

MSCI MOMENTUM INDEXES METHODOLOGY

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Contents

1 Introduction..... 3

2 Index Construction Methodology..... 4

 2.1 Applicable Universe..... 4

 2.2 Determination of Momentum Score..... 4

 2.2.1 Risk-adjusted Momentum Value4

 2.2.2 Calculating the Momentum Score5

 2.3 Security Selection..... 5

 2.4 Weighting Scheme 6

3 Maintaining MSCI Momentum Indexes..... 7

 3.1 Semi-Annual Index Reviews 7

 3.1.1 Buffer Rules:7

 3.2 Ongoing Event Related changes 7

Appendix I: Rules To Determine Fixed Number of Securities at Initial Construction and in Ongoing Rebalancing..... 10

Appendix II: Issuer Weight Capping..... 12

Appendix III: Conditional Rebalancing 13

Appendix IV: Short-Term Rates..... 14

Appendix V: Constructing the MSCI Momentum Tilt Index 17

1 Introduction

The MSCI Momentum Indexes aim to reflect the performance of an Equity Momentum strategy. High Momentum companies are characterized in the literature as companies with high price performance in the recent history, up to 12-months. High Momentum companies tend to continue their high price performance over the near term, typically over a 6-12-month period. Many active equity strategies emphasize Momentum factor as an important factor in security selection and portfolio construction.

MSCI categorizes the MSCI Momentum Indexes as part of the family of MSCI Factor Indexes (Risk Premia), which reflect the systematic elements of particular investment styles or strategies. While capitalization weighted indexes represent the broad market beta, investors increasingly recognize that there are additional sources of systematic return associated with particular investment styles and strategies, such as value, momentum, volatility, quality etc. that could be represented through alternatively weighted indexes. The Momentum factor is complementary to other systematic factors such as Size, Value and Low Volatility and may provide diversification to a factor portfolio.

The MSCI Momentum Indexes aim to reflect the performance of the Momentum factor with a simple and transparent methodology while maintaining reasonably high investment capacity and liquidity of constituent companies, with moderate Index turnover.

The potential applications of the MSCI Momentum Indexes for institutional investors include:

- Strategic asset allocation: seeking equity market exposure to the Momentum factor
- Portfolio diversification: combined with other systematic factors
- Investment research: tools to study the characteristics of Momentum strategies

The MSCI Momentum Indexes are constructed by selecting a set number of securities from the Parent Index (defined below) with the highest Momentum Scores (defined in section 2). The market capitalization of securities is then weighted based on the Momentum Score.

The MSCI Momentum Tilt Indexes are constructed by including all the constituents in the Parent Index and applying Momentum tilt on the market capitalization weights of securities. Please refer to Appendix V for further details on the methodology of MSCI Momentum Tilt Indexes.

2 Constructing MSCI Emerging + Frontier Markets Workforce Index

2.1 APPLICABLE UNIVERSE

The applicable universe includes all the existing constituents of an underlying MSCI Parent Index (herein, a “Parent Index”). This approach aims to provide an opportunity set with sufficient liquidity and capacity. The relevant Parent Index would be any country or regional MSCI Index.

2.2 DETERMINATION OF MOMENTUM SCORE

The Momentum value for each security is calculated by combining recent 12-month and 6-month local price performance of the security.

$$6\text{-month Price Momentum} = ((P_{T-1} / P_{T-7}) - 1) - (\text{Local Risk-free rate})$$

$$12\text{-month Price Momentum} = ((P_{T-1} / P_{T-13}) - 1) - (\text{Local Risk-free rate})$$

Where, P_{T-1} = Security Local Price one month prior to the rebalancing date (T)

P_{T-7} = Security Local Price seven months prior to the rebalancing date (T)

P_{T-13} = Security Local Price thirteen months prior to the rebalancing date (T)

The price performance is computed excluding recent 1-month. If 12-month Price Momentum is missing, only 6-month Price Momentum is used for computation of Momentum value. Momentum value is not computed if 6-month Price Momentum is not available. In the absence of Momentum value, security is not considered for inclusion in the MSCI Momentum Index.

Local risk-free rates are the short-term rates in local currency of the country. The details of the same are provided in Appendix IV.

