

# INDEX GUIDELINE

Solactive U.S. Large & Mid Cap Minimum Downside Volatility 100 Index

Version 1.0

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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 Index. Any changes made to the Guideline are initiated by the Committee specified in Section 1.6. The Index is calculated and published by Solactive AG. The name "Solactive" is trademarked.

It contains the underlying principles and rules regarding the structure and operation of the Solactive U.S. Large & Mid Cap Minimum Downside Volatility 100 Index (the "Index"). Solactive AG does not offer any explicit or tacit guarantee or assurance, neither pertaining to the results from the use of the Index nor the Index value at any certain point in time nor in any other respect. The Index is merely calculated and published by Solactive AG and it strives to the best of its ability to ensure the correctness of the calculation. There is no obligation for Solactive AG – 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 AG does not constitute a recommendation for capital investment and does not contain any assurance or opinion of Solactive AG regarding a possible investment in a financial instrument based on this Index.

# 1 INDEX SPECIFICATIONS

- > The Solactive U.S. Large & Mid Cap Minimum Downside Volatility 100 Index (the "Index") is an Index of Solactive AG and is calculated and distributed by Solactive AG.
- > The Index is designed to track the performance of US companies and construct a portfolio which exhibits low downside volatility and avoids excessive sector concentration and index turnover.
- > The Index is calculated as a Price Return (PR), Net Total Return (NTR), and Total Return (TR) Index. Only the Total Return Index is published at the time of creation of this document.
- > The Index is published in USD.

## 1.1 SHORT NAME AND ISIN

The Index is published under the following identifiers:

Name	ISIN	Currency	Type	RIC	BBG Ticker
Solactive U.S. Large & Mid Cap Minimum Downside Volatility 100 Index PR	-	USD	PR	-	-
Solactive U.S. Large & Mid Cap Minimum Downside Volatility 100 Index NTR	-	USD	NTR	-	-
Solactive U.S. Large & Mid Cap Minimum Downside Volatility 100 Index TR	DE000SLA5Z33	USD	TR	.SOLMDULM	-

## 1.2 INITIAL VALUE

The Index is based on 1000 at the close of trading on the start date, 5 May 1999.

## 1.3 DISTRIBUTION

The Index is published via the price marketing services of Boerse Stuttgart AG and is distributed to all affiliated vendors. Each vendor decides on an individual basis as to whether it will distribute/display the Index via its information systems.

## 1.4 PRICES AND CALCULATION FREQUENCY

The price of the Index is calculated on each Business Day based on the prices on the respective Exchanges on which the Index Components are listed. The most recent prices of all Index Components are used. Prices of Index Components not listed in the Index Currency are translated using spot foreign exchange rates quoted by Reuters. Should there be no current price available on Reuters, the most recent price or the Trading Price on Reuters for the preceding Trading Day is used in the calculation.

The daily Index Closing Level is calculated using the 4:00 p.m. London time Reuters/WMCO closing spot rates. The Index is calculated every Business Day from 9:00 a.m. to 10:30 p.m., CET. In the event that data

cannot be provided to Reuters or to the pricing services of Boerse Stuttgart AG, the Index cannot be distributed.

### 1.5 WEIGHTING

On each Selection Day each Index Component of the Index is weighted to achieve minimal portfolio downside volatility (under certain constraints). The single steps are described in detail in Section 2.1.

### 1.6 OVERSIGHT

A Committee composed of staff from Solactive AG is responsible for decisions regarding the composition of the Index as well as any amendments to the rules (in this document referred to as the "Committee" or the "Index Committee"). The future composition of the Index is set by the Committee on the Selection Days. The Committee shall also decide about the future composition of the Index if any Extraordinary Events should occur and the implementation of any necessary adjustments.

Members of the Committee can recommend changes to the guideline and submit them to the Committee for approval if there are regulatory reasons for changing the guidelines.

### 1.7 PUBLICATION

All specifications and information relevant for calculating the Index are made available on the <http://www.solactive.com> web page and sub-pages.

### 1.8 HISTORICAL DATA

Back-tested data prior to the launch of the index is available since 5<sup>th</sup> May 1999. Historical data will be maintained from the launch of the Index on 1 August 2018.

