left(2P_{2,t-1}^M - P_{2t}^M\right)$$

13.2.3.2.   ROLL PROCEDURE

The roll period starts from, and includes, the monthly Eurex VSTOXX futures settlement date and runs up to, but excludes, the subsequent monthly Eurex VSTOXX futures settlement date.

The daily roll has to satisfy both the target allocation constraint and the self-financing constraint, as explained below:

Target allocation constraint (I)

$$w_{1t} = \frac{C_{1t}^{Post}}{C_{1t}^{Post} + C_{2t}^{Post}}$$

After the roll, the number of contracts of each future has to satisfy the target weights with $w_{1t} + w_{2t} = 1$.

The target weight after the roll on day t of contract 1, w_{1t}, is defined as $\frac{d}{T}$ where

d = number of index business days between t and the next settlement date excluding day t and excluding the next settlement date

T = the total number of index business days in the current roll period including the previous final settlement date and excluding the next

The futures' final settlement dates are as defined by Eurex[4]:
Final settlement day is 30 calendar days prior to the expiration day of the underlying options (i.e. 30 days prior to the third Friday of the expiration month of the underlying options, if this is an exchange day). This is usually the Wednesday prior to the second last Friday of the respective maturity month, if this is an exchange day; otherwise the exchange day immediately preceding that day.

Self-financing constraint (II)

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[4] See http://www.eurexchange.com/exchange-en/products/vol/vstoxx/vstoxx--futures-and-options/VSTOXX--Futures/14566, subject to any change by Eurex

13.VSTOXX SHORT-TERM FUTURES INVESTABLE INDICES

$$IV_t^{Post} = IV_t^{Pre} - (C_{1t}^{Post} - C_{1t}^{Pre})(P_{1t}^* - P_{1t}^M) - (C_{2t}^{Post} - C_{2t}^{Pre})(P_{2t}^* - P_{2t}^M)$$

The post-roll index level has to be equal to the pre-roll index level minus cost the of trading. Hereby P_{xt}^* refers to either the bid price P_{xt}^B or ask price P_{xt}^A depending on whether the corresponding contract has to be bought (at ask) or sold (at bid); details at the end of this section.

P_{xt}^B = bid price, last available at 17:30:00 CET
P_{xt}^A = ask price, last available at 17:30:00 CET

Substituting the post-roll index into the self-financing constraint (II) and reordering yields:

$$C_{1t}^{Post}(2P_{1t}^M - P_{1t}^*) + C_{2t}^{Post}(2P_{2t}^M - P_{2t}^*) = C_{1t}^{Pre}(2P_{1,t-1}^M - P_{1t}^*) + C_{2t}^{Pre}(2P_{2,t-1}^M - P_{2t}^*)$$

Determination of the Number of Contracts

The above equation together with the target allocation constraint (I) can be solved for the post-roll number of contracts:

$$C_{1t}^{Post} = \frac{C_{1t}^{Pre}(2P_{1,t-1}^M - P_{1t}^*) + C_{2t}^{Pre}(2P_{2,t-1}^M - P_{2t}^*)}{(2P_{1t}^M - P_{1t}^*) + \frac{1-w_{1t}}{w_{1t}}(2P_{2t}^M - P_{2t}^*)}$$

$$C_{2t}^{Post} = \frac{C_{1t}^{Pre}(2P_{1,t-1}^M - P_{1t}^*) + C_{2t}^{Pre}(2P_{2,t-1}^M - P_{2t}^*)}{\frac{w_{1t}}{1-w_{1t}}(2P_{1t}^M - P_{1t}^*) + (2P_{2t}^M - P_{2t}^*)}$$

At the close of the last index business day of any roll period (the index business day immediately preceding a Eurex VSTOXX futures settlement date) all of the weight is allocated to the second month Eurex VSTOXX futures contract:

$$C_{1t}^{Post} = 0$$

$$C_{2t}^{Post} = \frac{C_{1t}^{Pre}(2P_{1,t-1}^M - P_{1t}^*) + C_{2t}^{Pre}(2P_{2,t-1}^M - P_{2t}^*)}{(2P_{2t}^M - P_{2t}^*)}$$

On the Eurex VSTOXX futures settlement date, the second month contract position becomes the first month contract at settlement. On the settlement date the post-roll number of contracts is calculated by:

$$C_{1t}^{Post} = \frac{C_{1t}^{Pre}(2P_{1,t-1}^M - P_{1t}^*)}{(2P_{1t}^M - P_{1t}^*) + \frac{1-w_{1t}}{w_{1t}}(2P_{2t}^M - P_{2t}^*)}$$

13.VSTOXX SHORT-TERM FUTURES INVESTABLE INDICES

$$C_{2t}^{Post} = \frac{C_{1t}^{Pre}\left(2P_{1,t-1}^M - P_{1t}^*\right)}{\frac{w_{1t}}{1-w_{1t}}\left(2P_{1t}^M - P_{1t}^*\right) + \left(2P_{2t}^M - P_{2t}^*\right)}$$

On the final settlement date, C_{1t}^{Pre} refers to the Eurex VSTOXX future which at the end of the settlement date is the contract with one-month to expiration which on the prior day had been the second month contract, C_2.
One has to note that in above formulas $P_{x,t-1}$ and P_{xt} refer to the futures prices on different days of contracts with identical expiration dates.

In order to determine whether bid or ask prices are to be used C_{1t}^{Post} and C_{2t}^{Post} are calculated for all four scenarios by using the appropriate bid and ask prices in above formulas.

Scenario	Self-financing constraint	Feasible if resulting
Buy 1st/Sell 2nd	$IV_t^{Post} = IV_t^{Pre} - (C_{1t}^{Post} - C_{1t}^{Pre})(P_{1t}^A - P_{1t}^M) - (C_{2t}^{Post} - C_{2t}^{Pre})(P_{2t}^B - P_{2t}^M)$	$C_{1t}^{Post} - C_{1t}^{Pre} \geq 0$ and $C_{2t}^{Post} - C_{2t}^{Pre} \leq 0$
Buy 1st/Buy 2nd	$IV_t^{Post} = IV_t^{Pre} - (C_{1t}^{Post} - C_{1t}^{Pre})(P_{1t}^A - P_{1t}^M) - (C_{2t}^{Post} - C_{2t}^{Pre})(P_{2t}^A - P_{2t}^M)$	$C_{1t}^{Post} - C_{1t}^{Pre} \geq 0$ and $C_{2t}^{Post} - C_{2t}^{Pre} \geq 0$
Sell 1st/ Sell 2nd	$IV_t^{Post} = IV_t^{Pre} - (C_{1t}^{Post} - C_{1t}^{Pre})(P_{1t}^B - P_{1t}^M) - (C_{2t}^{Post} - C_{2t}^{Pre})(P_{2t}^B - P_{2t}^M)$	$C_{1t}^{Post} - C_{1t}^{Pre} \leq 0$ and $C_{2t}^{Post} - C_{2t}^{Pre} \leq 0$
Sell 1st/Buy 2nd	$IV_t^{Post} = IV_t^{Pre} - (C_{1t}^{Post} - C_{1t}^{Pre})(P_{1t}^B - P_{1t}^M) - (C_{2t}^{Post} - C_{2t}^{Pre})(P_{2t}^A - P_{2t}^M)$	$C_{1t}^{Post} - C_{1t}^{Pre} \leq 0$ and $C_{2t}^{Post} - C_{2t}^{Pre} \geq 0$

On most days the inverse index roll procedure will have the first contract bought and the second contract sold. On a few occasions other trading scenarios might be required though (e.g. buy first contract and buy second contract). In those cases, the self-financing constraint needs to be adjusted and the correct bid or ask prices have to be used as one always buys at ask and sells at bid.

