

# EQUITY INDEX METHODOLOGY

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## TABLE OF CONTENTS

Symbols.....	4
Introduction .....	6
1. Index Calculation .....	7
1.1 Index Types .....	7
1.2 Calculation Formulas.....	7
1.2.1 Standard Index .....	8
1.2.2 Divisor Index .....	8
1.2.3 Index Calculation with Management Fee .....	9
1.2.4 Calculation of Daily Closing Levels of the Index .....	10
1.3 Rounding Convention .....	10
1.4 Distribution of Index Values .....	10
2. Index Adjustments .....	11
2.1 Corporate Actions.....	11
2.1.1 Dividends.....	11
2.1.2 Stock Dividend .....	17
2.1.3 Stock Split .....	18
2.1.4 Rights Issue .....	19
2.1.5 Capital Decrease .....	21
2.1.6 Spin-off .....	22
2.1.7 Mergers & Acquisitions .....	23
2.1.8 Delisting .....	29
2.1.9 Nationalization of a Company.....	30
2.1.10 Bankruptcy / Insolvency / Liquidation .....	31
2.1.11 Notice Period for Corporate Action Adjustments .....	32
2.2 Ordinary Index Rebalances .....	32
2.2.1 Ordinary Rebalance in a Standard Index .....	32
2.2.2 Ordinary Rebalance in a Divisor Index.....	35
2.2.3 Rebalance Fee .....	37
2.3 Extraordinary Index Rebalances in connection with China Connect Stock Listings.....	38
2.3.1 Introduction .....	38
2.3.2 Treatment.....	38



2.3.3 Transparency.....39

3. Terms and Definitions.....40



## SYMBOLS

<i>aS</i>	Adjusted Total Number of Shares
<i>ap</i>	Adjusted Price
<i>aw</i>	Adjusted Weight
<i>ax</i>	Adjusted Fraction of Shares
<i>CF</i>	Correction Factor
<i>CFI</i>	Conduit Foreign Income
<i>CP</i>	Cash Pocket
<i>d</i>	Dividend Amount
<i>DEL</i>	Index Component which is deleted from the Index due to Index Rebalance
<i>DDP</i>	Index Delta Dividend Points
<i>DWC</i>	Daily Weight Change of an Index Component in Multiday Index Rebalance
<i>D</i>	Divisor
<i>DP</i>	Index Dividend Point
<i>EX</i>	Ex-date
<i>f</i>	Foreign Exchange Rate
<i>FFF</i>	Free Float Factor
<i>g</i>	Number for Calendar Days for Management Fee Calculation
<i>i = 1, 2, ... N</i>	Count for Index Members
<i>Index</i>	Index Level
<i>ID</i>	Implementation Date
<i>IN</i>	Indicative
<i>n</i>	Number of Index Components on Business Day t
<i>m</i>	Number of Index Components on Business Day t+1
<i>MCAP</i>	Index Market Capitalization
<i>NAD</i>	Number of Adjustment Days in Multiday Index Rebalance



$p$	Price of Index Component
$PAF$	Price Adjustment Factor
$S$	Total Number of Shares of the Index Component
$SAR$	Share Adjustment Ratio
$SP$	Subscription Price
$ST$	Stock Terms
$t = 1, 2, \dots N$	Count for Index Calculation Days
$T$	Issue Terms
$TG$	Target
$TGW$	Index Target Weights after Rebalance
$w$	Withholding Tax Rate
$WCF$	Weighting Cap Factor
$x$	Fraction of Shares of the Index Component
$\alpha$	Pre-defined Management Fee Divisor
$\Delta$	Delta
$\mu$	Pre-defined Rebalance Fee Factor
$\vartheta$	Pre-defined Management Fee Factor



## INTRODUCTION

Solactive is committed to the highest standards of integrity and professionalism, which are reflected by a transparent and replicable Index design and calculation methodology. Accordingly, Solactive adheres to the following norms in developing methodologies, which are, inter alia:

- > robust and reliable;
- > rigorous and continuous;
- > traceable and verifiable;
- > resilient; and
- > inclusive of information on the treatment of Corporate Actions.

In line with the above objectives, Solactive develops, calculates and maintains its equity Indices based on an exhaustive and coherent comprehensive Equity Index Methodology.

Solactive fully complies with the IOSCO principles on the quality and integrity of methodologies by giving its stakeholders detailed insight into the calculation and maintenance of its Indices. With further reference to the EU Benchmarks Regulation (Regulation (EU) 2016/1011), it is the objective of this Equity Index Methodology to define a general framework of applicability that can be referenced by individual Index Guidelines. Disclosure of the index maintenance rules as well as general calculation methods contained in the Equity Index Methodology should further enable issuers and investors to evaluate and utilize Solactive Indices.

Index Guidelines contain index specifications of the relevant Index, Index Component Requirements, and calculation frequencies, whereas this Solactive Equity Index Methodology elaborates on the Index formulas used by Solactive and their respective adjustments. This Equity Index Calculation Methodology further defines the various Corporate Actions that are considered by Solactive in the index maintenance process and specifies their corresponding treatment. It explains the application with detailed step-by-step examples.

Solactive is also dedicated to developing customized Indices. Due to the variety of their different constructions, each customized Index follows its own unique Index Guideline. As such, the respective Index Guideline provides more detailed information on the index setup and maintenance. In the case the rules described in the Index Guideline differ from the framework of the Equity Index Methodology, the Index Guideline supersedes the Equity Index Methodology. While Solactive aims to create and maintain its Equity Index Methodology to be as comprehensive and transparent as possible and in line with above-mentioned regulatory requirements, it retains the right to deviate from the standard procedures described in this Equity Index Methodology in the case of any unusual or complex Corporate Action, or if such a deviation is made to preserve the comparability and representativeness of an Index over time.



In accordance with the principle of transparency, the Equity Index Methodology is directed to all stakeholders, such as financial issuers, potential investors as well as interested third parties, among others. As such, this methodology intends to be concise as well as comprehensible on all levels. The core concepts and terms are defined in Section 3 and the adjustment formulas are presented and explained as well as supplemented with examples to further illustrate the application of Index adjustments in practice.

## 1. INDEX CALCULATION

This section details the general calculation methodology for Solactive Indices, elaborating on the index types and the calculation formulas applied for the different cash reinvestment approaches. An overview of the rounding, settlement conventions and index adjustment rules used by Solactive for index calculation as well as the index data distribution process is also provided.

### 1.1 INDEX TYPES

Based on the client's objective and in line with industry standards, Solactive offers equity index calculation in Price Return, Gross Total Return, Net Total Return and Adjusted Return versions.

A Price Return Index reflects the market price movements of the Index Components, disregarding any payments made in respect of the Index Components, such as ordinary Cash Dividends whereas Special Cash Dividends are reinvested. A Price Return Index aims to reflect the price performance of a specific market, or a particular segment.

A Net Total Return Index seeks to replicate the overall return from holding a portfolio consisting of the Index Components. In order to achieve this aim, a Net Total Return Index considers payments, such as dividends, after the deduction of any withholding tax or other amounts an investor holding the Index Components would typically be exposed to.

A Gross Total Return Index seeks to replicate the overall return from holding a portfolio consisting of the Index Components. In order to achieve this aim, a Gross Total Return Index considers payments made in respect of the Index Components, such as dividends, without the deduction of any withholding tax or other amounts an investor holding the Index Components would typically be exposed to.

An Adjusted Return Index is an index which has a management fee deducted in either absolute or percentage terms at a predefined frequency.

### 1.2 CALCULATION FORMULAS

In respect of dividend reinvestment logic, Solactive follows different index calculation methodologies. Based on whether the dividend reinvestment affects only the dividend paying stock or the entire portfolio of Index, Solactive Indices can be calculated with either of the formulas outlined below.



## 1.2.1 Standard Index

The index level is the sum overall Index Components of the products of the Fraction of Shares of the Index Component and the price of the Index Component at the respective Exchange. If the currency of an Index Component is different from the currency in which the Index is calculated, the foreign exchange rate is used to convert the price into the currency in which the Index is calculated.

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

Dividend payments cause an adjustment in the Fraction of Shares. Due to the dividend payment, the Fraction of Shares of the dividend paying stock increases by an adjustment factor. Due to dividend reinvestment, the Fraction of Shares of other Index Components remains constant.

### 1.2.1.1 Standard Index Calculation with Cash Pocket

In contrast to the dividend reinvestment methodology in a Standard Index described above, some indices use a Cash Pocket for the dividend reinvestment. The Cash Pocket is an additional component of an Index where dividend payments with an ex-date on t paid by any Index Component are collected in.

$$CP_t = \sum_{i=1}^n x_{i,t-1} * d_{i,t} * (1 - w_{i,t}) * f_{i,t-1}$$

The Cash Pocket remains in the Index until the next Index Rebalance and is included in the calculation of the index level.

$$Index_t = \sum_{i=1}^n x_{i,t} * p_{i,t} * f_{i,t} + CP_t$$

## 1.2.2 Divisor Index

For the calculation of the index level, the sum of the Market Capitalization of the Index Components is divided by the Divisor.

$$Index_t = \frac{\sum_{i=1}^n S_{i,t} * p_{i,t} * f_{i,t} * WCF_{i,t} * FFF_{i,t}}{D_t}$$





The Divisor is a mathematical factor defined at the inception of the Index. The Divisor is adjusted by certain Corporate Actions and Index Rebalances.

