

Index Calculation Module (Risk Controlled Portfolios)

Index Calculation Methodology Module
HSBC Global Markets Indices

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RESTRICTED

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1. Introduction

(a) General

This Index Calculation Module (Risk-Controlled Portfolio) sets out a certain proprietary calculation methodology which is utilised in various HSBC Global Markets Indices. This Index Calculation Module (Risk-Controlled Portfolio) may be incorporated by reference in the relevant Index Terms Module for an Index. Once this Index Calculation Module (Risk-Controlled Portfolio) has been incorporated, whether in whole or in part, into an Index Terms Module, it is deemed to be an integral part of that Index Terms Module for all purposes.

This Index Calculation Module (Risk-Controlled Portfolio) must be read, and must be interpreted, in conjunction with the U.S. Base Terms Module, the Asset Terms Module (Equities), the Supporting Terms Module (Equities & Multi-Asset) and the Index Terms Module for the relevant Index. This is not a standalone document and should not be read or interpreted separately from the other parts of an Index Description for an Index.

If there is any inconsistency between the terms of this Index Calculation Module (Risk Controlled Portfolios) and the U.S. Base Terms Module, the Supporting Terms Module (Equities & Multi-Asset) or Asset Terms Module (Equities), this Index Calculation Module (Risk-Controlled Portfolio) shall prevail. If there is any inconsistency between the terms of this Index Calculation Module (Risk Controlled Portfolios) and any other part of the Index Terms Module into which this module has been incorporated, the terms of the main body of the Index Terms Module shall prevail for the purposes of the relevant Index.

(b) Definitions

Any capitalised terms not defined in Appendix 1 (*Definitions*) of this Index Calculation Module (Risk Controlled Portfolios) shall have the meaning given to such term in the U.S. Base Terms Module, the Asset Terms Module (Equities), the Supporting Terms Module (Equities & Multi-Asset) or the relevant Index Terms Module for the relevant Index.

2. Overview of the Risk Control Methodology

This Index Calculation Module (Risk-Controlled Portfolio) sets out the risk control methodology used by the Index Sponsor in certain HSBC Global Markets Indices. The HSBC Risk Control Methodology has been developed to seek improved risk-adjusted returns that are higher than the returns on the relevant underlying indices.

The methodology reflects the performance of an objective, systematic investment strategy that rebalances exposures through adjustments in notional investments between: (i) the relevant Portfolio Index and (ii) a hypothetical cash investment linked to the cash Deposit Index. Indices may be calculated as Total Return Indices or Excess Return Indices, where Total Return Indices represent a funded, and Excess Return Indices represent an unfunded, investment into the relevant Index. In addition, the Performance Weighting parameter of an Index can be no greater than 100%, such as to prohibit the potential for leveraging the notional investment in a Portfolio Index.

The rebalancing strategy adjusts the exposure to the Portfolio Index by reference to the realised volatility of that index. When the volatility of the Portfolio Index rises, the exposure to the Portfolio Index decreases, and the exposure to a specified cash deposit index increases. Conversely, when the volatility of the Portfolio Index decreases, the exposure to the Portfolio Index increases, and the exposure to the relevant cash deposit index decreases.

The parameters for each Index determined in accordance with this Index Calculation Module (Risk-Controlled Portfolio), which are used to determine the Risk Controlled Portfolio Level for each such Index, are set out in the Risk Controlled Portfolio Parameters Table in the Index Terms Module for each Index.

3. Process for the calculation of the Risk Controlled Portfolio Level

The calculation of the Risk Controlled Portfolio Level for an Index on each Index Valuation Date will follow a two-step process:

- (a) **Step One: Calculation of the Risk Controlled Portfolio Level:** the Index Calculation Agent will determine the Performance Amount, Cash Amount and Transaction Cost Amount in respect of each Index Valuation Date, and the Risk Controlled Portfolio Level shall then be determined by reference to those amounts, as further described in Section 4 (*Calculation of the Risk Controlled Portfolio Level*) below; and
- (b) **Step Two: Calculation of the Performance Weighting:** the Index Calculation Agent will determine the Performance Weighting for each Index Valuation Date by reference to the Reference Volatilities of the relevant Risk Controlled Portfolio Level and using the relevant Reference Volatility Tables, as further described in Section 5 (*Determination of Performance Weighting*).

