Index Calculation Guideline

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Index Calculations

Solactive calculates indices based on two general formulas:

1) Standard formula

The index value on a business day is calculated in accordance with the following formula:

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

with:

$Index_t$ = Index value on business day t

n = Number of index components on business day t

$x_{i,t}$ = Number of index shares of index component i on business day t

$p_{i,t}$ = Price of index component i on business day t

$f_{i,t}$ = Foreign exchange rate to convert the price of index component i on business day t into the index currency

2) Laspeyres Formula

The index value on a business day is calculated in accordance with the following formula:

$$Index_t = \frac{\sum_{i=1}^{n}\left[s_{i,t} * p_{i,t} * f_{i,t}\right]}{D_t}$$

with:

$Index_t$ = Index value on business day t

n = Number of index components on business day t

$s_{i,t}$ = Number of index shares of index component i on business day t

$p_{i,t}$ = Price of index component i on business day t

$f_{i,t}$ = Foreign exchange rate to convert the price of index component i on business day t into the index currency

D_t = Divisor on business day t

In the calculation of the daily index closing level, the official closing price of the respective index component on the respective exchange is used. In case an exchange does not have an official closing price for an index component on a specific day, the last known official closing price is used. Solactive may decide to use a different price for an index component in exceptional cases.

If an exchange does generally not publish official closing prices, Solactive decides on a price collection mechanism which ensures tradability and representativeness of its indices.

Index adjustments

Certain events may lead to a change in the price of an index component. Depending on the type of the index the calculation parameters are adjusted in order to reflect the anticipated price change.

1) Standard Formula

The number of index shares x of the index component subject to a corporate action is adjusted on the respective ex date of the corporate action. The adjustment conducted in such a way that the index weight of the affected index component and the value of the index are unchanged. As a formula:

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

with:

$x_{i,t+1}$ = Number of index shares of index component i on business day t+1

$x_{i,t}$ = Number of index shares of index component i on business day t

$p_{i,t}$ = Price of index component i on business day t

$ap_{i,t+1}$ = Adjusted opening price of index component i on business day t+1

2) Laspeyres Formula

Depending on the type of corporate action, the number of index shares s of the index component subject to a corporate action and/or the divisor D are adjusted on the respective ex date of the corporate action. The adjustment is conducted in such a way that the value of the index is unchanged. As a formula:

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

with:

D_{t+1} = Divisor on business day t+1

D_t = Divisor on business day t

$Index_t$ = Index value on business day t

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

$as_{j,t+1}$ = Adjusted number of index shares of index component j on business day t+1

$s_{i,t}$ = Number of index shares of index component i on business day t

$p_{i,t}$ = Price of index component i on business day t

$ap_{j,t+1}$ = Adjusted opening price of index component j on business day t+1

$f_{i,t}$ = Foreign exchange rate to convert the price of index component i on business day t into the index currency

$f_{j,t}$ = Foreign exchange rate to convert the price of index component j on business day t into the index currency

n = Number of index components on business day t

m = Number of index components on business day t+1

I= Index composition on business day t

J= Index composition on business day t+1

Events leading to index adjustments

The following types of distributions and corporate actions 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 an investor has the choice between different types of distributions the affected index is adjusted according to the default option. If no default option exists the affected index is adjusted for the cash distribution option if available. If the details (ex date, amount of distribution, terms of capital increase, etc.) of an event which may trigger an index adjustment are not known prior to the ex date, no index adjustment is carried out. If an estimation of the details of a distribution from a reliable source exists (for example distributions by Japanese or Russian companies), an index adjustment may be carried out based on the estimation. The index committee may decide differently on a case-by-case basis.

Cash distributions

Cash distributions are not taken into account in price indices with the exception of special cash dividends; total return indices are adjusted for cash dividend payments and other cash distributions. The following adjustment is implemented:

$$ap_{i,t+1} = p_{i,t} - d_{i,t+1} * (1 - tax_i) * f_{i,t}$$

with:

$ap_{i,t+1}$ = Adjusted opening price of index component i on business day t+1

$p_{i,t}$ = Price of index component i on business day t

$d_{i,t+1}$= Distribution of index component i on business day t+1

tax_i= Current withholding tax in the country of incorporation of index component i

$f_{i,t}$= Foreign exchange rate to convert the currency of the distribution into the trading currency of the affected index component on business day t

Stock distributions

In the case of stock distributions it is assumed that the prices change in ratio to the number of shares. The following adjustment is implemented:

$$as_{i,t+1} = s_{i,t} * (1 + N_{i,t+1})$$

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

$as_{i,t+1}$ = Adjusted number of index shares of index component i on business day t+1