The second column shows each scenario's respective self-financing constraint that has to be used to derive the post-roll amount of contracts.
We say that a solution is feasible if the trading it implies is consistent with the scenario's assumption. For example, in the sell/sell scenario the solution is feasible if the calculated post-roll contracts imply that both contracts have to be sold.
In the case that there is more than one feasible solution we pick out of all feasible solutions the one that has the least negative cost (i.e. causes the highest post-roll index value).

13.3. CONSEQUENCES OF AN INDEX DISRUPTION EVENT

If an index disruption event in relation to the Eurex futures contract occurs on index dissemination days, then the following applies:

STOXX Ltd. will repeat the end of day index value of the previous day and the roll for that day will be postponed to the next index business day (i.e. the number of contracts held of each contract remains unchanged).

Valid quotes not being available is considered an index disruption event.

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If an exchange fails to open due to unforeseen circumstances, STOXX Ltd. may determine not to publish the index for that day.

In situations where an exchange introduces a holiday during the month of the index calculation, the index will not be published, and the roll for that day will be carried to the next index business day, as described in the roll procedure section.

14. EURO STOXX 50 RISK CONTROL INDICES

14.1. OVERVIEW

With STOXX Risk Control indices a target volatility concept is applied to the EURO STOXX 50 Index and other STOXX indices. Whereas the risk profile of a standard index like the EURO STOXX 50 Index is the outcome of the existing market-cap weighted index concept, the EURO STOXX 50 Risk Control Index supervises the risk up to a defined target volatility level. In order to control for risk, the index shifts between a money market and a risky investment (measured by the EURO STOXX 50 Index).

If on a daily basis the risk of the current EURO STOXX 50 Risk Control Index composition is below the targeted risk, the allocation will be adjusted towards the risky asset. If the current risk profile is above the targeted level, the allocation will be adjusted towards the money market component.

» To avoid extreme leveraged positions, a maximum exposure of 150 percent towards the risky asset is introduced.
» A tolerance level of 5 percent around the target volatility is implemented to avoid high allocation turnover due to minimal deviations from the targeted risk level.
» To control for outliers, an average volatility level is used.
» The indices are offered both as implied volatility and realized volatility based versions, the latter being distinguished by the "RV" wording in the name.

14.2. BASIC DATA

Index	ISIN	Symbol
EURO STOXX 50 Risk Control 10% (Total Return)	CH0118856118	RC10IVTR
EURO STOXX 50 Risk Control 10% (Excess Return)	CH0118856126	RC10IVER
EURO STOXX 50 Risk Control 12% (Total Return)	CH0118856134	RC12IVTR
EURO STOXX 50 Risk Control 12% (Excess Return)	CH0118856142	RC12IVER
EURO STOXX 50 Risk Control 15% (Total Return)	CH0117326766	RC15IVTR
EURO STOXX 50 Risk Control 15% (Excess Return)	CH0117326758	RC15IVER
EURO STOXX 50 Risk Control 20% (Total Return)	CH0116915981	SX5TRCTR
EURO STOXX 50 Risk Control 20% (Excess Return)	CH0116915973	SX5TRCER
EURO STOXX 50 Risk Control 5% (Total Return)	CH0118856159	RC05IVTR
EURO STOXX 50 Risk Control 5% (Excess Return)	CH0118856167	RC05IVER
EURO STOXX 50 Risk Control 10% RV (Excess Return)	CH0147246760	SX5R10EE
<further indices as listed in the STOXX vendor code sheet>		

14.EURO STOXX 50 RISK CONTROL INDICES

14.3. CALCULATION

14.3.1. INDEX FORMULA

$$\text{IndexTR}_t = \text{IndexTR}_{t-1} \times \left[1 + w_{t-1} \times \left(\frac{SX5T_t}{SX5T_{t-1}} - 1 \right) + (1 - w_{t-1}) \times \left((IR_{t-1} + x) \frac{\text{Diff}(t-1,t)}{360} \right) \right]$$

$$\text{IndexER}_t = \text{IndexER}_{t-1} \times \left(1 - IR_{t-1} \frac{\text{Act}(t-1,t)}{360} \right) \times \left[1 + w_{t-1} \left(\frac{SX5T_t}{SX5T_{t-1}} - 1 \right) + (1 - w_{t-1}) \left((IR_{t-1} + x) \frac{\text{Diff}(t-1,t)}{360} \right) \right]$$

where:

IndexER_t	=	Excess Return Index level on index level determination date t
IndexTR_t	=	Net Return Index level on index level determination date t
$w_t =$		Equity Weight on index level determination date t
$SX5T_t =$		Level of the EuroStoxx50 Net Return on index level determination date t
$IR_t =$		Money-market rate on the index level determination date t
$x =$		Cost of borrowing: $w_{t-1} \leq 1$ x=0 otherwise x=50 Basis Points
Diff(t-1,1) =		Difference between determination date t-1 and t measured in calendar days

While EONIA rate will typically be applied as money-market rate to the EURO STOXX 50 Risk Control indices, some variants may adopt a different rate. Please refer to the individual index composition data for more details.

14.3.2. DETERMINATION OF THE TARGET WEIGHT (TGTW) USING IMPLIED VOLATILITY

On any index level determination date t, the target weight is to be determined as follows:

$$\text{Tgtw}_t = \frac{\text{TgtVol}}{\text{Max}_{i \in [t-19,t]} \left[\text{AverageVSTOXX}_{3,i} \right]}$$

where:

TgtVol =	targeted volatility level
Average VSTOXX $_{3,I}$ =	average of the close values of the VSTOXX for index level determination date i-2, i-1 and i
VSTOXX =	close value of the VSTOXX index as published by STOXX under the symbol V2TX
$\text{Max}_{i \in [t-19,t]} \left[\text{AverageVSTOXX}_{3,i} \right]$ =	maximum value of average VSTOXX $_{3,\,i}$ for i ranging from t-19 to t.

14.EURO STOXX 50 RISK CONTROL INDICES

14.3.3.   DETERMINATION OF THE TARGET WEIGHT (TGTW) USING REALIZED VOLATILITY

On any Index Level Determination Date t, the Target Weight shall be determined as follows:

$$Tgtw_t = \frac{TgtVol}{MaxRealizedVol_{t,(20,60)}}$$

where:

$TgtVol$ =   targeted volatility level

$MaxRealizedVol_{20,60}$ =   maximum of the realized volatilities measured over 20 days and 60 days

$$RealizedVol_{t,n} = \sqrt{\frac{252}{n} \cdot \sum_s \left[\ln\left(\frac{STOXX_s}{STOXX_{s-1}} \right) \right]^2}$$

where:
n =   19 (59)
s =   ranging from t-18 to t (t-58 to t)

14.3.4.   DETERMINATION OF EQUITY WEIGHT (W) AND INDEX REBALANCING DAYS

The equity weight on the index start date is to be equal to the target weight at the index start date,

$$w_0 = Min\left(Cap, Tgtw_0\right)$$

On any index level determination date t subsequent to the index start date, the equity weight is to be determined as follows:

(i) If $abs\left\{ 1 - \frac{w_{t-1}}{Tgtw_{t-1}} \right\} > Tolerance$

then that index level determination date t will be an index rebalancing day and

$$w_t = Min(Cap, Tgtw_{t-1})$$

(ii) Otherwise, index level determination date t will not be an index rebalancing day and

$$w_t = w_{t-1}$$

Tolerance =   5%
w_t =   Equity weight on index level determination date t

$Tgtw_t$ =   Target weight on index level determination date t

Cap =   150%

15.   STOXX RISK CONTROL INDICES

15.1. OVERVIEW

A target volatility concept is applied to the STOXX Risk Control Indices. Whereas the risk profile of the underlying index is the uncontrolled outcome of the existing market-cap weighted index concept, the Risk Control Indices controls for risk by aiming for a defined target volatility level. In order to control for risk, the index shifts between a risk free money market investment and a risky asset (measured by the respective underlying equity index).

