



EURO STOXX 50® Index Total Return Futures – Transition to €STR Flat

Attachment 2 – Determination of EURO STOXX 50® Index (SX5E) forward points for use in the conversion methodology

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1. Introduction

On 18th October 2021 (“**€STR Transition Effective Date**”), Eurex will implement the actions necessary for the EURO STOXX 50® Index Total Return Futures to be changed to use €STR flat as the funding rate. This will be achieved by removing the reference to the ECB determined Spread used as part of the fallback rate of EONIA.

The associated conversion methodology designed by Eurex Clearing to the holders of open interest on the date of implementation is shown at Attachment 3.

The methodology to be implemented by Eurex Clearing requires as an input the market determined forward curve of the EURO STOXX 50® Index (SX5E) for each expiration of the EURO STOXX 50® Index Total Return Futures (TESX). The forward curve will be determined and calculated by Eurex based on market inputs.

These calculations will be done after the close of trading on the trading day immediately preceding the €STR Transition Effective Date i.e. Friday, 15 October 2021 (“**Calculation Date**”)

This paper outlines the methodology to be used by Eurex to determine the forward points of the EURO STOXX 50® Index (SX5E) in relation to the conversion methodology.

In addition, Eurex will ask market participants to submit prices into the Eurex orderbook in the detailed instruments below at the implementation date to be determined.

Note: the forward points determined will not be used in the regular daily settlement process of the EURO STOXX 50® Index Options which occurs after market close.

2. Determination of the SX5E Index Forward Curve:

2.1. Spot index and nearest futures expiry

Eurex will use the Official Close of the EURO STOXX 50® Index (SX5E) as determined by Stoxx Ltd as the index level for calculation of forward points.

Eurex will use the nearest quarterly expiry in the Mar/Jun/Sep/Dec cycle of the EURO STOXX 50® Index Futures (FESX) to determine the forward price of that nearest quarterly. This will be based upon the official Eurex Daily Settlement Price – determined at the end of day by Eurex (at 17:30 CET).

Eurex will then calculate the basis between the EURO STOXX 50® Index (SX5E) and the front month EURO STOXX 50® Index Futures (FESX) based on these prices in index points.

For example: For the Jun-21 Expiry Date:

- i. EURO STOXX 50® Index Close is determined by Stoxx Ltd as 4070.56
- ii. EURO STOXX 50® Index Future (FESX) Daily Settlement Price for Jun-21 is determined by Eurex as 4066.0 index points

The basis between the spot index and the Jun-21 expiry for the calculation of the conversion methodology will be: $4066.0 - 4070.56 = - 4.56$ index points

2.2. Determination of the subsequent expiry months

Eurex will where possible use the prices in the order book of EURO STOXX 50® Index Options (OESX) for each relevant Expiration Date. Specifically, Eurex will use the prices of the Options Volatility Strategy Conversion + Underlying (CNV-U) for each available expiry matching those of the Total Return Futures (excluding the nearest expiration).

The CNV-U options volatility strategy comprises of two options and one futures leg. Specifically at Eurex this strategy, if bought, is a combination of the purchase of EURO STOXX 50® Index Options (OESX) Calls and simultaneous sale of an equal quantity of OESX Puts at the same strike, combined with the sale of the underlying EURO STOXX 50® Index Future (FESX) at a price equivalent to that of the strike of the call and put options. The underlying will be the nearest expiration of the EURO STOXX 50® Index Future (FESX).

The determined forward basis will be based upon the price of the CNV-U option strategy for each expiration. The price will be determined upon the volume weighted average trade price within a specified trading window, or if no trades occur, then at mid-price of the bid-ask spread taken as a snapshot at a random time within the last 3 minutes of the specified trading window.

The determined forward point of each expiry for which a price can be determined from this methodology will be calculated as:

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EURO STOXX 50® Index Future (FESX) Daily Settlement Price above plus the determined forward basis determined from the CNV-U option strategy price for each expiry divided by the discount factor relevant to that expiry.

For example: For the Dec-22 Expiry Date:

- i. EURO STOXX 50® Index Future (FESX) Daily Settlement Price for Jun-21 is determined by Eurex as 4066.0 index points
- ii. EURO STOXX 50® Index Options (OESX) CNV-U Strategy of the 4050 strike for Dec-22 expiry is determined by Eurex as -169.0
- iii. The discount factor (see 2.3 below) is 1.0087

The forward point for the Dec 22 Expiry can now be obtained by applying the following rationale. Relying on the CNV-U strategy being delta insensitive for short periods of time, i.e. between the specified trading window (see 3 below) and the official daily settlement price determination of FESX, along with employing put/call parity, provides the following CNV-U implied forward point:

$$= \frac{-169.0 + (4066.0 - 4050)}{1.0087} + 4050 = 3898.32$$

2.3. Determination of the applicable discount factors

Eurex will where possible use the prices in the order book of EURO STOXX 50® Index Options (OESX) for each relevant Expiration Date. Specifically, Eurex will use the prices of the Options Box Spread Strategy (BOX) for each available expiry matching those of the Total Return Futures (excluding the nearest expiration).

