SOLACTIVE
German Index Engineering

# INDEX GUIDELINE

Solactive Europe & US Prime ESG Equity Protected Index

*Version 1.0*

*1 September 2020*

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# INTRODUCTION

This document (the "Guideline") is to be used as a guideline with regard to the composition, calculation and maintenance of the Solactive Europe & US Prime ESG Equity Protected Index (the "Index"). Any changes to or deviations from this methodology shall be made in the sole judgment and discretion of Solactive. The Index is calculated, administered and published by Solactive AG ("Solactive") assuming the role as index administrator (the "Index Administrator") and Calculation Agent. The name "Solactive" is trademarked. Credit Agricole assumes the role of the Index Designer.

The Guideline and the policies and guidelines referenced herein contain the underlying principles and rules regarding the structure and operation of the Index. Solactive does not offer any explicit or tacit guarantee or assurance, neither pertaining to the results from the use of the Index nor the level of the Index at any certain point in time nor in any other respect. Solactive strives to the best of its ability to ensure the correctness of the calculation. There is no obligation for Solactive – irrespective of possible obligations to issuers – to advise third parties, including investors and/or financial intermediaries, of any errors in the Index. The publication of the Index by Solactive does not constitute a recommendation for capital investment and does not contain any assurance or opinion of Solactive regarding a possible investment in a financial instrument based on this Index.

# 1. INDEX SPECIFICATIONS

## 1.1. SCOPE OF THE INDEX

The Solactive Europe & US Prime ESG Equity Protected Index aims to protect the Underlying against adverse market movements by buying on a daily basis a 1 year European put option protection with strike between 90% and 95% on the Underlying. The pricing of the put option would use a standard B&S methodology as described in the Annex 1 : Option pricing methodology.

## 1.2. IDENTIFIERS AND PUBLICATION

The Index is published under the following identifiers:

| Name | ISIN | Currency | Type | RIC | BBG ticker |
|---|---|---|---|---|---|
| Solactive Europe & US Prime ESG Equity Protected Index | DE000SL0A667 | EUR | Net Total Return | .SOLPEMEP | SOLPEMEP |

The Index is published via the price marketing services of Boerse Stuttgart GmbH and may be distributed to all of its affiliated vendors. Each vendor decides on an individual basis as to whether it will distribute or display the Index via its information systems. In the event that data cannot be provided to the price marketing services of Boerse Stuttgart GmbH, the Index cannot be published.

## 1.3. INITIAL LEVEL OF THE INDEX

The initial level of the Index on 02 November 2007 (the "Start Date") is 100.

The index "Live Date" is 27 July 2020.

## 1.4. PRICES AND CALCUATION FREQUENCY

The closing level is based on the CLOSING PRICES for the INDEX COMPONENTS on the respective EXCHANGES on which the INDEX COMPONENTS are listed. The Closing level is calculated and published at 6pm EST.

## 1.5. DEFINITIONS IN RESPECT OF SECTION 1

This section contains defined terms used in Section 1 and, if applicable, other Sections of the Guideline.

"Index Business Day" means in respect of any Index constituent, each day on which the Underlying is scheduled to be published.

"Index Calculator" is Solactive or any other appropriately appointed successor in this function.

"Index Component" is each constituent as set out in the table in Section 2.1.

"Index Currency" is the currency specified in the column "Currency" in the table in Section 1.2.

"Start Date" is 02 November 2007.

"Live Date" is 27 July 2020.

"Initiation Date" is 10 October 2006

"Trading Price" is in respect to an Index Component and a Trading Day is the most recent price to be used in the index calculation on this Trading Day determined in accordance with the Exchange regulations. If the Exchange has no trading price for an Index Component for this Trading day, the most recent trading price for the preceding Trading Day is used in the calculation.

"Underlying" The Solactive Europe & US Prime ESG Min Vol EUR-Hedged VT 10% Index (Bloomberg ticker : SOLPEHVT).