15.2. BASIC DATA

Various versions of the STOXX Risk Control indices are available for a broad number of countries and target volatility levels. For more details please consult the Data Vendor Code sheet on the STOXX website[5].

15.3. CALCULATION

15.3.1.   INDEX FORMULA

$$STOXXTR_t = STOXXTR_{t-1} \times \left[1 + w_{t-1}\left(\frac{STOXX_t}{STOXX_{t-1}} - 1 \right) + (1 - w_{t-1})\left((IR_{t-1})\frac{Diff(t-1,t)}{360} \right) \right]$$

$$STOXXER_t = STOXXER_{t-1} \times \left(1 - IR_{t-1}\frac{Diff(t-1,t)}{360} \right) \times \left[1 + w_{t-1}\left(\frac{STOXX_t}{STOXX_{t-1}} - 1 \right) + (1 - w_{t-1})\left((IR_{t-1})\frac{Diff(t-1,t)}{360} \right) \right]$$

where:
$STOXXTR_t$ =   Total Return STOXX Risk Control index level on index level determination date t
$STOXXER_t$ =   Excess Return STOXX Risk Control index level on index level determination date t
w_t =   Equity Weight on index level determination date t
$STOXX_t$ =   Level of the underlying STOXX index on index level determination date t
IR_t =   Money-market rate on index level determination date t
$Diff(t-1,t)$ =   Difference between t-1 and t measured in calendar days

The indices exist in different variants, given by the combination of the underlying index return type (P, NR, GR) and the risk control return type (ER, TR).

The money-market rate applicable to each individual index is typically chosen on the basis of the region / country covered by the underlying index, as represented in the below table; however, some variants may adopt a different rate. Please refer to the individual index composition data for more details.

Region / Country	Interest rate (currency)
Americas	USD-LIBOR
Europe / Eurozone / Nordic	EUR-EONIA

[5] http://www.stoxx.com/

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UK	GBP-LIBOR
Oceania	AUD-LIBOR
Asia	USD-LIBOR
LatAm	USD-LIBOR
BRIC	USD-LIBOR
Global	USD-LIBOR

15.3.2. DETERMINATION OF THE TARGET WEIGHT

On any Index Level Determination Date t, the Target Weight shall be determined as follows:

$$Tgtw_t = \frac{TgtVol}{MaxRealizedVol_{t,(20,60)}}$$

where:

$TgtVol =$ predetermined level of volatility

$MaxRealizedVol_{20,60}$ is the maximum of the realized volatilities measured over 20 days and 60
days

$$RealizedVol_{t,n} = \sqrt{\frac{252}{n} \cdot \sum_s \left[ln\left(\frac{STOXX_s}{STOXX_{s-1}} \right) \right]^2}$$

where:
n =   19 (59)
s =   ranging from t-18 to t (t-58 to t)

15.3.3. DETERMINATION OF THE EQUITY WEIGHT AND INDEX REBALANCING DAYS

The Equity Weight on the Index Start Date shall be equal to the Target Weight at the Index Start Date,

$$w_0 = Min(Cap, Tgtw_0)$$

On any Index Level Determination Date t subsequent to the Index Start Date, the Equity Weight shall be determined as follows:

(i) If $abs\left\{ 1 - \frac{w_{t-1}}{Tgtw_{t-1}} \right\} > Tolerance$

then the Index Level Determination Date t will be an Index Rebalancing Day and

$$w_t = Min(Cap, Tgtw_{t-1})$$

(ii) Otherwise, Index Level Determination Date t will not be an Index Rebalancing Day and

$$w_t = w_{t-1}$$

where:

Tolerance = allows a predefined deviation from the target weight , set to 5% and subject to the exceptions listed in the following table

w_t = Equity Weight on Index Level Determination Date t

$Tgtw_t$ = Target Weight on Index Level Determination Date t

Cap = the maximum portion that can be given to the risky asset, set to 150% and subject to the exceptions listed in the following table.

Index	Tolerance	Cap
STOXX Europe Large 200 Risk Control Index	5%	100%
STOXX Nordic Strong Quality 20 Risk Control Index	5%	100%

16. EURO STOXX 50 INVESTABLE VOLATILITY

16.1. OVERVIEW

Volatility is a measure of the level of uncertainty prevailing in certain markets. In principle, there are two different approaches to estimating volatility. Historical volatility involves measuring the standard deviation of historical closing prices for any particular security over a given period of time. Implied volatility is derived from option prices; this kind of volatility represents the estimates and assumptions of market participants involved in a trade, on the basis of a given option price.

The VSTOXX index (calculated by STOXX) is a measure of current implied volatility, as measured using EURO STOXX 50 index options. Because the VSTOXX index is calculated using spot implied volatility levels, however, the returns of the VSTOXX index are not directly replicable.

The EURO STOXX 50 Investable Volatility index is a volatility index which provides exposure to forward implied volatility in a form which can be directly replicated. The EURO STOXX 50 Investable Volatility index is designed as a rolling index which targets a constant 3-month (90-day) forward, 3-month maturity volatility exposure. The index is calculated entirely using VSTOXX sub-index levels calculated and published by STOXX.

The model for the EURO STOXX 50 Investable Volatility index aims at making volatility tradable – i.e. the daily returns of the index should be replicable through holding a portfolio of liquid derivative instruments. As a result, rather than linking the index level to current spot implied variance levels, as in the calculation of the main VSTOXX index, the EURO STOXX 50 Investable Volatility index returns on a daily basis are linked to the movement in forward volatility levels between EURO STOXX 50 option expiries determined using the spot implied variance level to each option expiry (as implied by the VSTOXX sub-index level for each expiry.)

The EURO STOXX 50 Investable Volatility index has been jointly developed by Bank of America Merrill Lynch and STOXX. It offers great advantages in terms of transparency and the trading and hedging of tracking products linked to the index.

16.2. BASIC DATA

Index	ISIN	Symbol
EURO STOXX 50 Investable Volatility (Total Return)	CH0116915965	IVSTXTR
EURO STOXX 50 Investable Volatility (Excess Return)	CH0117221314	IVSTXER

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16.EURO STOXX 50 INVESTABLE VOLATILITY

16.3. CALCULATION

16.3.1. INPUT DATA

During the calculation time for the EURO STOXX 50 Investable Volatility index the following data are used (via snapshots every 60 seconds):

VSTOXX - EURO STOXX 50 Volatility index levels for the first, second and third month expiry and the second and third quarterly expiries.

EONIA - Euro Overnight index Average – overnight interest rate

Index Name	Expiry	Code	ISIN
VSTOXX 1M	First month	VSTX1M	DE000A0G87B2
VSTOXX 2M	Second month	VSTX2M	DE000A0G87C0
VSTOXX 3M	Third month	VSTX3M	DE000A0G87D8
VSTOXX 6M	Second quarter	VSTX6M	DE000A0G87E6
VSTOXX 9M	Third quarter	VSTX9M	DE000A0G87F3

16.3.2. UNDERLYING VSTOXX SUB-INDICES

Apart from the main VSTOXX index (which has no specific time to expiry), sub-indices for each time to expiry of the EURO STOXX 50 options, ranging from one month to two years, are calculated and distributed. The various VSTOXX sub-indices are calculated on the basis of all options available. The calculations are based on the best bid and best ask available for these options in the Eurex system.

The EURO STOXX 50 Investable Volatility index is calculated using forward implied volatility levels between quarterly EURO STOXX 50 option expiry dates by directly referencing VSTOXX sub-index levels representing spot implied volatility for each option expiry date.