The Risk Controlled Portfolio Level on the Base Date for an Index is equal to the Base Index Level and the Performance Weighting on the Base Date is equal to the Base Date Performance Weighting, all of which are specified in the relevant Index Terms Module for an Index.

4. Calculation of the Risk Controlled Portfolio Level (Step One)

(a) Calculation of the Performance Amount

The Index Calculation Agent shall, in respect of each Index Valuation Date for an Index, determine a performance amount (the “**Performance Amount**”), which represents the index points of the performance asset, and is equal to the product of the Performance Weighting, the Risk Controlled Portfolio Level and the change in the level of the relevant Portfolio Index (the “**Portfolio Level**”). For an Excess Return Index, the Performance Amount is reduced by the return on the applicable Cash Benchmark Index.

(i) Total Return Index

If the relevant Index Terms Module specifies that an Index is a ‘Total Return Index’, the Index Calculation Agent shall calculate the Performance Amount $PA(t)$ in respect of Index Valuation Date t in accordance with the following formula:

$$PA(t) = w(t-1) \times S(t-1) \times \frac{I_P(t)}{I_P(t-1)}$$

(ii) Excess Return Index

If the relevant Index Terms Module specifies that an Index is an 'Excess Return Index', the Index Calculation Agent shall calculate the Performance Amount $PA(t)$ in respect of Index Valuation Date t in accordance with the following formula:

$$PA(t) = w(t-1) \times S(t-1) \times \frac{I_P(t)}{I_P(t-1)} \times \frac{I_B(t-1)}{I_B(t)}$$

Where:

PA(t) means the Performance Amount in respect of Index Valuation Date t ,

w(t-1) means the Performance Weighting in respect of the Index Valuation Date immediately preceding Index Valuation Date t ,

S(t-1) means the Risk Controlled Portfolio Level in respect of the Index Valuation Date immediately preceding Index Valuation Date t ,

I_p(t) means the relevant Portfolio Level, as determined pursuant to the terms of the relevant Index Terms Module, in respect of Index Valuation Date t ,

I_p(t-1) means the relevant Portfolio Level, as determined pursuant to the terms of the relevant Index Terms Module, in respect of the Index Valuation Date immediately preceding Index Valuation Date t ,

I_B(t) means the level of the Cash Benchmark Index, as determined pursuant to the terms of the relevant Index Terms Module, in respect of Index Valuation Date t , and

I_B(t-1) means the level of the Cash Benchmark Index, as determined pursuant to the terms of the relevant Index Terms Module, in respect of the Index Valuation Date immediately preceding Index Valuation Date t .

(b) **Calculation of the Cash Amount**

The Index Calculation Agent shall, in respect of each Index Valuation Date for an Index, determine a cash amount (the "**Cash Amount**") as the product of the Performance Weighting, the Risk Controlled Portfolio Level and, for a Total Return Index, the return on the Deposit Index.

(i) Total Return Index

If the relevant Index Terms Module specifies that an Index is a 'Total Return Index', the Index Calculation Agent shall calculate the Cash Amount $CA(t)$ in respect of Index Valuation Date t in accordance with the following formula:

$$CA(t) = \max\left[0, 1 - w(t-1)\right] \times S(t-1) \times \frac{I_C(t)}{I_C(t-1)}$$

(ii) Excess Return Index

If the relevant Index Terms Module specifies that an Index is an 'Excess Return Index', the Index Calculation Agent shall calculate the Cash Amount $CA(t)$ in respect of Index Valuation Date t in accordance with the following formula:

$$CA(t) = \max\left[0, 1 - w(t-1)\right] \times S(t-1)$$

Where:

CA(t) means the Cash Amount in respect of Index Valuation Date t ;

w(t-1) means the Performance Weighting in respect of the Index Valuation Date immediately preceding Index Valuation Date t ;

S(t-1) means the Risk Controlled Portfolio Level in respect of the Index Valuation Date immediately preceding Index Valuation Date t ;

I_c(t) means the level of the Deposit Index, as determined pursuant to the terms of the relevant Index Terms Module, in respect of Index Valuation Date t ; and

I_c(t-1) means the level of the Deposit Index, as determined pursuant to the terms of the relevant Index Terms Module, in respect of the Index Valuation Date immediately preceding Index Valuation Date t .

(c) **Calculation of the Transaction Cost Amount**

The Index Calculation Agent shall, in respect of each Index Valuation Date for an Index, determine a transaction cost amount (the "**Transaction Cost Amount**") by first calculating the Rebalancing Amount, and then determining the appropriate Transaction Cost Amount in respect of that Rebalancing Amount.

The Rebalancing Amount is calculated by reference to the difference between the Performance Amount and the product of the Performance Weighting and the sum of that Performance Amount and the Cash Amount, in accordance with the following formula:

$$RA(t) = PA(t) - w(t) \times (PA(t) + CA(t))$$

Where:

- RA(t)** means the Rebalancing Amount in respect of Index Valuation Date *t*;
- PA(t)** means the Performance Amount in respect of Index Valuation Date *t*;
- CA(t)** means the Cash Amount in respect of Index Valuation Date *t*; and
- w(t)** means the Performance Weighting in respect of the Index Valuation Date *t*, as determined pursuant to Section 5 (*Determination of Performance Weighting*) below.

The Transaction Cost Amount is then calculated as the product of the absolute value of the Rebalancing Amount and either (a) the appropriate Sell Transaction Cost, if the Rebalancing Amount is a positive number, or (b) the appropriate Buy Transaction Cost, if the Rebalancing Amount is a negative number, in accordance with the following formula:

$$TCA(t) = |RA(t)| \times (TCB \times 1_{RA(t) < 0} + TCS \times 1_{RA(t) > 0})$$

Where:

- TCA(t)** means the Transaction Cost Amount in respect of Index Valuation Date *t*;
- RA(t)** means the Rebalancing Amount in respect of Index Valuation Date *t* determined in accordance with the provisions above;
- TCB** means the Buy Transaction Costs, as specified in the relevant Index Terms Module;
- TCS** means the Sell Transaction Costs, as specified in the relevant Index Terms Module;
- 1_{RA(t)>0}** means either:
- (a) one (1) if the Rebalancing Amount in respect of Index Valuation Date *t* is a positive number (which results in Sell Transaction Cost being deducted from the Risk Controlled Portfolio Level); or
 - (b) zero (0), if the Rebalancing Amount in respect of Index Valuation Date *t* is not a positive number (which results in no deduction of Sell Transaction Cost); and

$1_{RA(t)<0}$ means either:

(a) one (1) if the Rebalancing Amount in respect of Index Valuation Date t is a negative number (which results in Buy Transaction Cost being deducted from the Risk Controlled Portfolio Level); or

(b) zero (0), if the Rebalancing Amount in respect of Index Valuation Date t is not a negative number (which results in no deduction of Buy Transaction Cost).

(d) **Risk Controlled Portfolio Level**

The Index Calculation Agent shall calculate the Risk Controlled Portfolio Level in respect of each Index Valuation Date by reference to:

- (i) the Performance Amount, which represents a proportion of the Index invested in the Portfolio Index in respect of the relevant Index Valuation Date;
- (ii) the Cash Amount, which represents a proportion of the Index invested in cash in respect of the relevant Index Valuation Date; and
- (iii) the Transaction Cost Amount in respect of the relevant Index Valuation Date.