Dividends paid by any Index Component are applied across the entire basket by changing the Divisor.

### 1.2.2.1 Divisor Index Calculation with Cash Pocket

In contrast to the dividend reinvestment methodology in a Divisor Index described above, some indices use a Cash Pocket for the dividend reinvestment. The Cash Pocket is an additional component of an Index where dividend payments with an ex-date on  $t$  paid by any Index Component are collected in.

$$CP_t = \sum_{i=1}^n S_{i,t} * d_{i,t} * f_{i,t-1} * WCF_{i,t} * FFF_{i,t}$$

The Cash Pocket remains in the Index until the next Index Rebalance and is included in the calculation of the index level.

$$Index_t = \frac{\sum_{i=1}^n S_{i,t} * p_{i,t} * f_{i,t} * WCF_{i,t} * FFF_{i,t} + CP_t}{D_t}$$

### 1.2.3 Index Calculation with Management Fee

A Management Fee is an optional component which can be included in the index calculation to reflect the theoretical costs incurred due to Index Replication.

This fee is calculated based on pre-defined parameters such as Management Fee Factor  $\vartheta$ , calendar days  $\alpha$  and number of the index calculation days  $g$  which are subject to calculation of Management Fee.

The opening level of the Index applying the Management Fee is calculated as follows.

$$Index_{t+1}^{open} = Index_t^{close} * \left(1 - \left(\frac{\vartheta}{100} * \frac{g}{\alpha}\right)\right)$$



### 1.2.4 Calculation of Daily Closing Levels of the Index

In the calculation of the daily closing levels of the Index, the official close price of the respective Index Component on the respective exchange is used. In the case that an exchange does not provide an official closing price for an Index Component on a particular day, the Index is calculated with the last price available. If an exchange does not generally publish official closing prices, Solactive decides on a price collection mechanism that ensures tradability and representativeness of its Indices.

## 1.3 ROUNDING CONVENTION

Solactive calculates its Indices in accordance with the following rounding convention:

- 1- Index Level: two decimal places (if not specified otherwise in Index Guideline)
- 2- Prices of Index Components: no rounding
- 3- Foreign exchange rates: no rounding
- 4- Fraction of Shares of an Index Component in a Standard Index: six decimal places (if not specified otherwise in Index Guideline)
- 5- Divisor: six decimal places

## 1.4 DISTRIBUTION OF INDEX VALUES

The Index Values are distributed via the price marketing services of the Stuttgart Stock Exchange (Börse Stuttgart) and are published to all affiliated vendors.



## 2. INDEX ADJUSTMENTS

### 2.1 CORPORATE ACTIONS

The types of Corporate Actions described in this Equity Index Methodology are taken into account in the Index calculation. Further events may lead to Index adjustments as decided by the respective Index committee on a case-by-case basis. It is assumed that  $t$  is the last Business Day prior to the ex-date whereas  $t+1$  is the ex-date of the Corporate Action. If the details (ex-date, amount of distribution, terms of rights issue, etc.) of an event that may trigger an Index adjustment are not known prior to or on the ex-date, no Index adjustment is carried out. If an estimation of the details of a distribution from a reliable source exists (e.g. distributions by Japanese or South Korean companies), an Index adjustment may be carried out based on the estimation. The Index committee may decide differently on a case-by-case basis.

All examples given to illustrate the application of the Index adjustment formula are purely hypothetical and exclusively intended to convey the concept of the Methodology. No rights can be derived from these examples in any way with regard to their correctness or applicability to specific cases.

#### 2.1.1 Dividends

A dividend or cash distribution is a common way to dispense accumulated profits and earnings to a company's shareholders. Generally speaking, a company may opt to pay a Cash Dividend to its shareholders under consideration of several economic and financial factors.

For the purpose of Index adjustment, Solactive distinguishes between two dividend types: Cash Dividends and Special Dividends. The former refers to cash distributions usually paid in regular intervals and the latter designates all other dividend payments falling outside the normal pattern, which are often substantially larger than regular cash distributions and are usually non-recurring.

With regard to the Solactive product portfolio, Cash Dividends are treated differently depending on the type of Index. The following distinction can be made:

A Net Total Return Index considers reinvestments of Cash and Special Dividend distributions after deducting the withholding tax.

A Gross Total Return Index considers reinvestments of Cash and Special dividend distributions without deducting the withholding tax.

A Price Return Index neglects the regular Cash Dividends and considers only the Special Dividends.

##### *2.1.1.1 Dividend Adjustment in Standard Index*

Dividend payments cause an adjustment in the Fraction of Shares. Due to the dividend adjustment, the Fraction of Shares of the dividend paying stock increases by the price adjustment factor.

The price adjustment factor (PAF) is the relation between the close price of the stock with the corporate action event one day prior to the ex-date and the theoretical stock price after the corporate action.



In respect of dividend adjustment, the close price of dividend paying stock one day prior to the dividend ex-date is divided by the theoretical stock price after dividend.

$$PAF_{i,t+1} = \frac{p_{i,t}}{p_{i,t} - d_{i,t+1} * f_{i,t} * (1 - w_{i,t+1})}$$

The theoretical close price after dividend is calculated as follows:

$$ap_{i,t+1} = \frac{p_{i,t}}{PAF_{i,t+1}}$$

The final shares after the implementation of the dividend is calculated by the multiplication of the number of shares on the dividend ex-date with the PAF.

$$ax_{i,t+1} = x_{i,t} * PAF_{i,t+1}$$

### 2.1.1.2 Dividend Adjustment in Divisor Index

In contrast to the Standard Index, in a Divisor Index the implementation of the dividend payment doesn't change the total number of the shares of the dividend paying company. The dividend adjustment is reflected in the Divisor.

$$D_{t+1} = \frac{D_t * Index_t - \Delta MCAP}{Index_t}$$

The implementation of the dividend payment leads to a change in the Market Capitalization of the Index since the theoretical stock price after dividend is used for the calculation of the post-dividend Market Capitalization of the Index.

To calculate the theoretical stock price after dividend, the above-described PAF is used.

$$\Delta MCAP = \sum_{i=1}^n S_{i,t} * p_{i,t} * f_{i,t} * WCF_{i,t} * FFF_{i,t} - \sum_{i=1}^m S_{i,t+1} * p_{i,t} * \frac{1}{PAF_{i,t+1}} * f_{i,t} * WCF_{i,t+1} * FFF_{i,t+1}$$



### 2.1.1.3 Exceptions

#### 2.1.1.3.1 Australia

Australia applies a franking procedure on dividends by which a company pays the applicable withholding tax to the Australian Taxation Office on behalf of the shareholders and provides them with what is known as a franking credit. Foreign nationals are only subject to taxation with regards to the unfranked percentage of the dividends received. In addition, the Australian tax system exempts conduit foreign income (CFI), which is income received by an Australian company from abroad and again distributed to its foreign shareholders. With regard to these particularities, the effective tax rate that includes the franking and CFI is calculated as follows:

$$\text{Effective Tax Rate} = \text{Withholding Tax Rate in Australia} * \left( 1 - \text{Franking in \%} - \frac{\text{CFI Amount}}{\text{Declared Amount}} \right)$$

This effective tax rate is to be applied for the declared dividend amount. The net amount after taxes is calculated as follows:

$$\text{Net Dividend Amount} = \text{Declared Dividend} * (1 - \text{Effective Tax Rate})$$

Example: Dividend with Franking Credits and Conduit Foreign Income

Declared Dividend Amount: AUD 0.4

Franking: 50%

CFI: 30%

Withholding Tax Rate in Australia: 30%

$$\text{Effective Tax Rate} = 30\% * (100\% - 50\% - 30\%) = 6\%$$

$$\text{Net Dividend Amount} = 0.4 * (100\% - 6\%) = 0.376 \text{ AUD}$$

#### 2.1.1.3.2 Brazil

In addition to ordinary dividend payments, Brazilian companies often pay interest on the capital that is invested by shareholders in companies. In terms of taxation in Brazil, dividends and interest on capital repayments are subject to a different withholding rate. For the adjustment of Brazilian ordinary dividends and interest on capital payments, Solactive Indices only take the net value into account if the net amount is available. If only the gross amount is available, Solactive uses the gross amount. In the case a company distributes interest on capital and regular cash on the same day, these amounts are aggregated.

#### 2.1.1.3.3 Japan

The majority of dividend distributions for shares listed in Japan are declared in estimated amounts and these estimations are not confirmed by companies prior to the ex-date. In addition to this, some companies do not provide an estimation for dividend amounts.



*With regard to the Standard Index the following shall apply until November 30, 2020:*

Solactive applies the dividend payments in Indices for which an estimation is available on the ex-date. With regard to the Standard Index specified in Section 1.2.1. and if the estimation for the dividend amount is missing, Solactive does not apply any dividend amount. The estimated amounts are considered as final dividend amounts. Accordingly, the Post Ex-Date Dividend Adjustment specified in Section 2.1.1.3.7 doesn't apply for the indices affected.