16.3.3. COMPOSITE VSTOXX 3M

The VSTOXX 3M Composite represents a quarterly rolling 'front quarter' variance contract, which rolls on the EURO STOXX 50 quarterly option expiry date in line with the VSTOXX 6M and VSTOXX 9M sub-indices.

The VSTOXX 3M Composite is calculated according to the formulas shown below:

(1) VSTOXX 3M Comp. (t) = VSTOXX 1M* (t); if t ≤1M before the next quarterly expiry date

VSTOXX 2M (t); if 1M<t ≤ 2M before the next quarterly expiry date
VSTOXX 3M (t); if 2M<t ≤ 3M before the next quarterly expiry date

and:
» VSTOXX 1M* (t) is equal to VSTOXX 1M* (t-1) where t ≤ 2D before the next quarterly expiry date
» VSTOXX 1M* (t) is equal to VSTOXX 1M (t) otherwise

16.EURO STOXX 50 INVESTABLE VOLATILITY

16. EURO STOXX 50 INVESTABLE VOLATILITY

16.3.4. FORWARD-STARTING IMPLIED VOLATILITY LEVELS

3-month forward-starting implied volatility levels for the period between the first quarter and second quarter, and second quarter and third quarter

(2)
$$FSV_{3M-6M}(t) = \sqrt{\frac{TM_{6M}(t) \times VSTOXX\,6M^2(t) - TM_{3M}(t) \times VSTOXX\,3M\,Comp^2(t)}{TM_{6M}(t) - TM_{3M}(t)}}$$

(3)
$$FSV_{6M-9M}(t) = \sqrt{\frac{TM_{9M}(t) \times VSTOXX\,9M^2(t) - TM_{6M}(t) \times VSTOXX\,6M^2(t)}{TM_{9M}(t) - TM_{6M}(t)}}$$

and:

» TM3M (t) is the number of calendar days remaining until the next quarterly EURO STOXX 50 options expiry date (in March, June, September or December).
» TM6M (t) is the number of calendar days remaining until the subsequent quarterly EURO STOXX 50 options expiry date.

16.3.5. WEIGHTINGS

The weightings applied to each of the forward-volatility levels are calculated on the basis of the number of days to the forward-start date of each, with the target of a 3-month weighted average time to maturity, according to the formulas shown below.

(4)
$$\omega_{3M-6M}(t) = \frac{TM_{6M}(t) - ATM}{TM_{6M}(t) - TM_{3M}(t)}; \text{ where } TM_{3M}(t) \geq 7 \text{ days}$$

(5)
$$\omega_{3M-6M}(t) = 0\%; \text{ otherwise}$$

(6)
$$\omega_{6M-9M}(t) = 100\% - \omega_{3M-6M}(t)$$

(7)
$$U_{3M-6M}(t) = \frac{IV(t) \times \omega_{3M-6M}(t)}{FSV_{3M-6M}(t)};$$

(8)
$$U_{6M-9M}(t) = \left[U_{6M-9M}(t-1) - U_{3M-6M}(t)\right] \times \frac{FSV_{3M-6M}(t)}{FSV_{6M-9M}(t) \times (1 + 0.75\%)}$$.; if t-1 was a quarterly option expiry date

$$U_{6M-9M}(t) = U_{6M-9M}(t-1) + \left[U_{3M-6M}(t-1) - U_{3M-6M}(t)\right] \times \frac{FSV_{3M-6M}(t)}{FSV_{6M-9M}(t) \times (1 + 0.75\%)}$$; otherwise

and

» ATM=90 days (the target time to expiry);
» TM3M (t) is the number of calendar days remaining until the next quarterly EURO STOXX 50 options expiry date (in March, June, September or December);
» TM6M (t) is the number of calendar days remaining until the subsequent quarterly EURO STOXX 50 options expiry date;
» IV(t) is the EURO STOXX 50 Investable Volatility index base index level, calculated as described below (where IV(0) = 100 as at the index inception date).

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16.EURO STOXX 50 INVESTABLE VOLATILITY

16.3.6.   INDEX CALCULATION

The EURO STOXX 50 Investable Volatility index levels are calculated according to the formulas shown below.

(9) $IV(t) = U_{6M\text{-}9M}(t-1) \times FSV_{3M\text{-}6M}(t)$; if t-1 was a quarterly option expiry date

$IV(t) = U_{3M\text{-}6M}(t-1) \times FSV_{3M\text{-}6M}(t) + U_{6M\text{-}9M}(t-1) \times FSV_{6M\text{-}9M}(t)$; otherwise

(10) $IVSTX\ ER(t) = IVSTX\ ER(t-1) \times \left(1 + 1.5 \times \left[\left(\dfrac{IV(t)}{IV(t\text{-}1)} - 1\right)\right]\right)$

(11) $IVSTX\ TR(t) = IVSTX\ TR(t-1) \times \left(\dfrac{IVSTX\ ER(t)}{IVSTX\ ER(t-1)} + EONIA(t-1) \times \dfrac{DC(t)}{360}\right)$

(12) $IVSTXVOL = \omega_{3M-6M}(t) \cdot FSV_{3M-6M}(t) + \omega_{6M-9M}(t) \cdot FSV_{6M-9M}(t)$

and:
- » IVSTX ER(0) = 100 as at the index inception date
- » IVSTX TR(0) = 100 s at the index inception date
- » DC(t) is the number of calendar days from (and including) day t-1 to (but excluding) day t
- » EONIA (t-1) is the daily Effective Overnight index Average (EONIA) fixing for day t-1

16.3.7.   INDEX DISRUPTIONS

In order to account for abnormal market conditions (e.g. mistrades) a filter mechanism is applied: if a VSTOXX sub-index should deviate by more than 20 percent from the preceding index value, the index dissemination is suspended. The index is resumed if

- » the calculated index value deviates by not more than 20 percent from the last published value or
- » the index movement is considered to be caused by regular market conditions

Should any of the underlying indices used in the calculation of the EURO STOXX 50 Investable Volatility index be suspended, the index will remain stable until all sub-indices are available.

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17.   STOXX CURRENCY HEDGED

17.1. OVERVIEW

A currency-hedged index is designed to represent returns for global index investment strategies that involve hedging currency risk, but not the underlying constituent risk. The currency-hedged strategy indices eliminate the risk of currency fluctuations at the cost of potential currency gains.

An investor who will receive a payment in a foreign currency at a future date and expects the domestic (hedged) currency to appreciate against that foreign currency, can enter a forward contract to sell the foreign currency in the future at a predefined exchange rate. If, at the maturity of the forward contract, the domestic currency has appreciated against foreign currency, the investor can make a profit by selling the payment proceeds (in foreign currency) at a lower rate than the one prevailing on the market.

STOXX offers two types of currency-hedged indices: accordingly, the reset of hedge notional and currency exposures occurs either on a daily or monthly basis.

While all currency hedged indices are calculated as end-of-day, some may be updated intraday. For the indices updated intraday, only the value of the underlying -unhedged- index is updated, based on its calculation frequency, while the currency rates remain fixed throughout the day. More specifically, the previous day's WM fixings for spot and forward rates are used. The current day's WM fixings for spot and forward rates are only applied in the calculation of the end-of-day index calculation.

The STOXX currency-hedged indices are typically available in the following versions:

- AUD Hedged
- CHF Hedged
- EUR Hedged
- GBP Hedged
- JPY Hedged
- USD Hedged

Other versions are available upon request.