2.2.1 RISK-ADJUSTED MOMENTUM VALUE

A Momentum value computed above is further adjusted with corresponding volatility of the security.

$$\text{Risk-adjusted Price Momentum}_i = \text{Price Momentum}_i / \sigma_i$$

Where σ_i = Annualized Standard Deviation of weekly local price returns over the period of 3 years

2.2.2 CALCULATING THE MOMENTUM SCORE

Risk-adjusted Price Momentum (for the 6-month horizon and 12-month horizon) computed above are standardized into z-scores. The z-scores are combined in equal proportion and standardized to arrive at a single Momentum combined score (C).

$$C = 6\text{-month Momentum Z-score} * 0.5 + 12\text{-month Momentum Z-score} * 0.5$$

The single Momentum combined score (C) computed above is then standardized by calculating the z-scores to compute the standardized momentum Z-score(Z).

Momentum Z-score is then winsorized at +/- 3 i.e. the Z-scores above 3 are capped at 3 and Z-scores below -3 are capped at -3.

The Momentum Score is then computed from the Momentum Z-Score as follows:

$$\text{Momentum Score} = \begin{cases} 1 + Z, & Z > 0 \\ (1 - Z)^{-1}, & Z < 0 \end{cases}$$

2.3 SECURITY SELECTION

The MSCI Momentum Indexes are constructed with a fixed number of securities approach. All the existing constituents of the relevant Parent Index are ranked in the descending order of their unwinsorized Momentum Z-score. If multiple securities have the same unwinsorized Momentum Z-score, then the security having a higher weight in the Parent Index is given a higher rank. A fixed number of securities with the highest positive Momentum Z-scores are predetermined for every MSCI Momentum Index at initial construction with an aim to attain a high exposure to the Momentum factor while maintaining sufficient index market capitalization and number of securities coverage. Rules for arriving at a fixed number of constituents at initial construction are explained in Appendix I. The fixed number for security selection determined at initial construction is evaluated at every Semi-Annual Index Review (SAIR) to ensure that the Momentum universe has sufficient index market capitalization coverage. Rules for evaluating the fixed number of constituents at every SAIR are explained in Appendix I.

2.4 WEIGHTING SCHEME

For a given rebalancing effective date, all the securities eligible for inclusion in the MSCI Momentum Indexes are weighted by the product of their market capitalization weight in the Parent Index and the Momentum Score computed in Sect. 2.2.2 above.

*Momentum Weight = Momentum Score * Market Capitalization Weight in the Parent Index*

The above weights are then normalized to 100%. The final security level inclusion factor is determined as the ratio of the final security level weight and the security level pro forma market capitalization weight in the relevant Parent Index. To mitigate the impact of stock-specific risk, the issuer weight will be capped at a specific level as described in Appendix II.

3 Maintaining the Index

3.1 ANNUAL INDEX REVIEW:

The MSCI Momentum Indexes are rebalanced on a semi-annual basis, usually as of the close of the last business day of May and November, coinciding with the May and November Semi-Annual Index Review (SAIR) of the MSCI Global Investable Market Indexes.

In addition to the two Semi-Annual Index Reviews in May and November, MSCI Momentum Indexes undergo ad-hoc rebalancing subject to meeting certain trigger criteria. The details of the ad-hoc rebalancing are provided in Appendix III. The trigger condition for ad-hoc rebalancing is checked every month as detailed in Appendix III.

The pro forma MSCI Momentum Indexes are in general announced nine business days before the effective date.

3.1.1 BUFFER RULES

To reduce Index turnover and enhance Index stability, buffer rules are applied at 50% of the fixed number of securities in the MSCI Momentum Indexes.

For example, the MSCI ACWI Momentum Index targets 500 securities and the buffers are applied between rank 251 and 750. The securities in the Parent Index with a Momentum rank at or above 250 will be added to the MSCI ACWI Momentum Index on a priority basis. The existing constituents that have a Momentum rank between 251 and 750 are then successively added until the number of securities in the MSCI ACWI Momentum Index reaches 500. If the number of securities is below 500 after this step, the remaining securities in the Parent Index with the highest Momentum rank are added until the number of securities in the MSCI ACWI Momentum Index reaches 500.

3.2 ONGOING EVENT RELATED CHANGES

The general treatment of corporate events in the MSCI Momentum Indexes aims to minimize turnover outside of Index Reviews. The methodology aims to appropriately represent an investor's participation in an event based on relevant deal terms and pre-event weighting of the index constituents that are involved. Further, changes in index market capitalization that occur as a result of corporate event implementation will be offset by a corresponding change in the Variable Weighting Factor (VWF) of the constituent.

Additionally, if the frequency of Index Reviews in the Parent Index is greater than the frequency of Index Reviews in the MSCI Momentum Index, the changes made to the Parent Index during intermediate Index Reviews will be neutralized in the MSCI Momentum Index.