*With regard to the Standard Index the following shall apply from December 1, 2020:*

For the Standard Index specified in Section 1.2.1, Solactive will apply the the Post Ex-Date Dividend Adjustment specified in Section 2.1.1.3.7.

The Divisor Index specified in Section 1.2.2 is subject to the the Post Ex-Date Dividend Adjustment specified in Section 2.1.1.3.7 and experiences the delta dividend adjustments on the pre-defined Implementation Days.

#### [2.1.1.3.4 South Korea](#)

Companies listed in South Korea usually do not declare an estimation for their upcoming dividend distribution prior to the ex-date. The final dividend amount is announced a couple months after the dividend ex-date.

*The following shall apply until November 30, 2020:*

For the Standard Index specified in Section 1.2.1 and the Divisor Index specified in Section 1.2.2, Solactive applies the dividend payments for which an estimation is available. In the case the estimation for the dividend amount is missing, Solactive does not apply any dividend amount. The estimated amounts are considered as final dividend amounts.

*The following shall apply from December 1, 2020:*

For dividend reinvestments in the Standard Index specified in Section 1.2.1 and the Divisor Index specified in Section 1.2.2, Solactive will apply the Post Ex-Date Dividend Adjustment specified in Section 2.1.1.3.7.

#### [2.1.1.3.5 Depository Receipts Exceptions](#)

Depository Receipts such as ADRs or GDRs are also treated differently and are considered an exception to the general implementation of cash distributions. Depository Receipts are certificates on shares. Financial institutions holding shares of public companies in a separate deposit issue certificates on such shares that are subsequently tradable on exchanges. While their valuation correlates to the underlying stocks' prices, Depository Receipts vary with respect to several characteristics, such as the fee payable to the issuing bank



for its services. The main rationale behind such Depository Receipts is to open foreign equities to domestic investors, who can easily access these foreign company certificates on a local stock exchange (e.g. ADRs listed on the New York Stock Exchange). With regard to Solactive Indices, only the net values of the cash distributions of the Depository Receipts' underlying shares are considered.

#### 2.1.1.3.6 Return of Capital

Return of capital payments that are paid to investors from their original investment but not paid from the company's net income are applied in Indices as a special dividend. When the return of capital payment shows a repetitive characteristic in terms of dividend amount and frequency, and the payment is made in lieu of a regular Cash Dividend, the dividend is considered an ordinary Cash Dividend.

#### 2.1.1.3.7 Post Ex-Date Dividend Adjustment

In some countries like Japan and South Korea, the dividends amounts are not confirmed prior to their ex-dates and the final confirmation is available thereafter. Solactive uses the estimations as dividend amounts on the ex-date. If no estimation for dividend amount is available prior to their ex-date, Solactive considers the dividend amount from the same dividend period of the previous year as the estimated dividend amount, adjusted for any share changes such as stock splits, stock dividends or rights issues between the relevant dividend period and the ex-date. If a company did not pay any dividend last year and no estimation is available for the dividend amount, Solactive applies a dividend amount of zero as estimation to be able to conduct a further adjustment when the company confirms a dividend payment for this particular ex-date. Should the confirmed dividend amount differ from the estimated dividend amount that is applied on the ex-date Solactive performs a post ex-date dividend adjustment. With respect to the Post Ex-Date Dividend Adjustment the historical index levels are not restated.

The adjustment is only applicable if the affected dividend paying company with delta dividend amount was an Index Component on the ex-date. Furthermore, the adjustment of the delta dividend is performed even when the company with delta is not an Index Component on the Implementation Day anymore since this respective stock was an Index Component on the original ex-date.

The Post Ex-Date Dividend Adjustment is performed on the pre-defined Implementation Days that are scheduled weekly on Friday. Should Friday not be a Trading Day for the affected market, the Implementation Date is to be postponed to the next Business Day.

The delta amount between the confirmed dividend amount and the estimated dividend amount will be applied to the affected Indices by using the index dividend points.

$$\Delta d_{i,t} = (d_{i,ID} - d_{i,EX}) * (1 - w_{i,EX})$$



### 2.1.1.3.7.1 Adjustment in Standard Index

For the calculation of Index Delta Dividend Points on the Implementation Date in the Standard Index specified in Section 1.2.1, the calculation parameters of the Index Component from the ex-date are multiplied by the delta dividend and divided by the close index close from one day prior to the dividend ex-date:

$$DDP_{i,ID} = \frac{\Delta d_{i,ID} * x_{i,EX-1} * f_{x_{i,ID-1}}}{Index_{EX-1}}$$

The Index Delta Dividend Points correspond to the delta dividend capitalization in relation to the index level. In case multiple number of index constituents have delta dividends, the individual delta dividend points of each constituent are aggregated.

$$\sum_{i=1}^n DDP_{i,ID}$$

The aggregated value of delta dividend points is added to 1 to create the Correction Factor.

$$CF_{ID} = 1 + \sum_{i=1}^n DDP_{i,ID}$$

This Correction Factor is applied to the close index level from one day prior to the Implementation Day to calculate final index level after applying the Post Ex-Date Dividend Adjustment Methodology.

$$Index_{ID}^{Open} = Index_{ID-1}^{Close} * CF_{ID}$$

Given the fact that the aggregated value of delta dividend points can be positive as well as negative, the Correction Factor can increase or decrease the Index Level.

The adjustment of the Index Level leads to a change on Fraction of Shares of all index constituents.

$$x_{i,ID}^{Open} = x_{i,ID-1}^{Close} * CF_{i,ID}$$





### 2.1.1.3.7.2 Adjustment in Divisor Index

For the calculation of Index Delta Dividend Points on the Implementation Date, the calculation parameters of the particular share from the ex-date are multiplied by the delta dividend and divided by the Divisor from the ex-date:

$$DDP_{i,ID} = \frac{\Delta d_{i,ID} * S_{i,EX} * f_{i,ID-1} * WCF_{i,EX} * FFF_{i,EX}}{D_{EX}}$$

The index dividend points correspond to the delta of the Market Capitalization at the index level. In the case that multiple Index Components are affected, the individual dividend points of each constituent are aggregated. The aggregated value of index dividend points is added to the index level to reflect the delta dividends. Since the dividend point might be positive or negative, the index level is adjusted on the Implementation Date accordingly.

$$Index_{ID}^{Open} = Index_{ID-1}^{Close} + \sum_{i=1}^n DDP_{i,ID}$$

The adjustment of the index level at the opening of the Implementation Date triggers a Divisor adjustment. The Divisor from one day prior to the Implementation Date is adjusted by the ratio between the adjusted index level at the open of the Implementation Date and the close index level before the Implementation Date.

$$D_{ID}^{Open} = D_{ID-1}^{Close} * \frac{Index_{ID-1}^{Close}}{Index_{ID}^{Open}}$$

## 2.1.2 Stock Dividend

A Stock Dividend refers to a dividend paid to existing shareholders in the form of additional shares instead of a cash payment. In contrast to an ordinary dividend payment, the dividend paying company's liquidity reserves remain constant by issuing dividends in the form of additional shares. This liquidity can be held in the company or used for other investments. Additionally, the Stock Dividend has an advantage in terms of taxation, since the shareholder's dividend gain is not subject to taxation until the newly issued shares are sold.

If a company issues a 2% Stock Dividend of newly issued shares pro rata, the total amount of shares is increased by the Stock Dividend terms (T) of 2% while these additional shares are distributed among the shareholders accordingly. A shareholder will receive one newly issued share for every 50 shares the shareholder currently holds. However, at the same time, the value of a single share decreases proportionally because the Market Capitalization of the company as a whole remains the same, as does the value of the shareholder's portfolio.



### 2.1.2.1 Stock Dividend Adjustment

The PAF for Stock Dividend is calculated as follows:

$$PAF_{i,t+1} = 1 + T$$

The theoretical close price after the Stock Dividend is calculated as follows:

$$ap_{i,t+1} = \frac{p_{i,t}}{PAF_{i,t+1}}$$

The final shares after the implementation of the Stock Dividend are calculated by the multiplication of the number of shares on the dividend ex-date with the adjustment factor.

$$ax_{i,t+1} = x_{i,t} * PAF_{i,t+1}$$

Since the shares in the index are increased by the PAF, the implementation of a Stock Dividend does not change the Index Market Capitalization. Consequently, a Stock Dividend doesn't trigger a Divisor change in Divisor Indices. In respect of implementation, a Stock Dividend is treated identically across all index types (Standard Indices and Divisor Indices).

### 2.1.3 Stock Split

The practice of Stock Splits describes a corporate event through which a company's existing shares are split and therefore multiplied by a given factor. This split ratio (2-for-1 or 3-for-1), doubles or triples the total amount of shares and the number of shares held by each shareholder. From a structural perspective, it resembles a Stock Dividend on a greater scale. In practice, the newly issued shares are distributed to existing shareholders pro rata.

At the same time the company's Market Capitalization is not affected, its total value remains the same and the value of a single share decreases proportionally. It is this nominal depreciation, the share price's reduction by half or two-thirds, which is the objective of such an operation.