17.2. BASIC DATA

Index	ISIN	Symbol
< indices as listed in the STOXX vendor code sheet>		

17.3. CALCULATION

17.3.1.   DEFINITIONS

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The following definitions will be used throughout the chapter:

H_IDX_t = hedged index for day t
UH_IDX_t= unhedged reference index (in hedged currency) for day t
t=0 = last calculation day of preceding month (reset date)
t = day of index calculation / number of calendar days since t=0
T = number of calendar days in current month
C = number of foreign currencies in the unhedged index
AF_t = notional adjustment factor for day t
$HR_{c,t}$ = hedge ratio of currency c for day t
$FX_{c,t}$ = spot currency rate for day t
$FF_{c,t}$ = 1-month forward currency rate for day t
$IFF_{c,t}$ = interpolated forward currency rate for day t
R_t = return from hedging for day t

All currency rates are expressed as units of foreign currency c per one unit of domestic (hedged) currency.

The adjustment factor AF_t reflects the changes in the notional value to be hedged between the t=0 and t:

$$AF_t = \frac{UH\_IDX_t}{UH\_IDX_0}$$

The hedge ratio $HR_{c,t}$ can be varied to arrive at index portfolios that are over- or under-hedged to varying degrees. Furthermore, it can be used to hedge multi-currency portfolios.
To fully hedge a multi-currency portfolio, the hedge ratio of each currency is calculated as the sum of weights of the securities quoted in that currency:

$$HR_{c,t} = \sum_{i:ccy_i=c} w_{i,t}$$

The interpolated forward currency rate $IFF_{c,t}$ corrects the 1-month forward rate – traded with a fixed 1-month maturity – to reflect the progressively closer expiry (t=T) of the hedge. In other words, the interpolated 1-month forward rate linearly converges to the spot rate as t=T approaches:

$$IFF_{c,t} = FX_{c,t} + \left(1 - \frac{t}{T}\right) \cdot (FF_{c,t} - FX_{c,t})$$

From the above definition, it follows that $IFF_{c,0} = FF_{c,0}$ and $IFF_{c,T} = FX_{c,T}$.

For each currency c, the contribution of hedging to the index return is defined as the product of the relevant hedge ratio by the return on the forward currency trade.
For instance, an investor knows in t=0 that she will receive a payment of 1 unit of foreign currency in t=T. She could wait and convert it at the then prevailing spot rate $FX_{c,T}$ and obtain

$1/FX_{c,T}$ units of domestic currency. Alternatively, she could enter a forward trade in t=0 to sell the foreign currency in t=T at $FF_{c,0}$, thus obtaining $1/FF_{c,0}$ units of domestic currency.

The P&L from the forward trade, as compared to a spot conversion, is thus $P\&L_{c,\,[0,T]} = \dfrac{1}{FF_{c,0}} - \dfrac{1}{FX_{c,T}}$.

By expressing the forward trade P&L as percentage of the payment value in domestic currency in t=0 and rearranging the terms, the returns on the forward trade can be expressed as $\dfrac{FX_{c,0}}{FF_{c,0}} - \dfrac{FX_{c,0}}{FX_{c,T}}$.

The expression for forward trade returns can then be generalized as:

$$R_t = \sum_{c=1}^{C} HR_{c,t-1} \cdot \left(\frac{FX_{c,0}}{IFF_{c,t-1}} - \frac{FX_{c,0}}{IFF_{c,t}} \right)$$

17.3.2. DAILY HEDGED INDICES

With daily hedged indices, the hedging trade is entered at the end of each calendar month. From that day onwards, the returns of the underlying, unhedged index are integrated by the returns from hedging. Moreover, the notional amount being hedged and the weight of the individual underlying currencies are adjusted on a daily basis.

At the cost of an increased trading activity, the daily hedging aims to timely and precisely offset the currency exposures of the index and is thus particularly suited to volatile markets.

The daily currency hedged indices are thus calculated as:

$$H\_IDX_t = H\_IDX_0 \cdot \left(\frac{UH\_IDX_t}{UH\_IDX_0} + \sum_{d=1}^{t} AF_{d-1} \cdot R_d \right)$$

An alternative, but mathematically identical, formulation, which expresses the index level of a day as function of the previous day's level, can be obtained as follows.

First, the index formula can be rewritten as:

$$H\_IDX_t = \frac{H\_IDX_0}{UH\_IDX_0} \cdot \left(UH\_IDX_t + \sum_{d=1}^{t} UH\_IDX_{d-1} \cdot R_d \right)$$

which can be expanded as:

$$H\_IDX_t = \frac{H\_IDX_0}{UH\_IDX_0} \cdot \left(UH\_IDX_t + UH\_IDX_{t-1} \cdot R_t + \sum_{d=1}^{t-1} UH\_IDX_{d-1} \cdot R_d \right)$$

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By noting that:

$$H\_IDX_{t-1} = \frac{H\_IDX_0}{UH\_IDX_0} \cdot \left(UH\_IDX_{t-1} + \sum_{d=1}^{t-1} UH\_IDX_{d-1} \cdot R_d \right)$$

The index formula can finally be rewritten as:

$$H\_IDX_t = H\_IDX_{t-1} + \frac{H\_IDX_0}{UH\_IDX_0} \cdot \left[UH\_IDX_t - UH\_IDX_{t-1} \cdot (1-R_t) \right]$$

or equivalently as:

$$H\_IDX_t = H\_IDX_{t-1} + H\_IDX_0 \cdot \frac{UH\_IDX_t - UH\_IDX_{t-1}}{UH\_IDX_0} - H\_IDX_0 \cdot AF_{t-1} \cdot \sum_{c=1}^{C} HR_{c,t-1} \cdot \left(\frac{FX_0}{IFF_t} - \frac{FX_0}{IFF_{t-1}} \right)$$

17.3.3. MONTLHY HEDGED INDICES

In the monthly hedged version, the forward hedge is set up once a month and remains unchanged until the next reset: the currency weights are fixed at each reset, as well as the notional hedge amount.

The monthly currency hedged indices are thus calculated as:

$$H\_IDX_t = H\_IDX_0 \cdot \left[\frac{UH\_IDX_t}{UH\_IDX_0} + \sum_{c=1}^{C} HR_{c,0} \cdot \left(\frac{FX_{c,0}}{FF_{c,0}} - \frac{FX_{c,0}}{IFF_{c,t}} \right) \right]$$

The expression can be directly derived from the formula for daily currency hedged indices, by setting $AF_t = AF_0 = 1$ and $HR_{c,t} = HR_{c,0} \ \Box t$.

The expression of the monthly indices can also be rewritten as a function of the previous day's value as:

$$H\_IDX_t = H\_IDX_{t-1} + H\_IDX_0 \cdot \frac{UH\_IDX_t - UH\_IDX_{t-1}}{UH\_IDX_0} - H\_IDX_0 \cdot AF_0 \cdot \sum_{c=1}^{C} HR_{c,0} \cdot \left(\frac{FX_0}{IFF_t} - \frac{FX_0}{IFF_{t-1}} \right)$$

which simplifies to:

$$H\_IDX_t = H\_IDX_{t-1} + H\_IDX_0 \cdot \frac{UH\_IDX_t - UH\_IDX_{t-1}}{UH\_IDX_0} - H\_IDX_0 \cdot \sum_{c=1}^{C} HR_{c,0} \cdot \left(\frac{FX_0}{IFF_t} - \frac{FX_0}{IFF_{t-1}} \right)$$

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18.   STOXX FUTURES ROLL INDICES

18.1. OVERVIEW

The STOXX Futures Roll indices are designed to reflect the returns generated over time through notional investments in a long position in a series of STOXX index futures contracts.

The excess return index replicates the financial outcome of a portfolio rolling the 1st nearby STOXX index futures contract into the 2nd nearby contract; the total return index, in addition, replicates the remuneration of the cash component at risk-free rate.

The futures contract roll occurs over the four days preceding the last trading day of each futures contract series. The futures contracts series is not amended between roll dates. For the EURO STOXX 50 Traded Futures Roll, the futures contract roll occurs over the five days preceding the last trading day of each futures contract series.