The Index Calculation Agent shall calculate the Risk Controlled Portfolio Level in respect of Index Valuation Date t in accordance with the following formula:

$$S(t) = PA(t) + CA(t) - TCA(t)$$

Where:

S(t) means the Risk Controlled Portfolio Level in respect of Index Valuation Date t ;

PA(t) means the Performance Amount in respect of Index Valuation Date t ;

CA(t) means the Cash Amount in respect of Index Valuation Date t ; and

TCA(t) means the Transaction Cost Amount in respect of Index Valuation Date t .

5. Determination of Performance Weighting

In respect of each Index Valuation Date for a Portfolio Index, the Index Calculation Agent shall calculate the following:

- (i) the long historical volatility of the Portfolio Level (the "**Long Reference Volatility**") in respect of that Index Valuation Date; and
- (ii) the short historical volatility of the Portfolio Level (the "**Short Reference Volatility**") in respect of that Index Valuation Date.

The Index Calculation Agent shall calculate the Short Reference Volatility $\sigma_{short}(t)$ and the Long Reference Volatility $\sigma_{long}(t)$ in respect of Index Valuation Date t in accordance with the following formulae:

$$\sigma_{short}(t) = \sqrt{\frac{d}{ShortVolWindow} \times \left(\sum_{j=0}^{ShorVolWindow-1} R_{t-j-VolLag}^2 \right)}$$

$$\sigma_{long}(t) = \sqrt{\frac{d}{LongVolWindow} \times \left(\sum_{j=0}^{LongVolWindow-1} R_{t-j-VolLag}^2 \right)}$$

Where:

$\sigma_{short}(t)$ means the Short Reference Volatility in respect of Index Valuation Date t ;

$\sigma_{long}(t)$ means the Long Reference Volatility in respect of Index Valuation Date t ;

d means 260;

LongVolWindow means the Long Volatility Window value specified in the relevant Index Terms Module;

ShortVolWindow means the Short Volatility Window value specified in the relevant Index Terms Module;

$R_{(t)}$ is equal to $\ln\left(\frac{I_p(t)}{I_p(t-1)}\right)$ in respect of Index Valuation Date t ;

$I_p(t)$ means the relevant Portfolio Level, as determined pursuant to the terms of the relevant Index Terms Module, in respect of Index Valuation Date t ;

$I_p(t-1)$ means the relevant Portfolio Level, as determined pursuant to the terms of the relevant Index Terms Module, in respect of the Index Valuation Date immediately

preceding Index Valuation Date t ,
and

VolLag

means the value for the Volatility Lag specified in the relevant Index Terms Module.

The Index Calculation Agent shall determine the Short Weighting and the Long Weighting for an Index in respect of each Index Valuation Date by reference to (a) the value for Long Reference Volatility and Short Reference Volatility calculated under the provisions above and (b) the corresponding values set out in the Long Reference Volatility Table and the Short Reference Volatility Table, as applicable, as set out in the relevant Index Terms Module.

The Index Calculation Agent shall determine the Performance Weighting in respect of each Index Valuation Date after the Base Date for an index as the lower of the Short Weighting and the Long Weighting, in accordance with the formula below:

$$w(t) = \min(w_{short}(t), w_{long}(t))$$

Where:

w(t) means the Performance Weighting in respect of the Index Valuation Date t ,

w_{short}(t) means the Short Weighting, determined by reference to the Short Reference Volatility Table set out in the relevant Index Terms Module, in respect of Index Valuation Date t ; and

w_{long}(t) means the Long Weighting, determined by reference to the Long Reference Volatility Table set out in the relevant Index Terms Module, in respect of Index Valuation Date t .

6. Data Provider Disclaimer

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Appendix 1: Definitions

Except where the context otherwise requires, the following terms used in this Index Calculation Module have the following meanings:

"**Base Date**" has the meaning set out in the relevant Index Terms Module.

"**Base Date Performance Weighting**" has the meaning set out in the relevant Index Terms Module.

"**Base Index Level**" has the meaning set out in the relevant Index Terms Module.

