MSCI 10/40 INDEXES METHODOLOGY

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1 INTRODUCTION TO THE MSCI 10/40 INDEXES

The UCITS III (Undertakings for Collective Investment in Transferable Securities) directive imposes, among other restrictions, investment limits to funds incorporated in member states of the European Union. The directive constrains the weight of any single group entity, as defined therein, at 10% of a fund's total assets and the sum of the weights of all group entities representing more than 5% of the fund at 40% of the fund's total assets.

The MSCI 10/40 Indexes take into account these investment limits and aim to represent the constrained version of the MSCI Equity Indexes, offering a pertinent benchmarking alternative for UCITS III compliant funds. This document describes the methodology that MSCI uses to calculate the MSCI 10/40 Indexes by applying the weight constraints set forth herein to the non-constrained, free-float adjusted market capitalization weighted MSCI Equity Indexes (herein, "Parent Indexes").

2 INDEX OBJECTIVES AND GUIDING PRINCIPLES

In designing an appropriate methodology for constructing the MSCI 10/40 Indexes from underlying non-constrained indexes, the following principles have guided MSCI.

2.1 REFLECTING THE 10% AND 40% CONCENTRATION CONSTRAINTS

Reflecting the 10% and 40% concentration constraints is the primary consideration in terms of both index construction and index maintenance. Ensuring timely and on-going reflection of the constraints requires a 10/40 Index to be rebalanced as soon as the weights of one or more group entities exceed the constraints. In practice, this requires that rebalancing take place as of the close of the day when the constraints are breached, such that the index will comply with the weight restrictions before the opening of the following trading day.

2.2 MINIMIZING TURNOVER IN THE MSCI 10/40 INDEX

Due to absolute and/or relative market price movements, a 10/40 Index could potentially be rebalanced at the end of every trading day in order to remain compliant with the 10/40 framework. This would result in significant index turnover and exorbitant costs for a portfolio to track the index. Therefore, keeping the on-going index turnover in the MSCI 10/40 Indexes to a reasonable level is an important guiding principle of the MSCI 10/40 Index methodology.

2.3 MINIMIZING TRACKING ERROR TO THE PARENT INDEX

Minimizing the tracking error between the MSCI 10/40 Index and the Parent Index is another important objective of the current methodology. This is achieved by a regular rebalancing of the MSCI 10/40 Index relative to the constituents' weights in the Parent Index, as well as by features in the Index construction and maintenance process which are aimed at minimizing the difference between the MSCI 10/40 Index and the Parent Index.

3 INDEX CONSTRUCTION AND MAINTENANCE METHODOLOGY

The following are the salient features of the MSCI 10/40 Index methodology reflecting the investment restrictions of the UCITS III directive.

3.1 GROUP ENTITIES

3.1.1 DEFINITION

In order to take into account the definition of group entities as set forth in the UCITS III directive, financial accounts of listed companies holding stakes of 20% or more in other listed companies are analyzed in order to determine whether these stakes should be considered as controlling stakes and, consequently, whether both companies should be considered as belonging to the same group entity. Under International Accounting Standards, a parent company is required to consolidate its investment in subsidiaries, defined as companies it controls. In certain cases, even in the absence of consolidated accounts, MSCI may consider two companies as belonging to the same group entity where there is reasonable evidence of control based on other information.

3.1.2 MAINTENANCE

MSCI will perform an annual review of all group entities, which will coincide with the August Quarterly Index Review. Any change in a group entity resulting from a corporate event will be implemented at the time of the event. Updates triggered by the disclosure of new public information unrelated to corporate events or corrections to existing group entities will be implemented as of the close of the last business day of the month.

3.2 CONSTRUCTION AND REBALANCING OF THE MSCI 10/40 INDEXES

The MSCI 10/40 Index construction methodology follows a systematic approach using an iterative process which minimizes not only index turnover but also the tracking error and extreme deviation from the Parent Index. The process consists in analyzing all possible capping combinations in order to determine the optimal weight distribution which complies with the 10/40 investment restrictions.

3.2.1 CONSTRAINT TARGETS

In order to ensure that the indexes are not subject to constant rebalancing and hence to excessive index turnover caused by short-term market movements, group entities' weights are capped at levels below the 10/40 constraints. Under the MSCI 10/40 Index methodology, at the point of constructing or rebalancing the MSCI 10/40 Indexes, the weight of any single

group entity cannot exceed 9% of the index weight and all group entities representing more than 4.5% cannot exceed 36% of the index weight. In other terms, a "buffer" is used, which is set equal to 10% of the value of each constraint.