The BOX options volatility strategy comprises of four options legs. Specifically at Eurex this strategy, if bought, is a combination of the purchase of OESX Calls and sale of OESX Puts at the same strike, combined with the sale of OESX Calls and purchase of OESX Puts at a higher strike, all simultaneously and in the same quantity.

The determined discount factor will be based upon the price of the BOX option strategy for each expiration, in comparison to the payoff of that strategy determined as the difference between the two chosen strikes. The price of the BOX options spread will be determined upon the volume weighted average trade price, or if no trades occur, then at mid-price of the bid-ask spread, or where neither of these is available Eurex will source broker quotes in those expirations available.

For example: For the Dec-22 Expiry Date:

- i. EURO STOXX 50® Index Options Box Spread Strategy 1000/6000 i.e. where the lower strike is 1000 index points and the higher strike is 6000 index points has a pay-off profile of 5000 index points.
- ii. EURO STOXX 50® Index Options Box Spread Strategy 1000/6000 price is determined by Eurex as 5043.5 index points.

The determined discount factor for Dec-22 expiration is $= (5043.5 / 5000) = 1.0087$

Where no BOX strategy prices are available – discount factors will be linearly interpolated by Eurex

2.4. Determination of the Forward Points where CNV-U strategy are not available.

For all available expiries of EURO STOXX 50® Index Options (OESX) the Daily Settlement Price of the OESX will be used to calculate the Put-Call Parity for each expiry i.e. the theoretical strike price where the Put and Call would have equal value interpolated from the two adjacent Strikes.

The Put-Call parity levels will determine theoretical forward points based the EURO STOXX 50® Index Options (OESX) closing values. This level will then be used in conjunction with those adjacent expiries from which a forward point can be determined using 2. above.

The difference between the determined forward points and the derived Put-Call parity prices will be interpolated to determine the missing forward point.

For Example: For the Mar-23 Expiry Date:

OESX Expiry	Forward Point Determined by OESX CNV-U Strategy	Put-Call Parity Derived from OESX Daily Settlement Prices
Dec-22	3898.45	3909.68
Mar-23	Not available	3894.10
Jun-23	3809.62	3824.16

Forward Point for Mar-23 will be calculated as:

$$= 3898.45 + (3809.62 - 3898.45) * \frac{(3894.10 - 3909.68)}{(3824.16 - 3909.68)} = 3882.27$$

2.5. Determination of the Forward Points where no OESX expiries are available.

For expiries of the EURO STOXX 50® Index Total Return Futures (TESX) but where a forward point cannot be determined by 2. or 4. above due to the absence of relevant expiries in the EURO STOXX 50® Index Options (OESX).

The adjacent points calculated from 2. above will be used as the primary source for interpolation of those missing expiries. The interpolation will be based upon the seasonal proportionality of the required expiry in the previously calculated annual period.

For Example: For the Mar-24 Expiry Date:

Expiry	Forward Point Determined by 2.2 – 2.5 above	Expiry	Forward Point Determined by 2.2 – 2.5 above
Dec-22	3898.45	Dec-23	3790.43
Mar-23	3882.27	Mar-24	Not Available
Jun-23	3809.62	Jun-24	3698.79

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Forward Point for Mar-24 will be calculated as:

$$= 3790.43 + (3698.79 - 3790.43) * \frac{(3882.27 - 3898.45)}{(3809.62 - 3898.45)} = 3773.74$$

3. Trading Parameters and Specified Trading Window Timings.

On the day to be determined Eurex will populate the T7 Order book with CNV-U strategies for each required expiry in the EURO STOXX 50® Index Options (OESX). There will be one official strategy for each Expiry. The strike price of the Call, the Put and the price of the Underlying Futures will be the same. The Strike price to be used will be determined by Eurex based upon the price of the nearest Expiry in the EURO STOXX 50® Index Futures (FESX).

The specified reference trading window will be for a period between 16:30 and 17:00 CET on the trading day nominated. The market phase will be maintained as continuous throughout the specified trading window (i.e. no auction phase will be initiated) and the outputs will be used for the determination for the conversion methodology only.

4. Publication of the determined Forward Points.

For expiries of the EURO STOXX 50® Index Total Return Futures (TESX), the forward points, once determined by the above methodology will be published via the Eurex Production Noticeboard.

Additionally, the discount factors used to determine the forward points will also be published for information.