Similar to a Stock Split, a Reverse Stock Split is a rather straightforward operation. The concept and process of Reverse Stock Splits is similar to Stock Splits. The actual Market Capitalization of a company remains unchanged, yet the total number of issued shares is reduced by a given factor, again usually 1-for-2 or 1-for-3, and the nominal value of a single share is increased accordingly.



### 2.1.3.1 Stock Split Adjustment

The PAF for a Stock Split is calculated as follows:

$$PAF_{i,t+1} = T$$

Stock Split terms (T) is the relation between the number of shares before the corporate action and the number of shares that are received for each share held by an investor after the corporate action. Consequently, T is greater than 1 in a Stock Split, whereas this relation is lower than 1 in a Reverse Stock Split.

The theoretical close price after a Stock Split is calculated as follows:

$$ap_{i,t+1} = \frac{p_{i,t}}{PAF_{i,t+1}}$$

The final shares after the implementation of a Stock Split is calculated by the multiplication of the number of shares on the ex-date with the adjustment factor.

$$ax_{i,t+1} = x_{i,t} * PAF_{i,t+1}$$

The implementation of a Stock Split is treated the same across all index types (Standard Indices and Divisor Indices).

### 2.1.4 Rights Issue

Unlike the events described above, the term Rights Issue refers to a wider set of Corporate Actions that may take a variety of forms. A Rights Issue raises the Market Capitalization of a company. Generally speaking, a Rights Issue has a diluting effect on the shareholder's existing shares as their individual number of shares remains the same while the total amount of stock increases.

In order to counterbalance such a dilution, legislators have provided for rights regimes. These entail the possibility for existing shareholders to pre-emptively purchase newly issued shares for a pre-defined subscription price (SP) on a pro rata basis, i.e. in accordance with their existing number of the company's shares.

The stock price is likely to decrease at first in such a case. This depreciation of the share's nominal value due to such a corporate event has to be adequately reflected in the Index performance.

Solactive implements a Rights Issue only if the subscription price is lower than the stock's close price on the day before the ex-date.



### 2.1.4.1 Rights Issue Adjustment in Standard Index

The PAF for a Rights Issue is calculated as follows:

$$PAF_{i,t+1} = \frac{p_{i,t}}{\left(\frac{1 * p_{i,t} + T * SP}{1 + T}\right)}$$

The theoretical close price after a Rights Issue is calculated as follows:

$$ap_{i,t+1} = \frac{p_{i,t}}{PAF_{i,t+1}}$$

The Fraction of Shares prior to the ex-date is increased with the PAF. Following that, a Rights Issue does not affect the Index Market Capitalization in a Standard Index.

$$ax_{i,t+1} = x_{i,t} * PAF_{i,t+1}$$

### 2.1.4.2 Rights Issue Adjustment in Divisor Index

In contrast to the standard calculation formula, the implementation of a Rights Issue increases the Market Capitalization, since the number of shares is increased by the terms but not by the PAF.

$$aS_{i,t+1} = S_{i,t} * (1 + T)$$

This change in Market Capitalization requires a Divisor adjustment to keep the index level constant.

To calculate the theoretical stock price after a Rights Issue, the above-described PAF is used.

$$D_{t+1} = \frac{D_t * Index_t - \Delta MCAP}{Index_t}$$

$$\Delta MCAP = \sum_{i=1}^n S_{i,t} * p_{i,t} * f_{i,t} * WCF_{i,t} * FFF_{i,t} - \sum_{i=1}^m aS_{i,t+1} * \frac{1}{PAF_{i,t+1}} * p_{i,t} * f_{i,t} * WCF_{i,t+1} * FFF_{i,t+1}$$



## 2.1.5 Capital Decrease

The opposite procedure to a Rights Issue which increases capital is a Capital Decrease. A company may offer its shareholders the option to sell their shares at an agreed price.

To facilitate the buyback of larger quantities, companies often offer a fixed price with a moderate premium compared to the stock price. The repercussions to the stock price are complex and often depend on a set of additional factors.

Solactive implements a Capital Decrease only if the subscription price is higher than the stock's close price on the day before the ex-date.

### 2.1.5.1 Capital Decrease Adjustment in Standard Index

The PAF for a Capital Decrease is calculated as follows:

$$PAF_{i,t+1} = \frac{p_{i,t}}{\left(\frac{1 * p_{i,t} - T * SP}{1 - t}\right)}$$

The theoretical close price after a Capital Decrease is calculated as follows:

$$ap_{i,t+1} = \frac{p_{i,t}}{PAF_{i,t+1}}$$

The Fraction of Shares prior to the date ex-date is decreased with the PAF. Following that, a Capital Decrease does not affect the Index Market Capitalization in a Standard Index.

$$ax_{i,t+1} = x_{i,t} * PAF_{i,t+1}$$

### 2.1.5.2 Capital Decrease Adjustment in Divisor Index

In contrast to the standard calculation formula, the implementation of a Capital Decrease reduces the Market Capitalization, since the number of shares is decreased by the terms but not by the PAF.

$$aS_{i,t+1} = S_{i,t} * (1 - T)$$

This change in Market Capitalization requires a Divisor adjustment to keep the index level constant.



To calculate the theoretical stock price after a Capital Decrease, the above-described PAF is used.

$$D_{t+1} = \frac{D_t * Index_t - \Delta MCAP}{Index_t}$$

$$\Delta MCAP = \sum_{i=1}^n S_{i,t} * p_{i,t} * f_{i,t} * WCF_{i,t} * FFF_{i,t} - \sum_{i=1}^m aS_{i,t+1} * \frac{1}{PAF_{i,t+1}} * p_{i,t} * f_{i,t} * WCF_{i,t+1} * FFF_{i,t+1}$$

## 2.1.6 Spin-off

A Spin-off describes a procedure by which an existing company establishes a subsidiary or other company and confers some of its business activities to this newly established entity.

With reference to the Index calculation, an Index Component is subject to a Spin-off if the issuer of the shares that are currently Index Components splits its business activities into two or more entities and distributes equity shares in the newly created entities to the shareholders of the parent entity, (i.e. to the shareholders of the parent company). Such a process has a direct impact on the Index Component, as assets of the parent company are transferred to another entity, which decreases the value of the parent company.

### 2.1.6.1 Spin-off Adjustment

In the case of a Spin-off affecting an Index Component, the spin-off company will be added to the Index according to the transaction terms on the effective date:

$$\text{Shares Spin-off Company} = \text{Shares Parent Company} * \text{Spin-off Terms}$$

The parent company will remain in the Index with unchanged calculation parameters. The spin-off company will remain in the Index until further notice or the next ordinary rebalancing.

The spin-off company will be added to the Index with a price of 0.00000001. The Index calculation will be switched to official prices once the spin-off company starts to trade.

If the spin-off company does not begin trading on the effective date, a theoretical price for the spin-off company will be implemented as a fixed price until it commences trading. If a theoretical price cannot be calculated, the spin-off company remains in the index at the entry price of 0.00000001 expressed in the trading currency of the shares of the relevant spin-off company.

$$\text{Price Spin-off Company} = [(\text{Close Price Parent Company prior to effective date}) - (\text{Open Price Parent Company on effective date})] * \text{Transaction Terms}$$

If the first Trading Day of the spin-off company is unknown on the ordinary rebalancing date, the spin-off company will be removed from the Index with a price of 0.00000001.

In the case that the spin-off company is already an Index Component, the additional shares demerged from the parent company will be added to the spin-off company on the effective date.



#### EXAMPLE: Spin-off

*Case: An equity Index intends to reflect the performance of the largest companies active in the automotive sector in a given region. One of the Index Components, Company A, has built up additional expertise in the field of highly automated driving and a considerable part of its R&D department is devoted to this topic. In order to improve efficiency, Company A decides to transfer this specific team into a newly created subsidiary, Company A2.*

*Company A currently has 1,000 shares outstanding, trading at EUR 100 each. It distributes shares of Company A2 at a rate of 1-for-5 among its shareholders. Company A2 will be added to the Index with 200 shares outstanding.*

*Company A2 will remain in the Index until the next ordinary rebalancing.*

#### 2.1.6.2 Ad-hoc Adjustment in Spin-off

The Spin-off will be added to the index on a date to match the effective date in the market. Normally 2 full Business Days' notice would be given in advance of the effective date, but spin-offs can be added to an index with reduced notice, including intraday in an ad-hoc situation. The addition of a spin-off does not need action by the index owner to replicate, thus the notice is not required.

#### 2.1.7 Mergers & Acquisitions

The term Merger describes the fusion of two or more separate companies into one entity. It is part of a wider set of procedures usually referred to as Mergers & Acquisitions (M&A).

Mergers can take the form of horizontal integration or vertical integration, with the first term describing the fusion of comparable companies active in the same field, and the latter the fusion of companies on different production levels to control a larger part of the value chain. As such, the underlying rationale for a Merger can vary, and the same holds true for its technical execution. Generally speaking, a Merger is usually based on the consent of all parties and involves a multi-layered negotiation process. An acquisition, albeit generally understood as different from a Merger, is legally often the same, and precise delineations are difficult to make. In contrast to a Merger, which describes the fusion of two or more companies of comparable standing, an acquisition takes place when a company directly purchases another enterprise.