### 1.9 LICENSING

Licenses to use the Index as the underlying value for derivative instruments are issued to stock exchanges, banks, financial services providers and investment houses by Solactive AG.

## 2 COMPOSITION OF THE INDEX

### 2.1 SELECTION OF THE INDEX COMPONENTS

The initial composition of the Index as well as any ongoing adjustment is based on the following rules:

On each Selection Day, Solactive AG defines the Index Universe as outlined in Section 4.

On each Selection Day, the final index selection is determined following the steps below:

Based on the Index Universe, an optimization algorithm determines weights for the securities which would lead to minimized portfolio downside volatility.

$$\min_w w' \Sigma w$$

Subject to the constraints

$$\sum_{i=1}^n w_i = 1$$

$$\sum_{i=1}^n y_i = N$$

$$y_i \in \{0,1\}, i = 1, \dots, n$$

$$w^{\min} \cdot y_i \leq w_i \leq w^{\max} \cdot y_i, i = 1, \dots, n$$

$$s_j^{\min} \leq \sum_{i \in S(j)} w_i \leq s_j^{\max}$$

$$\frac{1}{2} \cdot \sum_{i=1}^n |w_{i,t} - w_{i,t-1}| \leq OWT$$

With

$w$  = n-dimensional vector of weights with generic element  $w_i$

$\Sigma$  = n-by-n-dimensional semi-variance-covariance matrix (using 250 daily returns)

$N$  = the number of stocks in the index

$w^{\max}$  = the maximum weight of each stock

$w^{\min}$  = the minimum weight of each stock

$s^{\max}$  = the maximum weight of each sector

$s^{\min}$  = the minimum weight of each sector

$S(j)$  = the set of securities belonging to sector j

$OWT$  = the maximum one-way turnover

On each Selection Day, the following constraints are applied:

Name of Constraint	Symbol	Numeric Value of Constraint
Number of stocks	$N$	100
Maximum weight of each stock	$w^{max}$	3.00%
Minimum weight of each stock	$w^{min}$	0.15%
Maximum weight of each sector	$s^{max}$	Sector allocation in Index Universe + 2.50%
Minimum weight of each sector	$s^{min}$	Sector allocation in Index Universe - 2.50%
Maximum one-way index turnover	$OWT$	10%

Due to small numerical inaccuracies of the optimization, the optimizer may find a solution that does not fully satisfy the specified constraints. In this case, the percentage weights of the index components are reallocated to fulfil the constraints. If the weights cannot be reallocated such that all constraints are met, the constraints above are relaxed and the above problem is solved again. The order of relaxation if the reallocation fails is as follows:

- 1) Increase maximum weight ( $w^{max}$ ) by 0.5% and decrease minimum weight ( $w^{min}$ ) by 0.05%
- 2) Increase maximum weight of each sector relative to the Index Universe ( $s^{max}$ ) by 2.5% and decrease the minimum weight of each sector relative to the Index Universe ( $s^{min}$ ) by 2.5%
- 3) Increase maximum one-way turnover ( $OWT$ ) in steps of 5% up to 30%

If the optimizer fails to find a feasible solution to the above problem, the constraints above are relaxed and the above problem is solved again. This procedure is iterated until the optimizer finds a feasible solution or every relaxation has been applied without the solver finding a feasible solution. In this case, the selection and rebalancing will be skipped. The order of relaxation is as follows:

- 1) Increase maximum one-way turnover ( $OWT$ ) in steps of 5% up to 30%
- 2) Increase maximum weight ( $w^{max}$ ) by 0.5% and decrease minimum weight ( $w^{min}$ ) by 0.05%
- 3) Increase maximum weight of each sector relative to the Index Universe ( $s^{max}$ ) by 2.5% and decrease the minimum weight of each sector relative to the Index Universe ( $s^{min}$ ) by 2.5%

## 2.2 ORDINARY ADJUSTMENT

The composition of the Index is adjusted quarterly. The composition of the Index is reviewed on the Selection Day and necessary changes are announced.

The first adjustment will be made in November 2018, based on the Trading Prices of the Index Components on the Adjustment Day.