# 2. CALCULATION OF THE INDEX

## 2.1. INDEX CONSTITUENTS

On each date t, the index transacts options with the following characteristics for inclusion in the synthetic option portfolio:

| | |
|---|---|
| Type | Put Option |
| Reference Instrument | Underlying |
| Strike date | t |
| Strike | K calculated as described in Annex A.3 |
| Maturity date | t + M Business days |
| Nominal | $\frac{Index_{t-1}}{M}$ |
| S(t) | Price of the Reference instrument on date t |

The interest rates used in the options pricing before "Live Date":

| Rate | Maturity | Bloomberg Page | Price source |
|---|---|---|---|
| Overnight - EONIA | 1 business day | EONIA Index | European Money Markets Institute |
| Euribor 1 week | 1 week | EUR001W Index | European Money Markets Institute |
| Euribor 1 month | 1 month | EUR001M Index | European Money Markets Institute |
| Euribor 3 months | 3 months | EUR003M Index | European Money Markets Institute |
| Euribor 6 months | 6 months | EUR006M Index | European Money Markets Institute |
| Euribor 12 months | 12 months | EUR012M Index | European Money Markets Institute |

The interest rates used in the options pricing after "Live Date":

| Rate | Maturity | Bloomberg Page | Reuters IC |
|---|---|---|---|
| Overnight - EONIA | 1 business day | ESTRON Index | EUROSTR= |
| Euribor 1 week | 1 week | EESWE1Z Curncy | EURESTSW= |
| Euribor 1 month | 1 month | EESWEA Curncy | EUREST1M= |
| Euribor 3 months | 3 months | EESWEC Curncy | EUREST3M= |
| Euribor 6 months | 6 months | EESWEF Curncy | EUREST6M= |
| Euribor 12 months | 12 months | EESWE1 Curncy | EUREST1Y= |

## 2.2. INDEX VALUE CALCULATION

On each Index Business Day t >= "Start Date", the Index will be calculated as follow:

$$FinalIndex_t = FinalIndex_{t-1} * \frac{NetIndex_t}{NetIndex_{t-1}} \text{ for t>=" Start Date"}$$

$$FinalIndex_{Start\ Date} = 100$$

$$NetIndex_t = NetIndex_{t\_1} * \frac{Index_t}{Index_{t-1}} * [\,1 - Fees * (ACT(t-1,t)/365]$$

$$NetIndex_{Inception\ Date} = 100$$

$$Index_t = Udl_t + MV_t$$

$$Index_{Inception\ Date} = Index_{Inception\ Date+1} = 1$$

With:

Act(t-1, t) The number of calendar days from, and including, the date t to, but excluding t-1

$Udl_t$ : The marked-to-market value of the investment on the underlying on date t as described in the section 2.4 (The marked-to-market calculation).

$MV_t$ : The marked-to-market value of the option positions (options with premium paid at maturity) ("O") which have not yet reached their maturity on date t as described in the section 2.3 (The marked-to-market calculation)

M : 252

$Fees$ = 0.0060

## 2.3. THE OPTIONS MARKED-TO-MARKET CALCULATION

The marked-to-market value of the option positions (options with premium paid at maturity) ("O") which have not yet reached their maturity on date t is calculated according to the below formula:

$$MV_t = \sum_{O \text{ in the Option Basket}} MVO_t^u = \sum_{O \text{ in the Option Basket}} (MtMO_t^u - MtMPremO_t^u)$$

$u$ : Strike date of the option with $t - M \text{ business days} < u \leq t$

M: 252

At Strike Date *t*, the marked-to-market value ("$MVO_t^t$") of the option position traded on date *t* is determined in accordance with the following formula:

$$MVO_t^t = MtMO_t^t - PremO_t^t = 0$$

The marked-to-market value of the option positions, in the Option Basket which, have not yet reached their maturity shall be determined in accordance with the following formula:

$$MVO_t^u = MtMO_t^u - MtMPremO_t^u = N^u \times PremOPct_t^u - PremO_t^u \times DF_{u+M}(t)$$

With:

$u$ Strike date of the option with $t - M \text{ business days} < u \leq t$

$N^u$ Nominal of the options traded on date $u$ as defined in the above section

$PremOPct_t^u$ Premium of a European option on date t, expressed as a percentage, without including the hedging buffer, calculated in accordance with the Black & Scholes formula (as defined in Annex *A- Option pricing methodology*) with the characteristics defined in the above section "*Description of the options comprised in the index composition*" (being noted the reference to the options with a strike date $u$)

$DF_{u+M}(t)$ Discount Factor on date t for the Maturity Date u+M of the option O (struck on date u), as determined in accordance with section "*Calculation of Discount Factor and Forward Price for the option Maturity*" in *A- Option pricing methodology*.