18.2. BASIC DATA

Index	ISIN	Index symbol	Futures symbol
EURO STOXX 50 Futures Roll EUR Excess Return	CH0230373265	SX5EFEER	FESX
EURO STOXX 50 Futures Roll EUR Total Return	CH0226976477	SX5EFETR	FESX
EURO STOXX 50 Traded Futures Roll EUR Excess Return	CH0313264233	SX5ETFER	FESX
EURO STOXX 50 Traded Futures Roll EUR Total Return	CH0313264225	SX5ETFTR	FESX
EURO STOXX 50 Quanto Futures Roll USD Excess Return	CH0328366148	SX5HFEER	FESQ[6]
EURO STOXX 50 Quanto Futures Roll USD Total Return	CH0328366155	SX5HFETR	FESQ[2]
EURO STOXX Select Dividend 30 Futures Roll EUR Excess Return	CH0328366064	SD3EFEER	FEDV
EURO STOXX Select Dividend 30 Futures Roll EUR Total Return	CH0328366072	SD3EFETR	FEDV

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[6] The EURO STOXX 50 Index Quanto Futures (FESQ) are calculated and distributed by EUREX Exchange since 17 March 2016. The historical data of the EURO STOXX 50 Quanto Futures Roll indices for the period between 2 January 2001 and 16 March 2016 was calculated using simulated values for the futures FESQ series, which were derived as follows:

$$\mathrm{FESQ}_t = \mathrm{FESX}_t \cdot \left(1 - \rho(\mathrm{SX5E},\ \mathrm{EURUSD}) \cdot V6I3 \cdot EURUSD3mV \cdot \frac{d}{365} \right)$$

Where:

FESQ_t = EURO STOXX 50 Index Quanto Futures on day (t)

FESX_t = EURO STOXX 50 Index Futures on day (t)

$\rho(\mathrm{SX5E},\ \mathrm{EURUSD})$ = Correlation of 90 days of EURO STOXX 50 index (SX5E) returns and EURUSD exchange rate returns

$V6I3$ = EURO STOXX 50 Volatility index (VSTOXX 3 months)

$EURUSD3mV$ = EURUSD exchange rate 3 month at-the-market (ATM) implied volatility

d = number of calendar days between (t) and the expiry date of the FESX contract

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18.STOXX FUTURES ROLL INDICES

STOXX Global Select Dividend 100 Futures Roll EUR Excess Return	CH0328366080	SDGPFEER	FGDV
STOXX Global Select Dividend 100 Futures Roll EUR Total Return	CH0328366098	SDGPFETR	FGDV
STOXX Europe 600 Futures Roll EUR Excess Return	CH0328366106	SXXPFEER	FXXP
STOXX Europe 600 Futures Roll EUR Total Return	CH0328366114	SXXPFETR	FXXP
EURO STOXX Banks Futures Roll EUR Excess Return	CH0328366122	SX7EFEER	FESB
EURO STOXX Banks Futures Roll EUR Total Return	CH0328366130	SX7EFETR	FESB

18.3. CALCULATION

$$I_t^{ER} = I_{t-1}^{ER} \cdot \left(\sum_{k=1}^{N+1} w_{k,t-1} \cdot \frac{F_{k,t}}{F_{k,t-1}} \right)$$

$$I_t^{TR} = I_{t-1}^{TR} \cdot \left(\sum_{k=1}^{N+1} w_{k,t-1} \cdot \frac{F_{k,t}}{F_{k,t-1}} + \frac{d}{360} \cdot R_{f,\,t-1} \right)$$

where:

I_t^{ER} =excess return index value on day (t)

I_t^{TR} =total return index value on day (t)

$w_{k,t}$ =weight of contract k on close of day (t)

$F_{k,t}$ =settlement value of futures contract k on day (t)

d =number of actual days between day (t) and day (t-1)

$R_{f,\,t}$ = fixing of risk-free rate on day (t). USD LIBOR ON is used as risk-free rate for EURO STOXX 50 Quanto Futures Roll and EONIA for the rest of indices

Weights calculation for the STOXX Futures Roll indices (except EURO STOXX 50 Traded Futures Roll indices):

The futures contracts weights $w_{k,t}$ are determined as follows:

$$w_{k,t-1} = \begin{cases} \dfrac{R-r}{R} \cdot \dfrac{1}{N} = \left(1 - \dfrac{r}{R}\right) \cdot \dfrac{1}{N} & :k = 1 \\[2ex] \dfrac{r}{R} \cdot \dfrac{1}{N} = \dfrac{1}{N} - w_{1,t-1} & :k = N+1 \\[2ex] \dfrac{1}{N} & :\text{else} \end{cases}$$

where:

R =length of roll period (4)

r =r^{th} roll day (0 if not in roll period)

N =number of futures contracts permanently in the index (1)

Weights calculation for the EURO STOXX 50 Traded Futures Roll indices:

The futures contracts weights $w_{k,t}$ are determined as follows:

$$w_{k,t-1} = \begin{cases} w_{k,t-2} - \left[10\% + \left(7\% - \dfrac{r-2}{100} \right) \cdot (r-1) \right] \cdot \dfrac{1}{N} & :k = 1 \\[2em] \dfrac{1}{N} - w_{1,t-1} & :k = N + 1 \\[2em] \dfrac{1}{N} & :else \end{cases}$$

where:

w_1= 1/N when r = 0

R =length of roll period (5)

r =r^{th} roll day (0 if not in roll period)

N =number of futures contracts permanently in the index (1)

19.   STOXX FUTURES REPLICATION INDICES

19.1. OVERVIEW

The STOXX Futures Replication indices aim to replicate the performance of STOXX Indices by simulating an investment into the a STOXX Futures Roll Total Return index, adjusted for dividends. The EURO STOXX 50 Futures Replications index uses the EURO STOXX 50 Traded Futures Roll Total Return for this purpose, adjusted for dividends.

Index types, currencies, base values and dates:

Index	Types	Currency	Base value and date
EURO STOXX 50 Futures Replication	Price, net and gross return	EUR	100 as of 29.12.2000
EURO STOXX 50 Quanto Futures Replication	Price, net and gross return	USD	100 as of 02.01.2001
EURO STOXX Select Dividend 30 Futures Replication	Price, net and gross return	EUR	100 as of 12.07.2007
STOXX Global Select Dividend 100 Futures Replication	Price, net and gross return	EUR	100 as of 16.07.2015
STOXX Europe 600 Futures Replication	Price, net and gross return	EUR	100 as of 20.07.2010
EURO STOXX Banks Futures Replication	Price, net and gross return	EUR	100 as of 19.03.2001

19.2. BASIC DATA

Index	ISIN	Symbol
EURO STOXX 50 Futures Replication Price EUR	CH0313264241	SX5EREP
EURO STOXX 50 Futures Replication Net Return EUR	CH0313264258	SX5TREP
EURO STOXX 50 Futures Replication Gross Return EUR	CH0313264266	SX5GTREP
EURO STOXX 50 Quanto Futures Replication Price USD	CH0328366288	SX5HPREP
EURO STOXX 50 Quanto Futures Replication Net Return USD	CH0328366296	SX5HNREP
EURO STOXX 50 Quanto Futures Replication Gross Return USD	CH0328366304	SX5HGREP
EURO STOXX Select Dividend 30 Futures Replication Price EUR	CH0328366163	SD3EREP
EURO STOXX Select Dividend 30 Futures Replication Net Return EUR	CH0328366171	SD3TREP
EURO STOXX Select Dividend 30 Futures Replication Gross Return EUR	CH0328366189	SD3GTREP
STOXX Global Select Dividend 100 Futures Replication Price EUR	CH0328366197	SDGPREP
STOXX Global Select Dividend 100 Futures Replication Net Return EUR	CH0328366205	SDGRREP
STOXX Global Select Dividend 100 Futures Replication Gross Return EUR	CH0328366213	SDGGRREP
STOXX Europe 600 Futures Replication Price EUR	CH0328366221	SXXPREP
STOXX Europe 600 Futures Replication Net Return EUR	CH0328366239	SXXRREP
STOXX Europe 600 Futures Replication Gross Return EUR	CH0328366247	SXXGRREP
EURO STOXX Banks Futures Replication Price EUR	CH0328366254	SX7EREP
EURO STOXX Banks Futures Replication Net Return EUR	CH0328366262	SX7TREP
EURO STOXX Banks Futures Replication Gross Return EUR	CH0328366270	SX7GTREP