$s_{i,t}$ = Number of index shares of index component i on business day t

$N_{i,t+1}$ = shares issued for every share held

$ap_{i,t+1}$ = Adjusted opening price of index component i on business day t+1

$p_{i,t}$ = Price of index component i on business day t

Stock distributions of another company

In the case of stock distributions of another company the following adjustment is implemented:

$$ap_{i,t+1} = p_{i,t} - p_{k,t} * f_{k,t} * U_{i,t+1}$$

$ap_{i,t+1}$ = Adjusted opening price of index component i on business day t+1

$p_{i,t}$ = Price of index component i on business day t

$p_{k,t}$ = Price of company k on business day t

$f_{k,t}$ = Foreign exchange rate to convert the trading price of company k into the trading price of company i

$U_{i,t+1}$ = Shares of company k which shareholders of index component i receive for every share held in index component i

Share splits

In the case of share splits it is assumed that the prices change in ratio to the number of shares. The following adjustment is implemented:

$$as_{i,t+1} = s_{i,t} * R_{i,t+1}$$

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

$as_{i,t+1}$ = Adjusted number of index shares of index component i on business day t+1

$s_{i,t}$ = Number of index shares of index component i on business day t

$R_{i,t+1}$ = Shares held after the split for every share held before the split

$ap_{i,t+1}$ = Adjusted opening price of index component i on business day t+1

$p_{i,t}$ = Price of index component i on business day t

Capital increases

In the case of capital increases the following adjustment is implemented:

$$ap_{i,t+1} = \frac{p_{i,t} + B_{i,t+1} * SP_{i,t+1} * f_{i,t}}{1 + B_{i,t+1}}$$

$$as_{i,t+1} = s_{i,t} * (1 + B_{i,t+1})$$

with:

$ap_{i,t+1}$ = Adjusted opening price of index component i on business day t+1

$p_{i,t}$ = Price of index component i on business day t

$B_{i,t+1}$ = Number of shares of index component i which can be subscribed to for every share in index component i held

$SP_{i,t+1}$ = Subscription price for every share new share in index component i

$f_{i,t}$= Foreign exchange rate to convert the currency of the subscription price into the trading currency of the affected index component i on business day t

$as_{i,t+1}$ = Adjusted number of index shares of index component on business day t+1

$s_{i,t}$ = Number of index shares of index component on business day t

In case the subscription price (converted in to the trading currency of the affected index component, if necessary) is equal to or higher than the closing price of the affected index component on business day t, no index adjustment is implemented.

Share Repurchases

In the case of share repurchases in the form of a tender offer to shareholders the following adjustment is implemented:

$$ap_{i,t+1} = \frac{p_{i,t} - C_{i,t+1} * TP_{i,t+1} * f_{i,t}}{1 - C_{i,t+1}}$$

$$as_{i,t+1} = s_{i,t} * (1 - C_{i,t+1})$$

$ap_{i,t+1}$ = Adjusted opening price of index component i on business day t+1

$p_{i,t}$ = Price of index component i on business day t

$C_{i,t+1}$ = Number of shares which can be sold for every share held

$TP_{i,t+1}$ = Tender price for every share which can be sold

$f_{i,t}$= Foreign exchange rate to convert the currency of the tender price into the trading currency of the affected index component on business day t

$as_{i,t+1}$ = Adjusted number of index shares of index component i on business day t+1

$s_{i,t}$ = Number of index shares of index component i on business day t

Spin-offs

In case of a spin-off affecting an index component, the affected index is adjusted according to one of the following options based on a decision of the respective index committee:

1) The spun-off company is not included in the index. The index is adjusted at the close of trading on the business day prior to the ex date for the value of the right to receive new shares in the spun-off company (based on the transaction terms and the closing price of the spun-off company on the business day prior to the ex date, if the spun-off company has already been trading before the ex date).
2) The spun-off company is added to the index based on the terms of the spin-off and deleted at the close of trading on the ex date.
3) The spun-off company is added to the index based on the terms of the spin-off and remains in the index.

In deciding which option to implement the index committee particularly takes into account the trading status of the spun-off company before, on and after the ex date, the fit of the company in relation to the respective index concept as well as other factors which may be relevant on a case-by-case basis.

Mergers & Acquisitions

If an index component is subject to a merger, a takeoverbid, a delisting, nationalization or insolvency the affected index is adjusted according to one of the following options based on a decision of the respective index committee:

1) The affected index component is deleted from the index prior to its delisting. No other change to the index composition is implemented.
2) The affected index component is replaced by a different company prior to its delisting.
3) The weight of the affected index component is added to another index component prior to its delisting.

In deciding which option to implement the index committee particularly takes into account the trading status of the affected index component before the delisting date, the liquidity of the affected index component, the existence of suitable replacement companies as well as other factors which may be relevant on a case-by-case basis.