With regard to Solactive Indices and the impact on selection and calculation of Index Components, a Merger is:

- (i) a change in the security class or a conversion of the share class that results in a transfer or an ultimate definite obligation to transfer all the shares 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 the Index Component is the acquiring or remaining company and that does not involve a change in security class or a conversion of all the shares);

- (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, although it does not involve a change in the class or a conversion of the issued shares, the shares 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 directly subsequent to such an event.

#### *2.1.7.1 Mergers & Acquisition Adjustment*

In the case an Index Component is subject to Merger or Acquisition, the acquired entity (i.e. the *target entity*) will be removed from the Index on the effective date as announced by Solactive. The Index is subject to further adjustments in accordance with the following cases.

- a) Merger or Acquisition of an Index Component with or by another Index Component:
  - i. Cash Terms: the weight of the target company based on its last close price will be distributed pro rata across the remaining Index Components.
  - ii. Stock Terms: the shares of the acquiring / surviving company will be increased according to the stock terms.
  - iii. Cash and Stock Terms: the cash portion will be reinvested pro rata across the remaining Index Components. The shares of the acquiring / surviving company will be increased according to the stock terms.
- b) Merger or Acquisition of an Index Component with or by a non-component:
  - i. Cash Terms: the weight of the target company based on its last close price will be distributed pro rata across the remaining Index Components.
  - ii. Stock Terms: the weight of the target company based on its last close price will be distributed pro rata across the remaining Index Components.
  - iii. Cash and Stock Terms: the weight of the target company based on its last close price will be distributed pro rata across the remaining Index Components.





### EXAMPLE: M&A in a Standard Index

*Company A is an engineering firm specialized in 3D printing. Company A is acquired by Company B, a larger technology corporation partly active on the same market. Both companies are Components of a 3D printing Index. As Company A will be delisted from the stock exchange, it will be removed from the Index. Depending on the type of payment (i.e. cash terms, stock terms, or cash and stock terms), the Index will be adjusted in line with the corresponding treatment.*

*The Index Level of an Index calculated with Standard formula is 200 and the Index has the following Index Components with the corresponding calculation parameter.*

Name	Closing Price $p$	Closing $f$	Weighting $w$	Fraction of Shares $x$
Company A	25	1	15.000000%	1.200000
Company B	20.00	1	30.000000%	3.000000
Company C	5.00	0.94459925	25.000000%	10.586500
Company D	10.00	0.94459925	20.000000%	4.234600
Company E	20.00	0.94459925	10.000000%	1.058650

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

### M&A with Cash Terms in a Standard Index

*In this example Company B pays EUR 25.00 per share of Company A.*

*The corresponding treatment will be: the weight of the target company based on its last close price will be distributed pro rata across the remaining Index Components.*

*The adjusted Index weight of an Index Component  $aw_{i,t+1}$  will be calculated as follows:*

$$aw_{i,t+1} = \frac{x_{i,t} * p_{i,t} * f_{i,t}}{\sum_{i=1}^n x_{i,t} * p_{i,t} * f_{i,t}}$$

*The adjusted number of Index shares for the remaining Index Components will be calculated as follows:*



$$\alpha x_{i,t+1} = \frac{aw_{i,t+1} * x_{A,t} * p_{A,t} * f_{A,t} + x_{i,t} * p_{i,t} * f_{i,t}}{p_{i,t} * f_{i,t}}$$

When calculating the adjusted weights or the adjusted number of Index shares, the Index will contain on  $t+1$  the following Index Components with the corresponding calculation parameter.

Name	Closing Price $p$	Closing $f$	Adjusted Weighting $aw$	Adjusted Number of Index Shares $ax$
Company B	20.00	1	35.29412%	3.529412
Company C	5.00	0.9445993	29.41176%	12.454706
Company D	10.00	0.9445993	23.52941%	4.981882
Company E	20.00	0.9445993	11.76471%	1.245471

### M&A with Stock Terms in a Standard Index

Assuming Company B pays 1.25 shares of Company B per every share of Company A.

The corresponding treatment will be: the shares of the acquiring / surviving company will be increased according to the stock terms.

The adjusted number of Index shares for Company B will be calculated as follows.

$$\alpha x_{B,t+1} = x_{A,t} * ST + x_{B,t}$$

When calculating the adjusted weights or the adjusted number of Index shares, the Index will contain on  $t+1$  the following Index Components with the corresponding calculation parameter.

Name	Closing Price $p$	Closing FX $f$	Weighting	Number of Index Shares $x$
Company B	20.00	1	45.000000%	4.500000
Company C	5.00	0.9445993	25.000000%	10.586500
Company D	10.00	0.9445993	20.000000%	4.234600
Company E	20.00	0.9445993	10.000000%	1.058650

### EXAMPLE: M&A in a Divisor Index

Company A is an engineering firm specialized in 3D printing. Company A is acquired by Company B, a larger technology corporation partly active in the same market. Both companies are Components of a 3D printing Index. As Company A will be delisted from the stock exchange, it will be removed from the Index. Depending



on the type of payment (i.e. cash terms, stock terms, or cash and stock terms), the Index will be adjusted in line with the corresponding treatment.

The Index Level is 200 and the Index has the following Index Components with the corresponding calculation parameter.

Name	Closing Price $p$	Closing $f$	Weighting	Number of Total Shares $S$	Free Float Factor $FFF$	Weighting Cap Factor $FFF$
Company A	25.00	1	11.83%	1000	1	1
Company B	20.00	1	18.92%	2000	1	1
Company C	5.00	0.94459925	6.70%	3000	1	1
Company D	10.00	0.94459925	17.87%	4000	1	1
Company E	20.00	0.94459925	44.68%	5000	1	1

$D_t$  = Divisor on Business Day  $t = 1057.064419$

$Index_t$  = Index value on Business Day  $t = 200.00$

#### M&A with Cash Terms in a Divisor Index

Assuming Company B pays EUR 25.00 per share of Company A.

The corresponding treatment will be: the weight of the target company based on its last close price will be distributed pro rata across the remaining Index Components.

The adjustment is conducted in such a way that the value of the Index is unchanged. Consequently, the Divisor will change. As a formula:

$$D_{t+1} = \frac{D_t * Index_t + \Delta MCap}{Index_t}$$

with:

$$\Delta MCap = \sum_{i=1}^m [aS_{i,t+1} * FFF_{i,t+1} * WCF_{j,t+1} * ap_{i,t+1} * f_{i,t}] - \sum_{i=1}^n [S_{i,t} * FFF_{i,t} * WCF_{i,t} * p_{i,t} * f_{i,t}]$$

This results in the following Index.



Name	Closing Price $p$	Closing FX $f$	Weighting $w$	Number of Shares $S$	Free Float Factor $FFF$	Weighting Cap Factor $FFF$
Company B	20.00	1	21.46%	2000	1	1
Company C	5.00	0.94459925	7.60%	3000	1	1
Company D	10.00	0.94459925	20.27%	4000	1	1
Company E	20.00	0.94459925	50.67%	5000	1	1

$$D_{t+1} = 932.064419$$

$$\text{Index}_t = 200.00$$

### M&A with Stock Terms in a Divisor Index

*In this example Company B pays 1.25 shares of Company B per every share of Company A.*

*The corresponding treatment will be: the shares of the acquiring / surviving company will be increased according to the stock terms.*

*As a formula:*

$$aS_{B,t+1} = S_{A,t} * ST + S_{B,t}$$

*This results in the following Index.*

Name	Closing Price $p$	Closing FX $f$	Weighting $w$	Number of Shares $S$	Free Float Factor $FFF$	Weighting Cap Factor $FFF$
Company B	20.00	1	30.75%	3250	1	1
Company C	5.00	0.94459925	6.70%	3000	1	1
Company D	10.00	0.94459925	17.87%	4000	1	1
Company E	20.00	0.94459925	44.68%	5000	1	1

$$D_t = 1057.064419$$

$$\text{Index}_t = 200.00$$

*The Divisor will not be changed due to this adjustment.*



### *2.1.7.2 Timing of Adjustment*

An adjustment will be applied to the Index when:

- a) the Extraordinary Event leads to a Delisting of the Index Component;
- b) the acquiring company initiates a squeeze-out procedure for the remaining outstanding shares of the target company; or
- c) the results of the tender offer, as referred to in 4.2.1. (iii), are announced, the offer is successful, and the free float of the target company is below 15%.

The Index adjustment will be announced with a notice period of at least two Business Days, i.e. the Index adjustment will become effective on the opening of the third Business Day following the announcement (= the effective date) at the earliest.

## **2.1.8 Delisting**

A Delisting takes place when a company's shares are no longer publicly traded on a stock exchange. This is, of course, the case when a company ceases to exist (e.g. after filing for bankruptcy), but there can also be other reasons. After a change in the ownership structure or a low percentage of free-float shares, companies can, depending on the jurisdiction, deliberately decide to go private.