$PremO_t^u$ Premium of the option "O" as calculated on strike date u and as described in the section 2.6 (OPTIONS PREMIUM).

## 2.4. THE UNDERLYING MARKED-TO-MARKET CALCULATION

The marked-to-market value of the investment on the underlying on date t is calculated according to the following formula:

For Each date t :

If t >= "Start Date":

$$Udl_t = Nb_t \times S_t$$

Else:

For "Inception Date" =< t < Start Date, we have to make the following adjustments:

$$Udl_t = Nb_t \times S_t + (1 - \frac{t+1}{M})$$

$S_t$: Value of the underlying on date t.

$Nb_t$: The number of underlying's units bought on date t:

$$Nb_t = Nb_{t-1} + \frac{IValO_t}{S_t}$$

$$Nb_{Inception\ Date+1} = \frac{1}{M \times S_{Inception\ Date+1}}$$

$Nb_{t-1}$: The number of underlying's units bought on date t-1 .

$IValO_t$: Value of the option exercised on date t (so, with a maturity date t) minus its premium as described in the section 2.5 THE OPTIONS INTRINSIC VALUE CALCULATION

## 2.5. THE OPTIONS INTRINSIC VALUE CALCULATION

For "Inception Date" =< t < Start Date:

$$IVal_t = \frac{1}{M}$$

The intrinsic value of the options, in the Option Basket which, have reached their maturity shall be determined in accordance with the following formula for each date > "Start Date":

$$IValO_t = N^d \times IValOPct_t^d - PremO_t^d$$

With:

$d$ : Strike date of the option equal to $t - M$ business days

$N^d$ : Nominal of the options as defined in the section (2.1 INDEX CONSTITUENTS)

$PremO_t^d$ : Premium of the option O as calculated on strike date d and as described in the section 2.3 (MARKED-TO-MARKET CALCULATIO)

$IValOPct_t^d$ : Intrinsic value of the option traded on date $d$ defined by:

$$\begin{cases} \dfrac{max(0, S(t) - K^d)}{S(d)} & if\ the\ option\ is\ a\ Call \\ \dfrac{max\left(0, K^d - S(t)\right)}{S(d)} & if\ the\ option\ is\ a\ Put \end{cases}$$

With $K^d$ being the strike of the option traded on date $d$, defined in accordance with section 2.5 (STRIKE CALCULATION)

## 2.6. STRIKE CALCULATION

On the Strike Date, the unconstrained strike $K_1$ of the option bought shall be determined so that:

$$1.25\% = PremOPct_t{}^*$$

With:

$PremOPct_t{}^*$: Hypothetic premium of a European option on date t, expressed as a percentage, including the hedging buffer (described in Annex A4), calculated in accordance with the Black & Scholes formula (as defined in Annex *A- Option pricing methodology*) with the characteristics defined in the above section (2.1 INDEX CONSTITUENTS)

The final strike K shall be determined according to the following formula:

$$K = \min(95\% \times S_t, \max\,(90\% \times S_t, K_1))$$

With:

$S_t$: Value of the underlying on date t

## 2.7. OPTIONS PREMIUM

The premium $PremO^t$ of the option bought (and paid at maturity) shall be determined in accordance with the following formula:

$$PremO_t^u = N^t \times PremOPct_t \times \frac{1}{DF_T(t)}$$

With:

$N^t$: Nominal of the options as defined in the section (2.1 INDEX CONSTITUENTS). Positive when buying option, negative when selling option

$PremOPct_t$ : Premium of a European option on date t, expressed as a percentage, for a strike K and including the hedging buffer (described in section A4), calculated in accordance with the Black & Scholes formula (as defined in section *A- Option pricing methodology*) with the characteristics defined in the above section "*Description of the options comprised in the index composition*"

$DF_T(t)$ : Discount Factor on date t for the Maturity Date T, as determined in accordance with section "*Calculation of Discount Factor and Forward Price for the option Maturity*" in section A.