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Solactive AG shall publish any changes made to the Index composition on the Selection Day and consequently with sufficient notice before the Adjustment Day.

### 2.3 EXTRAORDINARY ADJUSTMENT

An extraordinary adjustment, if applicable, is triggered and applied in compliance with the rules set forth in the [Solactive Guideline for Extraordinary Corporate Actions](#).



## 3 CALCULATION OF THE INDEX

### 3.1 INDEX FORMULA

The Index Value on a Business Day at the relevant time is calculated in accordance with the following formula:

$$Index_t = \sum_{i=1}^n \frac{(x_{i,t} * p_{i,t} * f_{i,t})}{D_t}$$

With:

- $x_{i,t}$  = Number of Index Shares of the Index Component  $i$  on Trading Day  $t$
- $p_{i,t}$  = Price of Index Component  $i$  on Trading Day  $t$
- $f_{i,t}$  = Foreign exchange rate to convert the Price of Index Component  $i$  on Trading Day  $t$  into the Index Currency
- $D_t$  = Divisor on Trading Day  $t$

The initial Divisor on the Start Date is calculated according to the following formula:

$$D_t = \frac{\sum_{i=1}^n (p_{i,t} * f_{i,t} * x_{i,t})}{1000}$$

After the close of trading on each Adjustment Day  $t$ , the new Divisor is calculated as follows:

$$D_{t+1} = \frac{\sum_{i=1}^n (p_{i,t} * f_{i,t} * x_{i,t+1})}{Index_t}$$

This Divisor is valid starting the immediately following Business Day.

### 3.2 ACCURACY

- > The value of the Index will be rounded to 2 decimal places.
- > Divisors will be rounded to six decimal places.

### 3.3 ADJUSTMENTS

Indices need to be adjusted for systematic changes in prices once these become effective. This requires the new Number of Shares of the affected Index Component to be calculated on an ex-ante basis.

The Index is adjusted for distributions, capital increases, rights issues, splits, par value conversions and capital reductions.

This procedure ensures that the first ex quote can be properly reflected in the calculation of the Index. This ex-ante procedure assumes the general acceptance of the Index calculation formula as well as open access to the parameter values used. The calculation parameters are provided by the Index Calculator.

## 3.4 DIVIDENDS AND OTHER DISTRIBUTIONS

Dividend payments and other distributions are included in the Index. They cause an adjustment of the Divisor. The new Divisor is calculated as follows:

$$D_{t+1} = D_t * \frac{\sum_{i=1}^n (p_{i,t} * f_{i,t} * x_{i,t}) - (x_{i,t} * y_{i,t} * g_{i,t})}{\sum_{i=1}^n (p_{i,t} * f_{i,t} * x_{i,t})}$$

With:

- $x_{i,t}$  = Number of Index Shares of the Index Component  $i$  on Trading Day  $t$
- $y_{i,t}$  = Distribution of Index Component  $i$  with ex-date  $t + 1$  multiplied by the Dividend Correction Factor
- $p_{i,t}$  = Price of Index Component  $i$  on Trading Day  $t$
- $f_{i,t}$  = Foreign exchange rate to convert the Price of Index Component  $i$  on Trading Day  $t$  into the Index Currency
- $g_{i,t}$  = Foreign exchange rate to convert the amount of the distribution of Index Component  $i$  on Trading Day  $t$  into the Index Currency
- $D_t$  = Divisor on Trading Day  $t$
- $D_{t+1}$  = Divisor on Trading Day  $t + 1$

## 3.5 CORPORATE ACTIONS

### 3.5.1 Principles

Following the announcement by an issuer of Index Components of the terms and conditions of a corporate action, the Index Calculation Agent determines whether such corporate action has a dilutive, concentrative or similar effect on the price of the respective Index Component.

If this should be the case, the Index Calculation Agent shall make the necessary adjustments that are deemed appropriate in order to take into account the dilutive, concentrative or similar effect and shall determine the date on which this adjustment shall come into effect.

Amongst other things, the Index Calculation Agent can take into account the adjustment made by an Affiliated Exchange as a result of the corporate action with regard to option and futures contracts on the respective share traded on this Affiliated Exchange.