Although the free float-shares remain intact, they are no longer publicly traded. This does not necessarily affect the enterprise as such, but has a fundamental impact on an Index containing a delisted company as component. Since the shares can only be bought and sold privately, no effective transaction prices can be determined, and the company falls out of the Index selection.

Another variation is a listing change whereby an Index Component changes its primary listing to a stock exchange that is not in accordance with the respective Index methodology.

### *2.1.8.1 Delisting Adjustment*

If an Index Component changes its primary listing to a stock exchange that is not in accordance with the Index guideline, the listing change will be implemented on the effective date of the listing change. The Index Component will then be removed from the Index with a notice period of two Business Days. The weight will be distributed pro rata across the remaining Index Components. If available, the Component is deleted on the basis of its last available stock price. Failing that, prices from alternative markets may be tracked (e.g. also by contacting the affected Component itself), and used. In all other cases, if no robust prices are available, the Component is removed from the Index with a stock price of 0.00000001 expressed in the trading currency of the relevant stock.



### *2.1.8.2 Timing of Adjustment*

Subject to the provision of appropriate notification, the adjustment will be applied to the Index after close of business of the last Trading Day of the affected Index Component.

The Index adjustment will be announced with a notice period of at least two Business Day, i.e. the Index adjustment will become effective on the opening on the third Business Day following the announcement (= the effective date) at the earliest.

## 2.1.9 Nationalization of a Company

When a company is nationalized, the complete ownership or effective control of a legal entity is taken over by the state. The form and procedure vary and are generally subject to strong constitutional safeguards. Nevertheless, the nationalization of a company dispossesses shareholders of their property on a large scale and brings forth a situation in which shares are no longer publicly traded, i.e. the component no longer meets the selection criteria.

### *2.1.9.1 Adjustment of Nationalization*

If an Index Component is nationalized, the security will be removed from the Index with notice period of two Business Days with the last available stock price. The weight will be distributed pro rata across the remaining Index Components.

If the security has already been delisted from the corresponding stock exchange and / or no valid price for the security is available, Solactive tries to the best of its knowledge to track prices from alternative liquid markets. The determined price from an official source will then be used for Index calculation until the security will be removed from the Index based on the new price.

If no appropriate price for the Index Component is available, the security will be removed from the Index with a price of 0.0000000001 expressed in the trading currency of the relevant Index Component.

### *2.1.9.2 Timing of Adjustment*

Subject to the provision of appropriate notification, the adjustment will be applied to the Index after close of business of the last Trading Day of the affected Index Component.

The Index adjustment will be announced with a notice period of at least two Business Days, i.e. the Index adjustment will become effective on the opening on the third Business Day following the announcement (= the effective date) at the earliest.



## 2.1.10 Bankruptcy / Insolvency / Liquidation

Bankruptcy is an ever-present possibility for companies in market economies. While there are several safeguards in place to prevent a struggling company from going bankrupt, Insolvency can also occur to larger and publicly traded corporations.

Regarding an Index Component, Insolvency occurs if:

- a) all shares of the respective issuer must be transferred to a trustee, liquidator, Insolvency administrator or similar public officer as result of a 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 the issuer are legally enjoined from transferring the shares.

### 2.1.10.1 Adjustment of Bankruptcy / Insolvency

If an Index Component is bankrupt, the security will be removed from the Index with notice period of two Business Days. The weight will be distributed pro rata across the remaining Index Components.

If the security has already been delisted from the corresponding stock exchange and / or no valid price for the security is available, Solactive will try to the best of its ability to track prices from alternative liquid markets. The determined price from an official source will then be used for Index calculation until the security is removed from the Index based on the new price.

If no appropriate price for the Index Component is available, the security will be removed from the Index with a price of 0.00000001 expressed in the trading currency of the relevant security.

EXAMPLE: Insolvency

*Case: Company A is an innovative IT start-up that experiences sudden problems after strong initial growth. Unexpected by its shareholders, the company files for Insolvency and the management of its assets is taken over by an Insolvency administrator.*

*The shareholders are disenfranchised by the Insolvency proceedings and Company A's shares become virtually worthless. Although the company remains preliminarily listed, it is removed from the Index with a stock price of EUR 0.00000001.*

### 2.1.10.2 Timing of Adjustment

The adjustment will be applied to the Index after close of business of the last Trading Day of the affected Index Component.

The Index adjustment will be announced with a notice period of at least two Business Days, i.e. the Index adjustment will become effective on the opening on the third Business Day following the announcement (= the effective date) at the earliest.



### 2.1.11 Notice Period for Corporate Action Adjustments

Solactive AG works on a best efforts basis to provide accurate information in a timely manner. Extraordinary events such as ad-hoc delistings, unspecified listing dates for spun-off companies, or undisclosed, incomplete or mismatched transaction terms require a high level of flexibility and fast reaction times. In the case an extraordinary event is not outlined as mentioned above, the Solactive Index Committee reserves the right to make index adjustments in an appropriate way on a best-efforts basis.

Ad-hoc situations are defined as circumstances where either Solactive receives information about the effectiveness of a transaction after the last Trading Day of the target security and / or the target security has been suspended from trading with immediate effect and will not resume trading until its Delisting and/or has been delisted from stock exchange with immediate effect.

In the case of ad-hoc situations, the Index adjustment will also be applied with a notice period of two Business Days, i.e. the Index adjustment will become effective on the opening on the third Business Day following the announcement (= the effective date).

## 2.2 ORDINARY INDEX REBALANCES

In order to ensure the validity of the Index composition, an Index is reviewed with a pre-defined frequency. The Index Guideline dictates the schedule of the Index Review and Index Rebalance. An Index rebalance may trigger a change in the Index Composition as well as the Index Calculation Parameters of the Index.

### 2.2.1 Ordinary Rebalance in a Standard Index

The Index Composition of a Standard Index is adjusted based on the Index Guideline on the pre-defined Adjustment Day. For the adjustment of a Standard Index, Solactive uses one of the 3 rebalance methodologies described below and as specified in the relevant Index Guideline.

#### *2.2.1.1 Index Rebalance in a Standard Index by Implementation of Target Weights*

Target Weights of Index Components which are determined on the Selection Day according to the Index Guideline are used to calculate the Fraction of Shares of each Index Component on the Adjustment Day.

The Target Weight of an Index Component reflects the proportion of this stock in the index level after the Index Rebalance takes place. Since the Market Capitalization of the Index is given and reflected by the index level, the Fraction of Shares after the Index Rebalance is calculated based on the market data such as stock price and currency foreign exchange rate as of the Adjustment Day  $t$ :

$$x_{i,t+1}^{TG} = \frac{Index_t * TGW_i}{p_{i,t} * f_{i,t}}$$





The opening level of the Index after the Index Rebalance is determined in accordance with the following formula:

$$Index_{t+1}^{Open} = \sum_{i=1}^n x_{i,t+1}^{TG} * p_{i,t} * f_{i,t}$$

### 2.2.1.2 Index Rebalance in a Standard Index by Share Fixing

This rebalance methodology contains two steps in terms of the calculation of the final Fraction of Shares after the Index Rebalance. In the first step, the indicative Fraction of Shares of each Index Component is calculated based on the market data as of the Selection Day.

$$x_{i,Selection\ Day+1}^{IN} = \frac{Index_{Selection\ Day}^{Close} * TGW_i}{p_{i,Selection\ Day} * f_{i,Selection\ Day}}$$

In the second step, the indicative Fraction of Shares is adjusted by the Share Adjustment Ratio (SAR) to calculate the final Fraction of Shares after the index rebalance. This value represents the ratio between the index level as of the Adjustment Day using the indicative Fraction of Shares and the index level of the Adjustment Day t.

$$SAR_t = \frac{Index_t^{Close}}{\sum_{i=1}^n x_{i,Selection\ Day+1}^{IN} * p_{i,t} * f_{i,t}}$$

$$x_{i,t+1}^{TG} = SAR_t * x_{i,Selection\ Day+1}^{IN}$$

The opening level of the Index after the Index Rebalance is determined in accordance with the following formula:

$$Index_{t+1}^{Open} = \sum_{i=1}^n x_{i,t+1}^{TG} * p_{i,t} * f_{i,t}$$

In the case that share changing Corporate Action events, such as Rights Issue, Stock Splits, Stock Dividends, occur between the Selection Day and Adjustment Day for any Index Component after Index Rebalance, the number of the Target Shares is adjusted according to the Corporate Action terms.



### 2.2.1.3 Multiday Index Rebalance in a Standard Index

In contrast to the other index rebalance methodologies, during a Multiday Index Rebalance the index is adjusted during a pre-defined Rebalance Period rather than on one particular Adjustment Day. The final Fraction of Shares after the last day  $t$  of the Rebalance Period is reached by moving from the initial weights on the first day of the Rebalancing Period to the Target Weights successively in an equal portion every day throughout the Rebalance Period. The daily weight change of an Index Component during the Rebalance Period is determined in accordance with the following formula:

$$DWC_i = \frac{TGW_i^{Final} - W_{i,t-1}}{NAD}$$

with:

$$x_{i,t+1}^{TG} = \frac{Index_t * TGW_{i,t}}{p_{i,t} * f_{i,t}}$$

and

$$TGW_{i,t} = W_{i,t-1} + DWC_i$$

	Current Weight	Target Weight ( $TGW_i^{Final}$ )	1. Day Index Weight ( $TGW_{i,1}$ )	2. Day Index Weight ( $TGW_{i,2}$ )
Stock A deleted from the Index	60%	0%	30%	0%
Stock B remains in the Index	40%	50%	45%	50%
Stock C added to the Index	0%	50%	25%	50%

The overview above illustrates a Multiday Index Rebalance which is applied during an Rebalance Period of 2 days.