The following section briefly describes the treatment of common corporate events within the MSCI Momentum Indexes.

No new securities will be added (except where noted below) to the Index between Index Reviews. Parent Index deletions will be reflected simultaneously.

EVENT TYPE	EVENT DETAILS
New additions to the Parent Index	A new security added to the parent index (such as IPO and other early inclusions) will not be added to the index.
Spin-Offs	All securities created as a result of the spin-off of an existing Index constituent will be added to the Index at the time of event implementation. Reevaluation for continued inclusion in the Index will occur at the subsequent Index Review.
Merger/Acquisition	For Mergers and Acquisitions, the acquirer's post event weight will account for the proportionate amount of shares involved in deal consideration, while cash proceeds will be invested across the Index. If an existing Index constituent is acquired by a non-Index constituent, the existing constituent will be deleted from the Index and the acquiring non-constituent will not be added to the Index.
Changes in Security Characteristics	A security will continue to be an Index constituent if there are changes in characteristics (country, sector, size

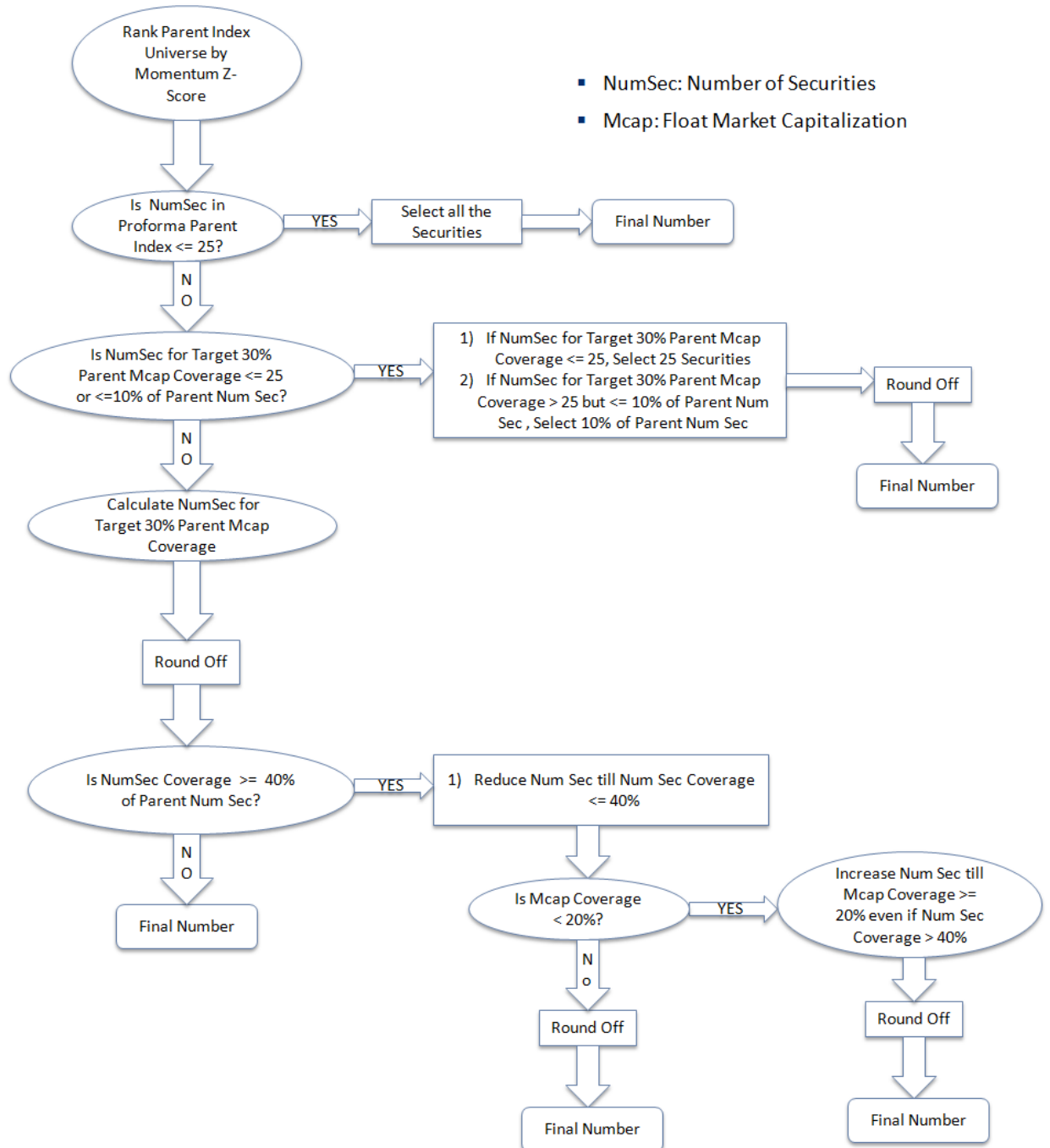
segment, etc.) Reevaluation for continued inclusion in the Index will occur at the subsequent Index Review.