### 3.5.2 Capital increases

In the case of capital increases with ex-date  $t + 1$ , the Index is adjusted as follows:

$$x_{i,t+1} = x_{i,t} * \frac{1 + B}{1}$$

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With:

- $x_{i,t}$  = Number of Index Shares of the Index Component  $i$  on Trading Day  $t$
- $x_{i,t+1}$  = Number of Index Shares of the Index Component  $i$  on Trading Day  $t + 1$
- $B$  = Shares received for every share held

$$p_{i,t+1} = \frac{p_{i,t} + s * B}{1 + B}$$

With:

- $p_{i,t}$  = Price of Index Component  $i$  on Trading Day  $t$
- $p_{i,t+1}$  = Hypothetical price of Index Component  $i$  on Trading Day  $t + 1$
- $s$  = Subscription Price in the Index Component currency
- $B$  = Shares received for every share held

$$D_{t+1} = D_t * \frac{\sum_{i=1}^n (p_{i,t} * f_{i,t} * x_{i,t}) + \sum_{i=1}^n [(x_{i,t+1} * p_{i,t+1} * f_{i,t}) - (x_{i,t} * p_{i,t} * f_{i,t})]}{\sum_{i=1}^n (p_{i,t} * f_{i,t} * x_{i,t})}$$

With:

- $x_{i,t}$  = Number of Index Shares of the Index Component  $i$  on Trading Day  $t$
- $x_{i,t+1}$  = Number of Index Shares of the Index Component  $i$  on Trading Day  $t + 1$
- $p_{i,t}$  = Price of Index Component  $i$  on Trading Day  $t$
- $p_{i,t+1}$  = Hypothetical price of Index Component  $i$  on Trading Day  $t + 1$
- $f_{i,t}$  = Foreign exchange rate to convert the Price of Index Component  $i$  on Trading Day  $t$  into the Index Currency
- $D_t$  = Divisor on Trading Day  $t$
- $D_{t+1}$  = Divisor on Trading Day  $t + 1$

### 3.5.3 Share splits

In the case of share splits with ex-date on Trading Day  $t + 1$ , it is assumed that the prices change in ratio of the terms of the split. The new Number of Index Shares is calculated as follows:

$$x_{i,t+1} = x_{i,t} * B$$

With:

- $x_{i,t}$  = Number of Index Shares of the affected Index Component on Trading Day  $t$
- $x_{i,t+1}$  = Number of Index Shares of the affected Index Component on Trading Day  $t + 1$
- $B$  = Shares after the share split for every share held before the split

### 3.5.4 Stock distributions

In the case of stock distributions with ex-date on Trading Day  $t + 1$ , it is assumed that the prices change according to the terms of the distribution. The new Number of Index Shares is calculated as follows:

$$x_{i,t+1} = x_{i,t} * (1 + B)$$

With:

- $x_{i,t}$  = Number of Index Shares of the Index Component  $i$  on Trading Day  $t$
- $x_{i,t+1}$  = Number of Index Shares of the Index Component  $i$  on Trading Day  $t + 1$
- $B$  = Shares received for every share held

## 3.6 MISCELLANEOUS

### 3.6.1 Recalculation

Solactive AG makes the greatest possible efforts to accurately calculate and maintain its indices. However, the occurrence of errors in the index determination process cannot be ruled out. In such cases Solactive AG adheres to its publicly available [Correction Policy](#).

### 3.6.2 Market Disruption

In periods of market stress Solactive AG calculates its indices following predefined and exhaustive arrangements set out in its publicly available [Disruption Policy](#).

## 4 DEFINITIONS

The "**Index Universe**" in respect of a Selection Day are companies that fulfill the following criteria:

1. Part of the latest selection of the Solactive US Large & Mid Cap Index (ISIN: DE000SLA0Q70).

The "**Index Component**" is each share currently included in the Index.

"**Sector**" is one of the following ten FactSet Economy baskets: Basic materials, Consumer durables, Consumer non-durables, Consumer services, Energy, Finance, Healthcare, Industrials, Technology, Utilities. Each basket consists of components in the Index Universe that belong to the stated FactSet Economy classification.

"**Number of Shares**" is in respect of an Index Component and any given Business Day the number or fraction of shares included in the Index. It is calculated for any Index Component as the ratio of (A) the Percentage Weight of an Index Component multiplied by the Index value and (B) its Trading Price.