The opening level of the Index after the index rebalance is determined in accordance with the following formula:

$$Index_{t+1}^{Open} = \sum_{i=1}^n x_{i,t+1}^{TG} * p_{i,t} * f_{i,t}$$

## 2.2.2 Ordinary Rebalance in a Divisor Index

The index composition of a Divisor Index is adjusted based on the index guideline on the pre-defined Adjustment Day. For the adjustment of a Divisor Index, Solactive uses one of the rebalance methodologies described below and as specified in the relevant Index Guideline.

### 2.2.2.1 Index Rebalance in a Divisor Index by Target Weights

The Target Weights, Weighting Cap Factors and Free Float Factors of Index Components which are determined on the Selection Day according to the Index Guideline are used to calculate the Total Number of Shares of each Index Component after the close of business on the Adjustment Day t.

$$S_{i,t+1}^{TG} = \frac{MCAP_t * TGW_i}{p_{i,t} * f_{i,t} * FFF_{i,t+1} * WCF_{i,t+1}}$$

This rebalance methodology does not trigger any Divisor change since the adjusted Total Number of Shares in t+1 are calculated based on the Market Capitalization of the Index as of the Adjustment Day t.

The opening level of the Index after the Index Rebalance is determined in accordance with the following formula:

$$Index_{t+1}^{Open} = \frac{\sum_{i=1}^n S_{i,t+1}^{TG} * p_{i,t} * f_{i,t} * WCF_{i,t+1} * FFF_{i,t+1}}{D_t}$$

### 2.2.2.2 Index Rebalance in a Divisor Index by Share Fixing

The Target Shares, Weighting Cap Factors and Free Float Factors are determined on the Selection Day and the Index Rebalance is executed based on these calculation parameters on the Adjustment Day t. Since the new Calculation Parameters of the Index might cause a change on the Market Capitalization of the Index as of the Adjustment Day t, this change is reflected by adjusting the Divisor to ensure that the index level is not affected by the Index Rebalance.



$$D_{t+1} = \frac{D_t * Index_t + \Delta MCAP}{Index_t}$$

$$\Delta MCAP = \sum_{i=1}^n S_{i,t+1}^{TG} * p_{i,t} * f_{i,t} * WCF_{i,t+1} * FFF_{i,t+1} - \sum_{i=1}^n S_{i,t} * p_{i,t} * f_{i,t} * WCF_{i,t} * FFF_{i,t}$$

whereas the formula below refers to the index level calculated using the pre-rebalance composition.

$$\sum_{i=1}^n S_{i,t} * p_{i,t} * f_{i,t} * WCF_{i,t} * FFF_{i,t}$$

The opening level of the Index after Index Rebalance is determined in accordance with the following formula:

$$Index_{t+1}^{Open} = \frac{\sum_{i=1}^n S_{i,t+1}^{TG} * p_{i,t} * f_{i,t} * WCF_{i,t+1} * FFF_{i,t+1}}{D_{t+1}}$$

In the case that share changing Corporate Action events, such as Rights Issue, Stock Splits, Stock Dividends, occur between the Selection Day and Adjustment Day for any Index Component after Index Rebalance, the number of the Target Shares is adjusted according to the Corporate Action terms.

### 2.2.2.3 Multiday Index Rebalance in a Divisor Index

Similar to the practice in the Standard Index, the Multiday Index Rebalance is implemented in a pre-defined Rebalance Period. The Target Weights which are defined on the Selection Day are used to determine the Number of Total Shares of each Index Component.

The final Number of Total Shares after the last day t of the Rebalance Period is achieved by implementing the Target Weights of each constituent successively in the same portion per day.

$$DWC_i = \frac{TGW_i^{Final} - W_{i,t-1}}{NAD}$$



with:

$$x_{i,t+1}^{TG} = \frac{Index_t * TGW_{i,t}}{p_{i,t} * f_{i,t}}$$

and

$$TGW_{i,t} = W_{i,t-1} + DW C_i$$

$$S_{i,t+1}^{TG} = \frac{MCAP_t * TGW_{i,t}}{p_{i,t} * f_{i,t} * WCF_{i,t+1} * FFF_{i,t+1}}$$

Since the Total Number of Shares after the Index Rebalance is calculated based on the Market Capitalization of the Index as of the Rebalance Date t, the Divisor remains constant.

For the calculation of the opening level of the Index after Index Rebalance the following formula is used:

$$Index_{t+1}^{Open} = \frac{\sum_{i=1}^n S_{i,t+1}^{TG} * p_{i,t} * f_{i,t} * WCF_{i,t+1} * FFF_{i,t+1}}{D_t}$$

### 2.2.3 Rebalance Fee

A Rebalance Fee is an optional component which can be included in the index calculation to reflect the theoretical costs due to Index Replication in terms of Index Rebalance.

The sum of the weights of Index Components on Rebalance Day t which are removed from the Index in the Index Rebalance, are added to the sum of the absolute delta between the Target Weights of Index Components on Rebalance Day t+1 and close index weights on Rebalance Day t. This number is then multiplied by a pre-defined Rebalance Fee Factor  $\mu$ .

The opening level of the Index after Index Rebalance is reduced as follows, whereas  $W_t = \mathbf{0}$  for additional Index Components which are not in the Index in on Rebalance Day t+1.

$$Index_{t+1}^{Open} = Index_t^{Close} * (1 - (\mu * (\sum_{i=1}^n W_t^{DEL} + \sum_{i=1}^n |W_t - W_{t+1}|)))$$



## 2.3 EXTRAORDINARY INDEX REBALANCES IN CONNECTION WITH CHINA CONNECT STOCK LISTINGS

### 2.3.1 Introduction

The Index guidelines may contain requirements that potential Index Components must be available for trading under the Shanghai- and Shenzhen Connect Programs<sup>1</sup> (the “China Stock Connect Program”) in order to be eligible for inclusion in the Index. Accordingly, such Indices may contain Index Components that are traded under the China Stock Connect Program.

In order to be eligible for inclusion in the Index securities must appear on the „ Lists of securities eligible for unrestricted buying and selling“ published by the Hong Kong Stock Exchange concerning the eligibility of securities under the China Stock Connect Program (the “Positive List”). The Positive List is available from the website of the Hong Kong Stock Exchange ([https://www.hkex.com.hk/Mutual-Market/Stock-Connect/Eligible-Stocks/View-All-EligibleSecurities?sc\\_lang=en](https://www.hkex.com.hk/Mutual-Market/Stock-Connect/Eligible-Stocks/View-All-EligibleSecurities?sc_lang=en)).

	“Shanghai Connect”	“Shenzhen Connect”
List of securities eligible for unrestricted buying and selling	List of SSE Securities/China Connect Securities (stocks eligible for both buy and sell)	List of SZSE Securities/China Connect Securities (stocks eligible for both buy and sell)

### 2.3.2 Treatment

In general, removals from the Positive List will be treated equivalent to a delisting (described in Section 2.1.8). The instrument will be removed and its weight will be redistributed pro-rata to the other Index Components.

In the case that

- an Index provides for a minimum Index Components constraint;
- an Index Component is removed from the Positive List (the “Affected Index Component”); and
- the removal of the Affected Index Component from the Index would result in a breach of the minimum Index Component constraint;

the Index is rebalanced extraordinarily. The extraordinary rebalance shall ensure that the minimum number of Index Components is included and the Index continues to reflect its investment objective.

The removal of the Affected Index Component takes place by performing an extraordinary rebalance in accordance with the provisions in the guideline of the Index with the following conditions: the effective date of the removal from the Positive List will be regarded as an extraordinary selection day. The

<sup>1</sup> With the China Connect Stock Program the People's Republic of China has allowed foreign and (residential) Hong Kong investors to participate within the Chinese stock market of Shanghai and Shenzhen.



corresponding rebalance day will be determined in accordance with the relevant provisions in the Index guideline.

If the next ordinary rebalance of the Index is scheduled to take place within fifteen (15) Index Calculation Days from the effective date of removal from the Positive List, the Affected Index Component will be removed triggering no extraordinary rebalance to avoid unnecessary costs. For clarification: The Index will not be extraordinary rebalanced and will contain less than the minimum number of Index Components specified in the respective Index guideline.

### 2.3.3 Transparency

Solactive will communicate and announce the removal of the Affected Index Component and the measures taken by it in a timely manner, and provide the necessary details and updates.

Solactive shall seek to provide for an implementation period that provides sufficient time for potential adjustments that users of the Index may need to take to account for the change.

All decisions by Solactive are to be duly recorded and published at the website <https://www.solactive.com/news/announcements/>.