3.2.2 FIXING CAPPING COMBINATIONS (PIVOTS)

The algorithm caps the weights of certain group entities at 9% and 4.5%. The difference between the group entities' fixed and original weights will be proportionally allocated to the uncapped group entities.

3.2.3 ADJUSTING THE CUMULATIVE LIMIT

The 36% limit is checked only after proportional allocation has been completed successfully; hence if a proportional allocation is not successful, the solution for the weight distribution iteration is abandoned and the next iteration is explored. However, if the allocation succeeds and the sum of the group entities' weights above 4.5% exceeds 36%, the algorithm will allocate the overweight to the group entities with weights below 4.5%.

3.2.4 CHECKING FOR COMPLIANCE AND EVALUATING QUALITY

The resulting discrete solution is then tested for compliance and rejected if it triggers a breach of the constraints. If compliant, the solution will be compared to the preceding best iteration based on three criteria: index turnover, extreme deviations and tracking error. If the result is better, the solution will be kept and if the result is worse, the solution will be discarded. The algorithm will then proceed to the next iteration.

Please refer to Appendix I and Appendix II for more detailed information on the dynamic rebalancing algorithm methodology.

3.3 MAINTENANCE RULES

3.3.1 QUARTERLY INDEX REVIEWS

The MSCI 10/40 indexes are rebalanced quarterly. Changes are implemented as of the close of the last business day of each February, May, August and November, to coincide with the Quarterly Index Reviews of their Parent Indexes. In order to minimize the tracking error of the MSCI 10/40 Indexes relative to the Parent Indexes, the rebalancing process is run based on the Parent Index's constituents' weights.

The pro forma MSCI 10/40 Indexes are in general rebalanced nine business days before the effective date. The changes resulting from the rebalancing are announced on the same day.

In case the pro forma MSCI 10/40 Index violates the 10/40 constraint between the announcement date and the effective date, the previously announced results will be discarded and a newly rebalanced pro forma index will be announced.

3.3.2 REBALANCING DUE TO NON-COMPLIANCE

The MSCI 10/40 Indexes are also rebalanced on an "as needed" basis. This means that a MSCI 10/40 Index is rebalanced at the end of any day on which the constraints as specified above are breached. The breach of the constraints can be, for example, triggered by the market performance of one constituent.

The rebalancing of the index in this case is done relative to the existing constituents' weights as explained in Appendix I and Appendix II, as opposed to rebalancing relative to the constituents' weights in the Parent Index. This feature of the methodology helps to significantly reduce the index turnover, as rebalancing to the Parent Index may increase or decrease the weight of constituents which are not in breach of the constraints.

The rebalancing will take place as of the close of the day when the index breaches the constraints, based on closing prices, such that the MSCI 10/40 Index will always be within the constraints before the opening of the following trading day.

3.3.3 ADDITIONS AND DELETIONS DUE TO CORPORATE EVENTS

The general treatment of additions and deletions due to corporate events aims at minimizing turnover in the MSCI 10/40 Indexes.

A security added to the Parent Index following a corporate event affecting an existing constituent (acquisition, spinoff, or merger) will also be added to the 10/40 Index with an estimated capped weight, which is determined using capping factors as explained in Appendix III. Following the inclusion, the 10/40 Index will only be rebalanced relative to the existing constituents' weights if the 10/40 constraints are breached.

The deletion of a constituent from the Parent Index following a corporate event will trigger its deletion from the 10/40 Index. The 10/40 Index will only be rebalanced relative to the existing constituents' weights if the 10/40 constraints are breached.

3.3.4 REBALANCING DUE TO THE ADDITION OF A NEWLY ELIGIBLE SECURITY IN THE PARENT INDEX

The addition of a newly eligible security in the Parent Index -- for example an early inclusion of a large IPO, or a security migrating to the Parent Index from another size segment -- will result in the inclusion of that security in the MSCI 10/40 Index and will trigger the full rebalancing of the MSCI 10/40 Index, relative to the constituents' weight in the Parent Index.

This process ensures that an event with significant impact on the market structure of a country is correctly reflected in the MSCI 10/40 Indexes.

Please refer to the MSCI Corporate Events Methodology book available at: https://www.msci.com/index-methodology for more details.