The "**Percentage Weight**" of an Index Component is the ratio of its Trading Price multiplied by its Number of Shares divided by the Index value and the Divisor.

The "**Dividend Correction Factor**" is calculated as 1 minus the applicable withholding tax rate and/or other applicable tax rate currently prevalent in the respective country.

In particular, an "**Extraordinary Event**" is

- > a Merger
- > a Takeover Bid
- > a Delisting
- > the Nationalization of a company
- > Insolvency.

The Trading Price for this Index Component on the day the event came into effect is the last available market price for this Index Component quoted on the Exchange on the day the event came into effect (or, if a market price is not available for the day the event came into effect, the last available market price quoted on the Exchange on a day specified as appropriate by the Index Calculation Agent) as determined by the Index Calculation Agent, and this price is used as the Trading Price of the particular Index Component until the end of the day on which the composition of the Index is next set.

In the event of the Insolvency of an issuer of an Index Component, the Index Component shall remain in the Index until the next Adjustment Day. As long as a market price for the affected Index Component is available on a Business Day, this shall be applied as the Trading Price for this Index Component on the relevant Business Day, as determined in each case by the Index Calculation Agent. If a market price is not available on a Business Day the Trading Price for this Index Component is set to zero. The Committee may also decide to eliminate the respective Index Component at an earlier point in time prior to the next Adjustment Day. The procedure in this case is identical to an elimination due to an Extraordinary Event.

An Index Component is "**delisted**" if the Exchange announces pursuant to the Exchange regulations that the listing of, the trading in, or the issuing of public quotes on the Index Component at the Exchange has ceased immediately or will cease at a later date, for whatever reason (provided the Delisting is not because of a Merger or a Takeover Bid), and the Index Component is not immediately listed, traded or quoted again on an exchange, trading or listing system, acceptable to the Index Calculation Agent.

"**Insolvency**" occurs with regard to an Index Component if (A) all shares of the respective issuer must be transferred to a trustee, liquidator, insolvency administrator or a similar public officer as result of voluntary or compulsory liquidation, insolvency or winding-up proceedings or comparable proceedings affecting the issuer of the Index Components or (B) the holders of the shares of this issuer are legally enjoined from transferring the shares.

A "**Takeover Bid**" is a bid to acquire, an exchange offer, or any other offer or act of a legal person that results in the related legal person acquiring as part of an exchange or otherwise more than 10% and less than 100% of the voting shares in circulation from the issuer of the Index Component or the right to acquire these shares, as determined by the Index Calculation Agent based on notices submitted to public or self-regulatory authorities or other information considered by the Index Calculation Agent to be relevant.

With regard to an Index Component, a "**Merger**" is

- (i) a change in the security class or a conversion of this share class that results in a transfer or an ultimate definite obligation to transfer all the shares in circulation to another legal person,
- (ii) a merger (either by acquisition or through forming a new structure) or a binding obligation on the part of the issuer to exchange shares with another legal person (except in a merger or share exchange under which the issuer of this Index Component is the acquiring or remaining company and which does not involve a change in security class or a conversion of all the shares in circulation),
- (iii) a takeover offer, exchange offer, other offer or another act of a legal person for the purposes of acquiring or otherwise obtaining from the issuer 100% of the shares issued that entails a transfer or the irrevocable obligation to transfer all shares (with the exception of shares that are held and controlled by the legal person), or
- (iv) a merger (either by acquisition or through forming a new structure) or a binding obligation on the part of the issuer of the share or its subsidiaries to exchange shares with another legal person, whereby the issuer of the share is the acquiring or remaining company and it does not involve a change in the class or a conversion of the all shares issued, but the shares in circulation directly prior to such an event (except for shares held and controlled by the legal person) represent in total less than 50% of the shares in circulation directly subsequent to such an event.

The "**Merger Date**" is the date on which a Merger is concluded or the date specified by the Index Calculation Agent if such a date cannot be determined under the law applicable to the Merger.

"**Nationalization**" is a process whereby all shares or the majority of the assets of the issuer of the shares are nationalized or are expropriated or otherwise must be transferred to public bodies, authorities or institutions.