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19.STOXX FUTURES REPLICATION INDICES

19.3. CALCULATION

The STOXX Futures Replication indices are calculated by using the performance of the STOXX Futures Roll Total Return Index. The Price and Net Return version are being adjusted for dividends by using the performance of the corresponding STOXX Price, Net Return and Gross Return indices as follows:

Futures Replication Index	Indices symbols for dividend adjustment
EURO STOXX 50 Futures Replication	Price: SX5E; net return: SX5T; gross return: SX5GT
EURO STOXX 50 Quanto Futures Replication	Price: SX5HUP; net return: SX5HUN; gross return: SX5HUG
EURO STOXX Select Dividend 30 Futures Replication	Price: SD3E; net return: SD3T; gross return: SD3GT
STOXX Global Select Dividend 100 Futures Replication	Price: SDGP; net return: SDGR; gross return: SDGGR
STOXX Europe 600 Futures Replication	Price: SXXP; net return: SXXR; gross return: SXXGR
EURO STOXX Banks Futures Replication	Price: SX7E; net return: SX7T; gross return: SX7GT

$$PR\_REP_t = PR\_REP_{t-1} \times \left(\frac{STX\_FTR_t}{STX\_FTR_{t-1}} - \frac{GR_t}{GR_{t-1}} + \frac{PR_t}{PR_{t-1}} \right)$$

$$NR\_REP_t = NR\_REP_{t-1} \times \left(\frac{STX\_FTR_t}{STX\_FTR_{t-1}} - \frac{GR_t}{GR_{t-1}} + \frac{NR_t}{NR_{t-1}} \right)$$

$$GR\_REP_t = GR\_REP_{t-1} \times \left(\frac{STX\_FTR_t}{STX\_FTR_{t-1}} \right)$$

With:

PR_REP_t	STOXX Futures Replication Price Index at time t
NR_REP_t	STOXX Futures Replication Net Return Index at time t
GR_REP_t	STOXX Futures Replication Gross Return Index at time t
STX_FTR_t	STOXX Futures Roll Total Return Index at time t. The EURO STOXX 50 Futures Replications index uses the EURO STOXX 50 Traded Futures Roll Total Return
PR_t	STOXX Price index for dividend adjustment at time t
NR_t	STOXX Net Return index for dividend adjustment at time t
GR_t	STOXX Gross Return index for dividend adjustment at time t

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20.   EURO STOXX 50 MULTI-ASSET

20.1. FIXED ALLOCATION INDICES

20.1.1.   OVERVIEW

The EURO STOXX 50 Multi-Asset Indices with fixed allocation reflect the performance of a cross-asset strategy by allocating weights in accordance with a pre-defined scheme. The indices are comprised of equity and bond exposure, using the EURO STOXX 50 and EURO STOXX 50 Corporate Bond indices. The different combinations of both indices offer efficient portfolios to investors, accordingly to their individual preferences:

	High Growth	Growth	Balanced	Stability	High Stability
EURO STOXX 50 Corporate Bond Index	20%	40%	50%	60%	80%
EURO STOXX 50 Equity Index	80%	60%	50%	40%	20%

Rebalancing: Indices are rebalanced to target weights on a quarterly basis. The new weights are implemented on the last trading day of March, June, September and December and effective on the following calculation day.

Index types and currencies: Price, total return[7] in EUR.

Base values and dates: 100 as of December 31, 2010

20.1.2.   BASIC DATA

Index	ISIN	Symbol
EURO STOXX 50 Multi-Asset High Growth Price Index EUR	DE000A2BLEC7	SX5MHGPI
EURO STOXX 50 Multi-Asset High Growth Total Return Index EUR	DE000A2BLED5	SX5MHGTR
EURO STOXX 50 Multi-Asset Growth Price Index EUR	DE000A2BLEE3	SX5MGPI
EURO STOXX 50 Multi-Asset Growth Total Return Index EUR	DE000A2BLEF0	SX5MGTR
EURO STOXX 50 Multi-Asset Balanced Price Index EUR	DE000A2BLEG8	SX5MBPI
EURO STOXX 50Multi-Asset Balanced Total Return Index EUR	DE000A2BLEH6	SX5MBTR
EURO STOXX 50 Multi-Asset Stability Price Index EUR	DE000A2BLEJ2	SX5MSPI
EURO STOXX 50 Multi-Asset Stability Total Return Index EUR	DE000A2BLEK0	SX5MSPTR
EURO STOXX 50 Multi-Asset High Stability Price Index EUR	DE000A2BLEL8	SX5MHSPI
EURO STOXX 50 Multi-Asset High Stability Total Return Index EUR	DE000A2BLEM6	SX5MHSTR

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[7] Total return version comprised of EURO STOXX 50 Corporate Bond Total Return and EURO STOXX 50 Gross Return versions

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20.EURO STOXX 50 MULTI-ASSET

20.1.3.   CALCULATION

The EURO STOXX 50 Multi-Asset indices with fixed allocation involve proportional long positions into the EURO STOXX 50 and EURO STOXX 50 Corporate Bond indices at each quarterly rebalancing.

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

With:

$w_{reb,i}$	Target 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 at time t
IV_t	Value of EURO STOXX 50 Multi-Asset index at time t
IV_{reb}	Value of EURO STOXX 50 Multi-Asset index at rebalancing date
reb	Rebalancing date of the EURO STOXX 50 Multi-Asset index (last trading day of March, June, September and December)

20.2. DYNAMIC ALLOCATION – MOMENTUM RISK CAP INDICES

20.2.1.   OVERVIEW

The EURO STOXX 50 Multi-Asset Momentum Risk Cap Indices reflect the performance of a strategy which dynamically allocates the weights of different asset types in accordance with the historical performance and risk profile of the relevant index. The indices are a blend of equity and bond exposure, constructed using the EURO STOXX 50 and EURO STOXX 50 Corporate Bond indices. The different versions offer efficient portfolios combining a momentum allocation strategy and simultaneously capping volatility at 5%, 7.5%, 10%, 15% or 20%.

Rebalancing: Indices are rebalanced on a quarterly basis. The new weights are implemented on the last trading day of March, June, September and December and effective on the following calculation day. Index weights are calculated by using the momentum of both underlying indices and considering the accordant predefined maximum volatility level.

Extraordinary weight changes: At any other calculation day, a daily volatility level control procedure is applied in order to react to substantial changes in the portfolio volatility as they may arise between two regular rebalancing events. In case the portfolio volatility exceeds the risk cap by more than 20%, the weights can be changed accordingly on a daily basis. The 20% buffer is applied to avoid excessive turnover. For example in case of 10% risk cap, a recalculation of the weight will be only triggered if the portfolio volatility exceeds 12%.

20. EURO STOXX 50 MULTI-ASSET

Index types and currencies: Price, total return[8] in EUR.