## 2.8. ACCURACY

Index Levels are published end of day on Bloomberg with levels rounded to two decimal places.

## 2.9. RECALCULATION

Solactive makes the greatest possible efforts to accurately calculate and maintain its indices. However, errors in the index determination process may occur from time to time for variety reasons (internal or external) and therefore, cannot be completely ruled out. Solactive endeavors to correct all errors that have been identified within a reasonable period of time. The understanding of "a reasonable period of time" as well as the general measures to be taken are generally depending on the underlying and is specified in the Solactive (http://www.solactive.com/news/documents/), which is incorporated by reference and available on the Solactive website: www.solactive.com.

## 2.10. MARKET DISRUPTION

In periods of market stress Solactive calculates its indices following predefined and exhaustive arrangements as described in the Solactive Disruption Policy, which is incorporated by reference and available on the Solactive website: www.solactive.com. Such market stress can arise due to a variety of reasons, but generally results in inaccurate or delayed prices for one or more Index Components. The determination of the Index may be limited or impaired at times of illiquid or fragmented markets and market stress.

# 3. MISCELLANEOUS

## 3.1. DISCRETION

Any discretion which may need to be exercised in relation to the determination of the Index (for example, the selection of the Index Components or any other relevant decisions in relation to the Index) shall be in accordance with the Solactive's Discretion Policy, which is available at Solactive's website: www.solactive.com.

## 3.2. METHODOLOGY REVIEW

The methodology of the Index is not subject to a regular review.

## 3.3. CHANGES IN CALCULATION METHOD

The application by the Index Calculator of the method described in this document is final and binding. The Index Calculator shall apply the method described above for the composition and calculation of the Index. However, it cannot be excluded that the market environment, supervisory, legal, financial or tax reasons may require changes to be made to this method. In such cases the Index Designer may make changes to the terms and conditions of the Index and the method applied to calculate the Index that it deems to be necessary and desirable in order to prevent obvious or demonstrable error or to remedy, correct or supplement incorrect terms and conditions. The Index Designer is obliged to provide information on any such modifications or changes to the Index Calculator.

## 3.4. TERMINATION

Solactive makes the greatest possible efforts to ensure the resilience and continued integrity of its indices over time. Nevertheless, if no other options are available the orderly cessation of an index may be indicated. This is usually the case when the underlying market or economic reality, which an index is set to measure or to reflect, changes substantially and in a way not foreseeable at the time of inception of the index, the index rules, and particularly the selection criteria, can no longer be applied coherently or the index is no longer used as the underlying value for financial instruments, investment funds and financial contracts.

Solactive has established and maintains clear guidelines on how to identify situations in which the cessation of an index is unavoidable, how stakeholders are to be informed and consulted and the procedures to be followed for a termination or the transition to an alternative index. Details are specified in the Termination Policy, which is incorporated by reference and available on the Solactive website: www.solactive.com.

## 3.5. OVERSIGHT

The Index Designer is responsible for decisions regarding any amendments to the rules of the Index. Any such amendment, which may result in an amendment of the Guideline, must be submitted to the Index Committee for prior approval and will be made in compliance with the "Solactive Methodology Policy", which is available at www.solactive.com.

# ANNEX A : OPTION PRICING METHODOLOGY

## 1- DEFINITIONS

This section defines the pricing methodology for a European-style vanilla option (the "Option") on the Reference Instrument, on any given date t.

The Option is defined with the following terms:

| | |
|---|---|
| CorP | If the Option is a Call: CorP = +1 or if it's a Put: CorP = –1 |
| T | Maturity Date of the Option |
| K | Strike of the Option |
| S(t) | Price of the Reference Instrument on date t |

The payoff at maturity for the Option is defined by:

$$Payoff(T) = max\big(0, CP \times (S(t) - K)\big)$$

The premium of the Option is determined with reference to the terms of the Option as well as the levels $DF_T$, $F_T$ and $V_{T,K}$ as defined below:

$$Call\left(t, F_T(t), DF_T(t), T, K, V_{T,K}(t)\right) = Premium\left(t, CP = +1, F_T(t), DF_T(t), T, K, V_{T,K}(t)\right)$$

$$Put\left(t, F_T(t), DF_T(t), T, K, V_{T,K}(t)\right) = Premium\left(t, CP = -1, F_T(t), DF_T(t), T, K, V_{T,K}(t)\right)$$