"**Buy Transaction Cost**" has the value set out in the relevant Index Terms Module.

"**Cash Amount**" means an amount determined pursuant to Section 4(b) (*Calculation of the Risk Controlled Portfolio Level (Step One)*) of this Index Calculation Module.

"**Cash Benchmark Index**" has the meaning set out in the relevant Index Terms Module.

"**Data Providers**" has the meaning set out in Section 6 (*Data Provider Disclaimer*) of this Index Calculation Module.

"**Deposit Index**" has the meaning set out in the relevant Index Terms Module.

"**Excess Return Index**" means an Index with the Index Type "Excess Return" specified in the relevant Index Terms Module for such Index, which is calculated in accordance with Section 4(b)(ii) (*Calculation of the Risk Controlled Portfolio Level (Step One)*) of this Index Calculation Module.

"**Index**" has the meaning set out in the relevant Index Terms Module.

"**Index Sponsor**" has the meaning set out in Appendix 1 (*Definitions*) of the U.S. Base Terms Module.

"**Index Valuation Date**" means each day designated as an Index Valuation Date in the relevant Index Terms Module.

"**Investment Product**" has the meaning set out Appendix 1 (*Definitions*) of the U.S. Base Terms Module.

"**Long Reference Volatility**" has the meaning set out in Section 5(i) (*Determination of Performance Weighting*) of this Index Calculation Module.

"**Long Reference Volatility Table**" means the relevant table set out in the relevant Index Terms Module.

"**Long Weighting**" means an amount determined pursuant to the terms of the relevant Index Terms Module.

"**Long Vol Window**" means the relevant value set out in the relevant Index Terms Module.

"**Parameter Table**" means, in respect of each Index, the table set out in the relevant section of the Index Terms Module.

"Performance Amount" means an amount determined pursuant to Section 4(a) (*Calculation of the Risk Controlled Portfolio Level (Step One)*) of this Index Calculation Module.

"Performance Weighting" means a percentage amount determined pursuant to Section 5 (*Determination of Performance Weighting*) of this Index Calculation Module.

"Portfolio Index" means an index identified as a 'Portfolio Index' in the relevant Index Terms Module.

"Portfolio Level" has the meaning set out in Section 4(a) (*Calculation of the Risk Controlled Portfolio Level (Step One)*) of this Index Calculation Module.

"Rebalancing Amount" means an amount determined pursuant to Section 4(c) (*Calculation of the Risk Controlled Portfolio Level (Step One)*) of this Index Calculation Module.

"Reference Volatility" means a value determined pursuant to Section 5 (*Determination of Performance Weighting*) of this Index Calculation Module.

"Reference Volatility Table" means either the Short Reference Volatility Table or the Long Reference Volatility Table, as applicable.

"Risk Controlled Portfolio Level" has means the level of each Index determined pursuant to the terms of this Index Calculation Module.

"Risk Controlled Portfolio Parameters Table" means the risk controlled portfolio parameters table set in the relevant Index Terms Module.

"Sell Transaction Cost" means the value set out in the relevant Index Terms Module.

"Short Reference Volatility" has the meaning set out in Section 5(ii) (*Determination of Performance Weighting*) of this Index Calculation Module.

"Short Reference Volatility Table" means the relevant table set out in the relevant Index Terms Module.

"Short Vol Window" means the relevant value set out in the relevant Index Terms Module.

"Short Weighting" means an amount determined pursuant to the terms of the relevant Index Terms Module.

"Total Return Index" means an Index with the Index Type "Total Return" specified in the relevant Index Terms Module for such Index.

"Transaction Cost Amount" means an amount determined pursuant to Section 4(c) (*Calculation of the Risk Controlled Portfolio Level (Step One)*) of this Index Calculation Module.

"Underlying Index" has the meaning set out in the Asset Terms Module (Equities).

"Vol Lag" means the relevant value set out in the relevant Index Terms Module.

Appendix 2: Disclaimer

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