### 3. TERMS AND DEFINITIONS

For the purpose of this document, the defined terms used herein shall have the following meaning:

An 'Adjustment Day' is as of which the index rebalance takes place.

An 'ADR' is an acronym for American Depository Receipt, i.e. a Depository Receipt issued by an American bank.

A 'Business Day' is a day on which Stuttgart Stock Exchange is open for trading.

'Calculation Parameters' are inputs that are used for the calculation of the index level. Among those are: Fraction of Shares, Total Shares, Index Shares and Divisor.

When a company carries out a 'Capital Decrease' it buys back shares from its shareholders, often at a premium. It is a way to invest excess earnings or to modify the shareholder structure strategically, leading to a decrease in the Market Capitalization.

A 'Cash Dividend' takes place when a company pays an amount of cash to its shareholders. This is generally decided by the general assembly of shareholders and carried out on a pro-rata-basis. Solactive further distinguishes between two types of Cash Distributions: Regular Dividends and Special Dividends.

'China Stock Connect Program' shall have the meaning as defined in Section 2.3.1.

A 'Corporate Action' is specifically:

- a Cash Dividend;
- a Stock Dividend;
- a Stock Split;
- a Reverse Stock Split;
- a Rights Issue;
- a Capital Decrease;
- a Spin-off;
- a Merger;
- a Delisting;
- a Nationalization of company; or
- Bankruptcy / Insolvency

An Index Component is subject to 'Delisting' 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 Calculator.





A 'Depository Receipt' is a certificate on a share issued by a financial institution. The banks purchase and hold shares of a company in the country where it is listed and issue certificates granting particular rights to the underlying shares. The precise legal construction may vary depending on the jurisdiction. The certificates are subsequently publicly tradeable and are often listed on stock exchanges, thus enabling domestic investors to invest in foreign equities.

The 'Divisor' divides the total value of an Index into a more comprehensible number. It is one of the key tools to ensure the accuracy and continuity of the Index over time and is adjusted to offset changes due to Corporate Actions.

An 'Exchange' is, in respect of this document, the respective primary exchange where an Index Component has its primary listing. The Committee or respective Index Committee may decide to declare a different stock exchange the Exchange for trading reasons, even if an Index Component is only listed there via a stock substitute.

'Fraction of Shares' is in respect of an Index Component and any given Business Day, the number of shares included in a Standard Index.

'Free Float Factor' with regard to a share is a ratio of (A) the number of shares in circulation and (B) the number of shares outstanding of the respective company.

'Free Float Market Capitalization' with regard to a share is its Market Capitalization multiplied by the ratio of (A) the number of shares in circulation and (B) the number of shares outstanding of the respective company.

A 'GDR' is an acronym for Global Depository Receipt, i.e. a Depository Receipt issued by any bank other than an American bank. In some contexts, GDR is also understood to refer to a German Depository Receipt.

An 'Implementation Date' is a day on which the post ex-date dividend adjustments are implemented to the affected indices.

An 'Index' (or 'Indices') is, simply put, a number describing the average value of its Index Components and their development over a longer time period.

'Index Calculation Parameters' are all components used for calculating the Index Level.

An 'Index Component' is a financial instrument or other constituent currently included in the respective Index. The terms Index Component and Index Constituent are used indiscriminately throughout this Methodology.

An 'Index Composition' is a construction which consists of Index Components.

An 'Index Guideline' is a document ruling the composition, calculation and maintenance of an Index.

An 'Index Review' refers to the assessment of an Index to determine the Index Composition based on the criteria defined in the respective Index Guideline.

An 'Index Rebalance' is the adjustment of an Index to implement the Index Composition dictated by the respective Index Guideline.



'Index Replication' refers to the trading activities to reflect the value of an Index in portfolios tracking the Index.

'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 a 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.

'Management Fee' is a fee which is deducted from the index either in absolute or percentage terms at a predefined frequency to reflect costs associated with the management of an index.

The 'Management Fee Factor' is either an absolute or percentage terms which shall reflect the exposure of the management costs associated to the index management

'Market Capitalization' with regard to a share is the value of the issuing company calculated by multiplying the number of outstanding company shares by their share price.

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 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
    - 1.3. on an Exchange or in a trading or quotation system (as determined by Solactive AG) in which an Index Component is listed or quoted; or
  - B) an event that (in the assessment of Solactive AG) generally disrupts and affects the opportunities of market participants to execute transactions on the Exchange in respect of an Index Component or to determine market values for an Index Component or to execute transactions with regard to options and futures contracts on these shares or to determine market values for such options or futures contracts; or
2. trading on the Exchange or an Affiliated Exchange is ceased prior to the usual closing time (as defined below), unless the early cessation of trading is announced by the Exchange on this Trading Day at least one hour before
  - (aa) the actual closing time for normal trading on the Exchange on the Trading Day in question or, if earlier.
  - (bb) the closing time (if given) of the Exchange for the execution of orders at the time the quote is given.

With regard to an Index Component a 'Merger' is:



- a change in the security class or a conversion of the share class that results in a transfer or an ultimate definite obligation to transfer all the shares to another legal person;
- 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 the Index Component is the acquiring or remaining company and that does not involve a change in security class or a conversion of all the shares);
- 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
- 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, although it does not involve a change in the class or a conversion of the all shares issued, the shares 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 directly subsequent to such an event.

The 'Merger Date' is the date on which a Merger is concluded or the date specified by Solactive AG if such a date cannot be determined under the law applicable to the Merger.

A 'Methodology' is, in accordance with the EU Benchmarks Regulation, the central guideline documenting the administrator's rules for the determination of a benchmark. This Equity Index Methodology is a vital part of the overall Methodology and particularly identifies how and when discretion may be exercised in the situation of Corporate Actions.

A 'Multiday Index Rebalance' is defined as the implementation of a new index composition spread over a specific number of days.

'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.

'Normal exchange closing time' is the time at which the 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; or 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 Solactive, whereby Solactive takes its decision based on those circumstances that it considers reasonable and appropriate.

'Positive List' shall have the meaning as defined in Section 2.3.1.

The 'Rebalance Fee' shall reflect the trading costs associated with the replication of the index during the rebalance.

The 'Rebalance Fee Factor' is a number expressed in percent which shall describe the trading costs associated with the replication of the index during the rebalance.



A 'Rebalance Period' is in respect of an Index Rebalance the timeframe where during which the adjustment takes place.

A 'Regular Dividend' refers to Cash Distributions paid in regular intervals, such as once every month or, more commonly, on a quarterly basis, depending on the pattern previously established by the individual company or as is common practice in the respective jurisdiction (cf. Cash Distribution).

A 'Reverse Stock Split' occurs when the existing shares are withdrawn from the shareholders and replaced by newly issued shares. The actual Market Capitalization of a company remains untouched, yet the total number of issued shares is reduced by a given factor, usually 2-for-1 or 3-for-1, and the nominal value of a single share is increased accordingly.

A 'Rights Issue' refers to actions raising the Market Capitalization of a company, often facilitated by issuing new shares. Existing shareholders may usually acquire the newly issued shares at a slight discount thus retaining their existing percentage of the free float.

A 'Selection Day' is the day as of which the Index is reviewed based on the selection criteria described in the Index Guideline.

A 'Special Dividend' is any Cash Distribution that falls outside the general pattern of dividend payments, either with regard to its timing or the amount paid out to shareholders (cf. Regular Dividend and Cash Distribution).

A 'Stock Split' describes a Corporate Action through which a company's present shares are split and therefore multiplied by a given factor. The newly issued shares are distributed based on what is known as a split ratio, often 2-for-1 or 3-for-1, thus doubling or tripling the total amount of shares and the number of shares held by each shareholder. The stock price decreases proportionally.

An Index Component is subject to a 'Spin-off' if the issuer of the shares that are currently Index Components splits its business activities into two or more entities and distributes equity shares in the newly created entities to the shareholders of the parent (i.e. status before the Spin-off took place) entity.

A 'Squeeze-out' refers to a procedure by which a majority shareholder may take a company private by compensating minority shareholders appropriately. The requirements and process of a squeeze-out vary depending on the jurisdiction at hand, but the majority shareholder generally needs to control a certain percentage of the company.

A 'Stock Dividend' is similar to a Cash Dividend but the shareholders receive shares pro rata by the company instead of cash. Usually this involves the issuing of new shares.

A 'Takeover bid' with respect to an Index Component 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% of the shares of an issuer or the right to acquire these shares, as determined by Solactive AG based on notices submitted to public or self-regulatory authorities or other information considered by Solactive AG to be relevant.

A 'Target Weight' with respect to an Index Component is the portion of an Index Component in the Index which is to be used for the calculation of the Fraction of Shares / Total Shares on the Adjustment Day.



'Total Shares' are in respect of an Index Component and any given Business Day, the number of shares included in a Divisor Index.

A 'Trading Day' is in relation to 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. Solactive AG is ultimately responsible as to whether a certain day is a Trading Day with regard to an Index Component or in any other connection relating to this document, the Index Calculation Guideline or an Index term sheet.

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 Solactive AG), as determined by Solactive AG. 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.

'Weighting Cap Factor' with respect to an Index Component is a factor defining the relative weight of an Index Component to the Index Market Capitalization.

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