Where:

| | |
|---|---|
| $DF_T(t)$ | Discount Factor on date t for the Maturity Date T, as determined in accordance with section "*Calculation of Discount Factor and Forward Price for the option Maturity*" below |
| $F_T(t)$ | Forward Price on date t for the Maturity Date T, as determined in accordance with section "*Calculation of Discount Factor and Forward Price for the option Maturity*" below |
| $V_{T,K}(t)$ | Implied Volatility on date t for the Maturity Date T and the Strike K, as determined in accordance with section "*Implied volatility determination*" below |

## 2- BLACK & SCHOLES FORMULA

The Black & Scholes model will be used to estimate the premium of options:

$$Premium\left(t, u, CP, F_T(t), DF_T(t), T, K, V_{T,K}(t)\right)$$
$$= DF_T(t) * CP * \left(F_T(t) * N(CP * d_1) - K * N(CP * d_2)\right)$$

The Black & Scholes option premium, expressed as a percentage of Reference Instrument price S(t) is determined in accordance with the following formula:

$$PremiumPct\left(t,u,CP,F_T(t),DF_T(t),T,K,V_{T,K}(t)\right) = \frac{Premium\left(t,CP,F_T(t),DF_T(t),T,K,V_{T,K}(t)\right)}{S(u)}$$

With:

$$d_1 = \frac{ln\left(\frac{F_T(t)}{K}\right) + \frac{V_{T,K}(t)^2}{2} * \frac{Act(t,T)}{365}}{V_{T,K}(t) * \sqrt{\frac{Act(t,T)}{365}}}$$

$$d_2 = d_1 - V_{T,K}(t) * \sqrt{\frac{Act(t,T)}{365}}$$

Where:

Act(t, T) The number of calendar days from, and including, the date t to, but excluding, the date T

$N(x)$ The cumulative distribution function of the standard normal distribution

$$N(x) = \frac{1}{\sqrt{2\pi}}\int_{-\infty}^{x} e^{\frac{-u^2}{2}}du$$

$ln(x)$ The natural logarithm of x

## 3- CALCULATION OF DISCOUNT FACTOR AND FORWARD PRICE FOR THE OPTION MATURITY

Within the set of available rate curve maturities $\tau = \{T_i, 1 \leq i \leq m\}$ two eligible maturities $T_{inf}$ and $T_{sup}$ are selected with regards to the target Maturity Date of the Option using the following methodology:

- Where T is less than or equal to $T_1$, a flat rate extrapolation will be used. In such case, $T_{inf} = T_{sup} = T_1$
- Where T is greater than or equal to $T_m$, a flat rate extrapolation will be used. In such case, $T_{inf} = T_{sup} = T_m$
- Otherwise $T_{inf}$ is the furthest eligible maturity that is less than or equal to T and $T_{sup}$ is the shortest Eligible Listed Maturity that is greater than or equal to T :

$$T_{inf} = max\{x \in \tau \backslash x \leq T\}$$

$$T_{sup} = min\{x \in \tau \backslash x \geq T\}$$

Given those two eligible maturities, the Discount Factor and the Forward Price for the option are interpolated as set forth below:

$$DF_T(t) = exp\left(-\left(r_{inf}(t) - \frac{r_{inf}(t) * Act(T_{inf}, T) - r_{sup}(t) * Act(T_{inf}, T)}{Act(T_{inf}, T_{sup})}\right) \times \frac{Act(T_{inf}, T)}{360}\right)$$

$$F_T(t) = \frac{S(t)}{DF_T(t)}$$

Where :

$r_i(t)$ Rate on date t for the eligible maturity date $T_i$, as referenced in the *Rate Table* in the section 2.1 INDEX CONSTITUENTS

## 4- IMPLIED VOLATILITY DETERMINATION

Implied Volatility on date t for the Maturity Date T and the Strike K is set according to the target volatility of the Reference Instrument:

1. When taking into account the hedging buffer:

$$V_{T,K}(t) = V_{Target} * (1 + 15\%)$$

2. Without the hedging buffer:

$$V_{T,K}(t) = V_{Target}$$

$V_{Target} = 10\%$

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