Base values and dates: 100 as of March 31, 2011

20.2.2. BASIC DATA

Index	ISIN	Symbol
EURO STOXX 50 Multi-Asset Momentum 5% Risk Cap Price Index EUR	DE000A2BLFR2	SX5M5PI
EURO STOXX 50 Multi-Asset Momentum 5% Risk Cap Total Return Index EUR	DE000A2BLFL5	SX5M5TR
EURO STOXX 50 Multi-Asset Momentum 7.5% Risk Cap Price Index EUR	DE000A2BLFS0	SX5M75PI
EURO STOXX 50 Multi-Asset Momentum 7.5% Risk Cap Total Return Index EUR	DE000A2BLFM3	SX5M75TR
EURO STOXX 50 Multi-Asset Momentum 10% Risk Cap Price Index EUR	DE000A2BLFT8	SX5M10PI
EURO STOXX 50 Multi-Asset Momentum 10% Risk Cap Total Return Index EUR	DE000A2BLFN1	SX5M10TR
EURO STOXX 50 Multi-Asset Momentum 15% Risk Cap Price Index EUR	DE000A2BLFU6	SX5M15PI
EURO STOXX 50 Multi-Asset Momentum 15% Risk Cap Total Return Index EUR	DE000A2BLFP6	SX5M15TR
EURO STOXX 50 Multi-Asset Momentum 20% Risk Cap Price Index EUR	DE000A2BLFV4	SX5M20PI
EURO STOXX 50 Multi-Asset Momentum 20% Risk Cap Total Return Index EUR	DE000A2BLFQ4	SX5M20TR

20.2.3. CALCULATION

The EURO STOXX 50 Multi-Asset Momentum Risk Cap indices involve dynamically allocated long positions into the EURO STOXX 50 and EURO STOXX 50 Corporate Bond indices (called sub-indices).

Rebalancing:

STEP 1
Calculate the historical price momentum of both sub-indices:

$$Momentum_{reb,i} = \frac{U_{reb-1,i}}{U_{reb-60,i}} - 1$$

STEP 2
Rank the sub-indices by momentum in ascending order.

STEP 3
Case I: If RealizedVol$_{t,rank1}$ ≤ RiskCap, set $w_{rank1} = 1$, $w_{rank2} = 0$.

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[8] Total return version comprised of EURO STOXX 50 Corporate Bond Total Return and EURO STOXX 50 Gross Return versions

$$RealizedVol_{t,i} = \sqrt{\frac{252}{59} * \sum_s \left[ln\left(\frac{U_{s,i}}{U_{s-1,i}}\right) \right]^2}$$

Case II: If RealizedVol$_{t,rank1}$ > RiskCap:
   a. if RealizedVol$_{t,rank2}$ ≤ RiskCap, set PortfolioVol$_{t,MA}$ = RiskCap and solve for w$_{rank1}$, where:

$$PortfolioVol_{t,MA} =$$
$$= \sqrt{w_{rank1}^2 * RealizedVol_{rank1}^2 \quad + w_{rank2}^2 * RealizedVol_{rank2}^2 + 2 * w_{rank1} * w_{rank2} * RealizedCov_{rank1,rank2}}$$

$$w_{rank1} + w_{rank2} = 1$$
$$w_{rank1}, w_{rank2} \leq 1$$
$$w_{rank1}, w_{rank2} \geq 0$$

$$RealizedCov_{t,rank1,rank2} = \frac{252}{59} * \sum_s \left[ln\left(\frac{U_{s,rank1}}{U_{s-1,rank1}}\right) * ln\left(\frac{U_{s,rank2}}{U_{s-1,rank2}}\right) \right]$$

   b.if RealizedVol$_{t,rank2}$ > RiskCap, use 100% weight for the sub-index with the lower RealizedVol.

STEP 4
Assign w$_{rank1}$ and w$_{rank2}$ to the relevant w$_{reb,i}$.

Extraordinary weight changes:

   At any other calculation day recalculate $PortfolioVol_{t,MA}$ and check whether it breaches the RiskCap adjusted with 20% tolerance buffer:
   a. if PortfolioVol$_{t,MA}$ ≤ 1,2 * RiskCap, no changes required, use previous weights;
   b. if PortfolioVol$_{t,MA}$ > 1,2 * RiskCap, set PortfolioVol$_{t,MA}$ = RiskCap, solve for w$_{rank1}$ (refer to formulas in Case II a.) and assign the new calculated weights w$_{rank1}$ and w$_{rank2}$ to the relevant w$_{reb,i}$.

At any calculation time t, the value of a EURO STOXX 50 Multi-Asset Momentum Risk Cap index value is calculated as follows:

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

With

$U_{t,i}$	Value of sub-index i (bond or equity) at time t, rounded to to four decimal places for EURO STOXX 50 Corporate Bond index and to two decimal places for EURO STOXX 50
s	t-59 to t-1
$RealizedVol_{t,i}$	Realized volatility measured over 60 days for sub-index i at day t
RiskCap	Predefined maximum level of volatility (i.e. 5%, 7,5%, 10%, 15% or 20%)
$RealizedCov_{rank1,rank2}$	Covariance of the bond and equity sub-indices
$RealizedVol_{t,MA}$	Realized volatility measured over 60 days for multi-asset index i at time t
$w_{reb,i}$	Weight of sub-index i at rebalancing date or intra-monthly weight change date
$U_{reb,i}$	Close value of sub-index i at rebalancing date or intra-monthly weight change date
IV_t	Index value at time t, rounded to four decimal places
IV_{reb}	Index close value at last rebalancing date or extraordinary weight change date, rounded to four decimal places
reb	Last ordinary rebalancing date of the index or extraordinary weight change date

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21. STOXX GLOBAL BASKET

21.1. OVERVIEW

The STOXX Global Basket Select & Diversification Select EUR Index aims to invest a fixed proportion into each STOXX Regional Select & Diversification Select EUR Index.

The STOXX Global Basket Select EUR index invests 40% into the STOXX North America Select 50 EUR Index, 30% into the STOXX Asia/Pacific Select 50 EUR Index and 30% into the STOXX Europe Select 50 EUR Index at each quarterly review.

The STOXX Global Basket Diversification Select EUR index invests 40% into the STOXX North America Diversification Select 50 EUR Index, 30% into the STOXX Asia/Pacific Diversification Select 50 EUR Index and 30% into the STOXX Europe Diversification Select 50 EUR Index at each quarterly review.

Index types and currencies: price, net return and gross return in EUR, rebalanced on a quarterly basis.

Base values and dates: The following base values and dates apply: 100 on June 21, 2004

21.2. BASIC DATA

Index	ISIN	Symbol
STOXX Global Basket Select EUR Price	CH0321426923	SXW1BSEE
STOXX Global Basket Select EUR Net Return	CH0321426980	SXW1BSER
STOXX Global Basket Select EUR Gross Return	CH0321427038	SXW1BSEG
STOXX Global Basket Diversification Select EUR Price	CH0321427079	SXW1BDSE
STOXX Global Basket Diversification Select EUR Net Return	CH0321427129	SXW1BDSR
STOXX Global Basket Diversification Select EUR Gross Return	CH0321427145	SXW1BDSG

21.3. CALCULATION

The index values are calculated as following:

$$IV_t = IV_{reb} \times \sum_{i=1}^{3} w_i \times \frac{U_{t,i}}{U_{reb,i}}$$

With

w_i	target weight of sub-index i
U_{reb}	close value of sub-index i on rebalancing day
IV_t	Index value
IV_{reb}	Index value on rebalancing day

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21.STOXX GLOBAL BASKET

STOXX Europe Basket Select EUR index	weight
STOXX North America Select 50 EUR Index	40%
STOXX Europe Select 50 EUR Index	30%
STOXX Asia/Pacific Select 50 EUR Index	30%

STOXX Europe Basket Diversification Select EUR index	weight
STOXX North America Diversification Select 50 EUR Index	40%
STOXX Europe Select Diversification 50 EUR Index	30%
STOXX Asia/Pacific Diversification Select 50 EUR Index	30%

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