3.4 GROUP ENTITY CONCENTRATION ISSUES

A minimum of 19 group entities in the Parent Index is required at any point in time for an MSCI 10/40 Index to be rebalanced as described in sub-section 3.2. In the event the number of group entities drops below 19 but remains above 15 following a corporate event or a regular index review, MSCI will apply the following adjustments:

- Number of group entities drops to 18: the buffer mentioned in sub-section 3.2.1 will be reduced from 10% to 9%
- Number of group entities drops to 17: the buffer mentioned in sub-section 3.2.1 will be reduced from 10% to 4%.
- Number of group entities drops to 16: the buffer mentioned in sub-section 3.2.1 will be reduced from 10% to 0%.

The MSCI 10/40 Index will need to be discontinued if the number of group entities drops below 16 as mathematically no solution can satisfy the 10% and 40% constraints. MSCI will however temporarily maintain the MSCI 10/40 Index for a minimum of two months before discontinuation by adding the necessary number of securities to the index. The index discontinuation will coincide with one the subsequent regular index reviews. The securities to be added will be chosen in the following order of priority:

- Securities deleted from the MSCI 10/40 Index that triggered the decrease in the number of group entities, provided they remain eligible, e.g., exhibit required liquidity, were not deleted due to financial difficulties, etc.
- Eligible securities of relevant size not included in the Parent Index, e.g., largest small cap size-segment securities if the Parent Index is a MSCI Standard Index.

In the event that no securities are eligible for temporary addition to the MSCI 10/40 Index, MSCI will be providing an index, as close as possible to the 10/40 constraints, for a minimum of two months before discontinuation. The index discontinuation will coincide with one of the subsequent regular index reviews.

MSCI will announce any of these adjustments to all impacted clients ahead of implementation.

APPENDIX I: REBALANCING ALGORITHM: TECHNICAL SPECIFICATIONS

Definitions

- ICL: Individual cap limit (9%)
- CCL: Combined cap limit (36%)
- CT: Combination Threshold (4.5%)
- Cap pivot: The lowest weighted group entity at ICL
- High pivot: The highest weighted group entity at CT
- Low pivot: The lowest weighted group entity at CT
- Fixing Weight: Under/overweight obtained after all pivots have been fixed
- High caps: Group Entities above CT and below ICL
- Low caps: Group Entities below CT
- Variable caps: High and low caps not fixed (not forced to ICL or CT)
- Area weight: Sum of all the group entity weights above the CT