The "**Exchange**" is, in respect of the Index and every Index Component, the respective primary exchange where the Index Component has its primary listing. The Committee may decide to declare a different stock exchange the "Exchange" for trading reasons, even if the company is only listed there via a Stock Substitute.

A "**Stock Substitute**" includes in particular, American Depository Receipts (ADR) and Global Depository Receipts (GDR).

With regard to an Index Component (subject to the provisions given above under "Extraordinary Events") the "**Trading Price**" in respect of a Trading Day is the closing price on this Trading Day determined in accordance with the Exchange regulations. If the Exchange has no closing price for an Index Component, the Index Calculation Agent shall determine the Trading Price and the time of the quote for the share in question in a manner that appears reasonable to it.

A "**Trading Day**" is in relation to the Index or an Index Component a Trading Day on the Exchange (or a day that would have been such a day if a market disruption had not occurred), excluding days on which trading may be ceased prior to the normal Exchange closing time. The Index Calculation Agent is ultimately responsible as to whether a certain day is a Trading Day with regard to the Index or an Index Component or in any other connection relating to this document.

The "**Index Calculation Agent**" is Solactive AG or any other appropriately appointed successor in this function.

The "**Index Currency**" is USD.

The "**Market Capitalisation**" is with regard to each of the securities in the Index on a Selection Day the share class-specific Market Capitalisation for any security in the Index Universe. It is calculated as the multiplication of the shares outstanding (as sourced from data vendors) with the Trading Price of the share class as of the respective Selection Day.

A "**Business Day**" is any day where the New York Stock Exchange is open for trading.

The "**Adjustment Day**" is the close of the first Wednesday in February, May, August, and November. If that day is not a Business Day the Adjustment Day will be the following Business Day.

The "**Selection Day**" is ten Business Days before the Adjustment Day.

A "**Market Disruption Event**" occurs if

1. one of the following events occurs or exists on a Trading Day prior to the opening quotation time for an Index Component:
  - A) trading is suspended or restricted (due to price movements that exceed the limits allowed by the Exchange or an Affiliated Exchange, or for other reasons):
    - 1.1. across the whole Exchange; or
    - 1.2. in options or futures contracts on or with regard to an Index Component or an Index Component that is quoted on an Affiliated Exchange; or
    - 1.3. on an Exchange or in a trading or quotation system (as determined by the Index Calculation Agent) in which an Index Component is listed or quoted; or

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- B) an event that (in the assessment of the Index Calculation Agent) generally disrupts and affects the opportunities of market participants to execute on the Exchange transactions in respect of a share included in the Index or to determine market values for a share included in the Index or to execute on an Affiliated Exchange transaction with regard to options and futures contracts on these shares or to determine market values for such options or futures contracts.
- 2. trading on the Exchange or an Affiliated Exchange is ceased prior to the "**Normal Exchange Closing Time**", which is the time at which the Exchange or an Affiliated Exchange is normally closed on working days without taking into account after-hours trading or other trading activities carried out outside the normal trading hours. An exception to this classification as a Market Disruption Event is where the early cessation of trading is announced by the Exchange or Affiliated Exchange on this Trading Day at least one hour before
  - 2.1. the actual closing time for normal trading on the Exchange or Affiliated Exchange on the Trading Day in question or, if earlier.
  - 2.2. the closing time (if given) of the Exchange or Affiliated Exchange for the execution of orders at the time the quote is given.
- 3. a general moratorium is imposed on banking transactions in the country in which the Exchange is resident if the above-mentioned events are material in the assessment of the Index Calculation Agent, whereby the Index Calculation Agent makes its decision based on those circumstances that it considers reasonable and appropriate.



## 5 APPENDIX

### 5.1 CONTACT DATA

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### 5.2 CHANGES IN CALCULATION METHOD

The application by the Index Calculation Agent of the method described in this document is final and binding. The Index Calculation Agent 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. The Index Calculation Agent may also 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 Calculation Agent is not obliged to provide information on any such modifications or changes. Despite the modifications and changes, the Index Calculation Agent will take the appropriate steps to ensure a calculation method is applied that is consistent with the method described above.