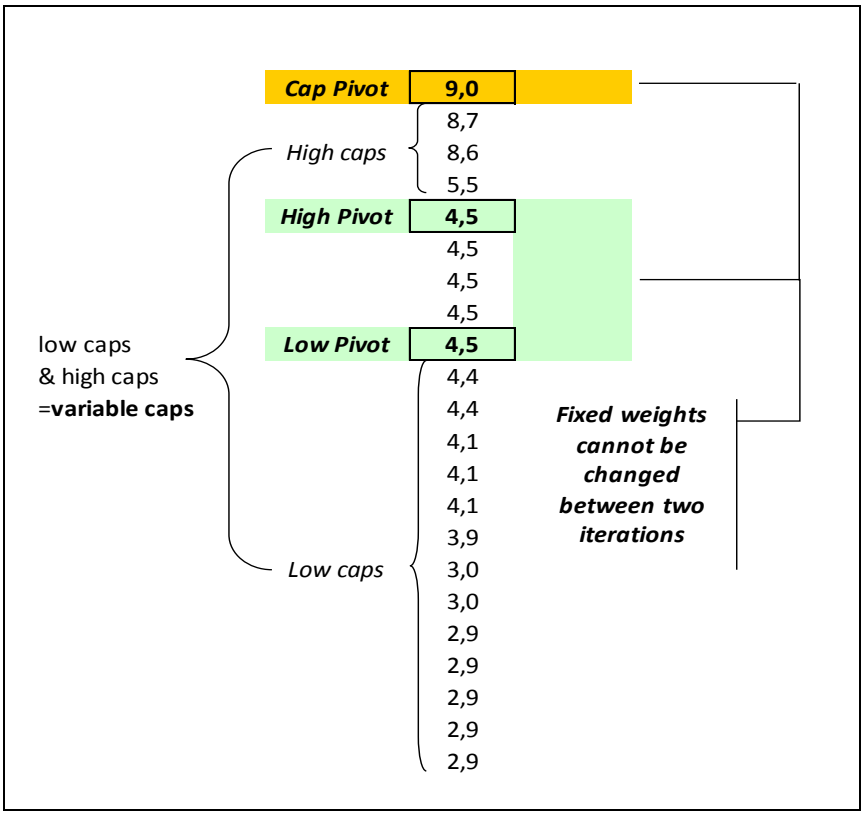

Figure 1: Defining terms

Method and order

There are 3 *pivots* that define a discrete solution (low, high and cap). They fix some weights at the ICL and CT limits. For each discrete solution, allocation/removal of weight differential between the original weights and the capped weights is applied based on a proportional ratio. Iterating in that way may often give more than one solution. The best solution is then chosen, based on defined quality criteria, as set forth below. The pivots are searched in the following order: cap pivot, high pivot, and low pivot.

Pivot order:

1. Set cap pivot first; then for each cap pivot position (including none[1]).
2. Iterate over high pivots (including none), then for each high/cap pivot position (including none).

[1] A flat weight distribution of the Parent Index might not warrant the setting of a cap pivot.

3. Iterate over low pivots (including none if there is no high pivot).

Iteration

In cases where the weight distribution of the index exceeds the 10/40 constraints the pivot positioning is as follows:

4. Cap pivot iteration goes from position 0 to 4 (0=none, 4 is the max. allowed by the 10/40 constraints).
5. High pivot position cannot go below cap pivot position +1.
6. The sum of weights between low and high pivots cannot exceed (group entity's sum)-(cap pivot position * ICL)
7. Low pivot position can't go below high pivot position.

Quality Criteria

The best discrete solution will be based on three quality criteria: lowest turnover, lowest maximum increase factor and minimum distance from the Parent Index.

The following formulas are used to define the quality criteria:

1. **Turnover** = $\sum abs(W_{final_i} - W_{original_i})$
2. **Max relative increase** = $\max_{\text{all weights}} (\frac{W_{final_i}}{W_{original_i}} - 1)$
3. **Distance** = $\sqrt{\sum (W_{final_i} - W_{original_i})^2}$

W: Weight

APPENDIX II: REBALANCING ALGORITHM: CALCULATIONS DESCRIPTION FOR EACH ITERATION

Fixing weight set and allocation

By fixing the pivots, some weights must be forced at the ICL (individual cap limit) and/or CT (combination threshold). Consequently, we obtain a positive or negative weight called "fixing weight". That fixing weight must then be allocated proportionally (if applicable) to low and high caps.

ID	Orig.	Fixed	Fixing weight	
1	12,0	9,0	**3,0**	
2	8,7	9,0	**-0,3**	***Cap Pivot***
3	8,6	8,6		*High caps*
4	5,5	5,5		
5	4,8	4,8		
6	4,7	4,5	**0,2**	***High Pivot***
7	4,7	4,5	**0,2**	
8	4,5	4,5		
9	4,4	4,5	**-0,1**	
10	4,3	4,5	**-0,2**	
11	4,3	4,5	**-0,2**	
12	4,2	4,5	**-0,3**	
13	4,1	4,5	**-0,4**	
14	4,0	4,5	**-0,5**	***Low pivot***
15	3,9	3,9		*Low caps*
16	3,0	3,0		
17	3,0	3,0		
18	2,9	2,9		
19	2,9	2,9		
20	2,9	2,9		
21	2,6	2,6		
	100,0	98,6	**1,4**	***Fixing weight***
		40,1	***Sum of high caps and low caps***	

Figure 2: Getting fixing weight for a set of pivots

Once obtained, the fixing weight is allocated to the high and low caps proportionally to their respective weights. In some cases it may happen that no low caps or no high caps exist, but there must be at least one of them if the fixing weight is not 0.

ID	Orig.	Fixed	Allocated
1	12,0	9,0	9,0
2	8,7	9,0	9,0
3	8,6	8,6	8,9
4	5,5	5,5	5,7
5	4,8	4,8	5,0
6	4,7	4,5	4,5
7	4,7	4,5	4,5
8	4,5	4,5	4,5
9	4,4	4,5	4,5
10	4,3	4,5	4,5
11	4,3	4,5	4,5
12	4,2	4,5	4,5
13	4,1	4,5	4,5
14	4,0	4,5	4,5
15	3,9	3,9	4,0
16	3,0	3,0	3,1
17	3,0	3,0	3,1
18	2,9	2,9	3,0
19	2,9	2,9	3,0
20	2,9	2,9	3,0
21	2,6	2,6	2,7
	100,0	98,6	100,0

Figure 3: allocating fixing weight

The weights are changed without regard to the CCL limit. The factor is computed by the ratio between the fixing weight and the sum of low and high caps. In our example, the factor will be 1+(fixing weight / sum variable caps) → 1+(1.4/40.1)=1.03

When allocating or removing weight, none of the pivots are moved. That is to say: if a factor (positive or negative) brings a group entity to the CT or ICL value, the result is abandoned and the next pivots iteration is explored.

Bringing a group entity to the same value as a pivot (CT or ICL) will be equivalent to exploring another pivot combination. This is performed in any event because the process iterates through all possible pivot positions.

CCL over weight set and allocation

Then the CCL is calculated and checked for compliance (in our example, it must not exceed 36%). Note also that in our example the area weight has been reduced by the fixing weight step, but is still above 36%, so it must be corrected here. The CCL overweight must be removed proportionally from the high caps and allocated to the low caps.

ID	Orig.	Fixed	Allocated	
1	12,0	9,0	9,0	
2	8,7	9,0	9,0	
3	8,6	8,6	8,9	**37,6** *sum CCL*
4	5,5	5,5	5,7	***19,6*** *sum high caps*
5	4,8	4,8	5,0	
6	4,7	4,5	4,5	
7	4,7	4,5	4,5	
8	4,5	4,5	4,5	
9	4,4	4,5	4,5	
10	4,3	4,5	4,5	
11	4,3	4,5	4,5	
12	4,2	4,5	4,5	
13	4,1	4,5	4,5	
14	4,0	4,5	4,5	
15	3,9	3,9	4,0	
16	3,0	3,0	3,1	
17	3,0	3,0	3,1	
18	2,9	2,9	3,0	***21,9*** *sum low caps*
19	2,9	2,9	3,0	
20	2,9	2,9	3,0	
21	2,6	2,6	2,7	
	100,0	98,6	100,0	***1,6*** *area over weight*
				0,92 *High caps factor*
				1,07 *Low caps factor*

Figure 4: Checking and allocating CCL over weight

As the sums of variable high and low caps are not identical, two distinct factors have to be computed, one to reduce the high variable caps and one to increase the low ones. In order to compute these two factors, there must be at least one high and one low cap. In other words, if any of the two variable caps areas is equal to 0, the solution is abandoned and the next pivots iteration is explored.

The large caps factor is computed by the ratio of the area over/under weight over the sum of high caps. In the above example the factor will be 1-(area over weight / sum high caps) → 1-(1.6/19.6)=0.92

The small caps factor is computed by the ratio of the area over/under weight over the sum of low caps. In the above example the factor will be 1+(area over weight / sum low caps) → 1+(1.6/21.9)=1.07

ID	*Orig.*	*Fixed*	*Allocated*	Final result	
1	12,0	9,0	9,0	9,0	
2	8,7	9,0	9,0	9,0	
3	8,6	8,6	8,9	8,2	**36,0**
4	5,5	5,5	5,7	5,2	
5	4,8	4,8	5,0	4,6	
6	4,7	4,5	4,5	4,5	
7	4,7	4,5	4,5	4,5	
8	4,5	4,5	4,5	4,5	
9	4,4	4,5	4,5	4,5	
10	4,3	4,5	4,5	4,5	
11	4,3	4,5	4,5	4,5	
12	4,2	4,5	4,5	4,5	
13	4,1	4,5	4,5	4,5	
14	4,0	4,5	4,5	4,5	
15	3,9	3,9	4,0	4,3	
16	3,0	3,0	3,1	3,3	
17	3,0	3,0	3,1	3,3	
18	2,9	2,9	3,0	3,2	
19	2,9	2,9	3,0	3,2	
20	2,9	2,9	3,0	3,2	
21	2,6	2,6	2,7	2,9	
	100,0	98,6	100,0	100,0	

Figure 5: Reallocating CCL overweight

Check constraints and quality

The result is then tested for ordering (i.e., none of the group entities has crossed a rank) and for constraint breaches. It is rejected if it is not compliant, otherwise it is compared to the previous result and the best one is kept based on the quality criteria as explained in Appendix I.

APPENDIX III: GENERAL FORMULA FOR WEIGHT CALCULATION

A *constrained* index can be defined based on a *parent* index as long as they share the list of constituents.

The weight of a security *s* in the parent index at a time *t* will become the unconstraint weight $uw_{s,t}$:

$$uw_{s,t} = \frac{MC_{s,t}}{\sum_i MC_{i,t}} \quad s \in Index, i \in Index$$

where $MC_{s,t}$ = market capitalization of security *s* at time *t*.

We can define a constraint weight $cw_{s,t}$ for a security *s* at a time *t* with the help of a constraint factor:

$$cw_{s,t} = \frac{uw_{s,t} \times Factor_{s,t}}{\sum_i (uw_{i,t} \times Factor_{i,t})} \quad s \in Index, i \in Index$$

Constraint factor calculation for the 10/40 Indexes

In the case of the 10/40 Indexes, each group entity, and thus the securities composing this group entity, will be assigned a constraint factor whenever the 10/40 index is rebalanced to its parent index, i.e. at every Quarterly Index Review. This factor will remain constant between rebalancings to the parent index for a particular group entity, unless one or more securities of the group entity is involved in a corporate event. In this last situation, a specific rule for corporate events will be applied to calculate the new factor for the securities involved in the event. This allows MSCI to compute the new weights of the securities in the 10/40 index and to include them without rebalancing the whole 10/40 index. If the 10/40 constraints are breached, it will trigger the rebalancing relative to the existing constituents' weights. If the rule is not applicable, i.e. in the case of an IPO, then the factor cannot be calculated and the rebalancing to the parent index is triggered.

Constraint factor at rebalancing time

The constraint factor for a security *s* at a rebalancing time *r* is defined as follows:

$$Factor_{s,r} = \frac{AW(GE, r)}{\sum_g uw_{g,r}} \quad s \in GE, g \in GE$$

where AW = the assigned weight (fixed) to the Group Entity (GE) at rebalancing time *r*

and $uw_{s,r}$ = uncapped opening weight of security *s* at time *r*.

Constraint factor between rebalancings

Without corporate event

If no corporate event involved a security *s*, its factor will remain constant between rebalancings.

The constraint factor for a security *s* at a time *t*, if *t* is not a rebalancing time, is defined as:

$$Factor_{s,t} = Factor_{s,t-1}$$

With corporate event

We can define the corporate event CE as a transformation from one security set to another, from a time t-1 to a time t:

$$\begin{Bmatrix} a_1 \\ a_2 \\ \vdots \\ a_m \end{Bmatrix} \overset{CE}{\rightarrow} \begin{Bmatrix} b_1 \\ b_2 \\ \vdots \\ b_n \end{Bmatrix} \qquad m \geq 0, n \geq 0$$

$$A \overset{CE}{\rightarrow} B \qquad\qquad a \in A, b \in B$$

We can have, for example, a corporate event where a company a1 and a company a2 merge into a company b.

Consequently, companies a1 and a2 will be deleted from the Parent Index as well as from the 10/40 Index and company b will have to be assigned a constraint weight in the 10/40 Index.

We define the constraint factor for security b at a time t, $b \in B$ and $b \in Index$, as:

$$Factor_{b,t} = \frac{\sum_{k=1}^{m} Factor_{a_k,t-1} \times MC_{a_k,t-1} \times IF_{a_k,t-1}}{\sum_{k=1}^{m} MC_{a_k,t-1} \times IF_{a_k,t-1}} \qquad a_k \in A, a_k \in Index\ at\ time\ t-1$$

where $MC_{s,t}$= market capitalization of security *s* at time *t*

and $IF_{s,t}$ = Inclusion Factor of the security *s* in the Index at *t* in order to adjust the market capitalization to the free-float of the security.

This formula can also be expressed as:

$$Factor_{b,t} = \frac{\sum_{k=1}^{m} Factor_{a_k,t-1} \times ucw_{a_k,t-1}}{\sum_{k=1}^{m} ucw_{a_k,t-1}} \qquad a_k \in A, a_k \in Index\ at\ time\ t-1$$

where $ucw_{s,t}$= uncapped closing weight of the security *s* in the Index at time *t*.

The following sections have been modified since Feb 2013:

Section 1: Introduction to the MSCI 10/40 Indexes

- Updates to the description

The following sections have been modified since Sep 2017:

Section 3.3.1: Quarterly Index Reviews

- Change of rebalancing notification from five days to nine days

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