Further detail and illustration regarding specific treatment of corporate events relevant to this Index can be found in the MSCI Corporate Events Methodology book under the sections detailing the treatment of events in Capped Weighted and Non-Market Capitalization Weighted indexes.

The MSCI Corporate Events methodology book is available at:
<https://www.msci.com/index-methodology>

Appendix I: Rules to Determine Fixed Number of Securities at Initial Construction and in Ongoing Rebalancing

Algorithm to Determine Fixed Number of Securities at Initial Construction

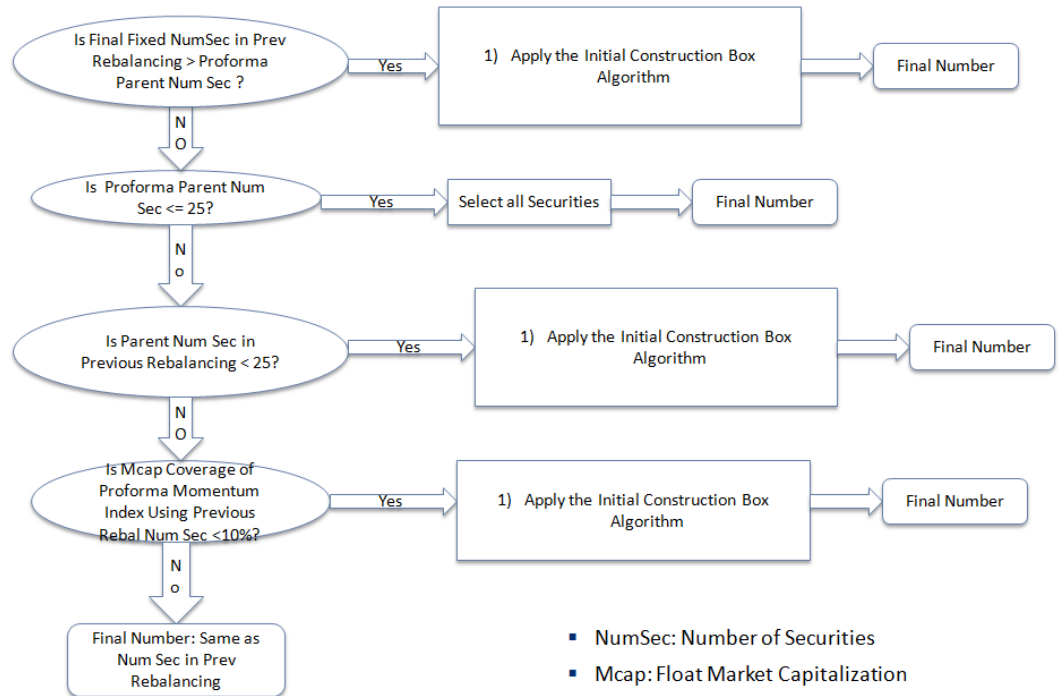


Rounding Off Rules:

Upward rounding off is done depending on NumSec Obtained in the Previous Box Step

- If NumSec in Previous Step < 100, Nearest Rounding = 10 Securities
- If NumSec in Previous Step >= 100 but < 300, Nearest Rounding = 25 Securities
- If NumSec in Previous Step >= 300, Nearest Rounding = 50 Securities

Algorithm to reevaluate Fixed Number of Securities at Semi Annual Rebalancing



Appendix II: Issuer Weight Capping

For Broad Regional/Country Indexes issuer weight is capped at 5%. For other narrow Country/Regional Indexes issuer weight is capped at maximum issuer weight in the Parent Index.

Narrow Country/Regional Index is defined as an index for which maximum market cap weight in the Parent Index is greater than 10%.

For the following broad regional Momentum Indexes, the issuer weight is capped at 5%:

1. MSCI ACWI Momentum Index
2. MSCI USA Momentum Index

Appendix III: Conditional Rebalancing

In order to mitigate drawdown during periods characterized by spikes in market volatility, MSCI Momentum Indexes are rebalanced on an ad-hoc basis in addition to the two scheduled Semi-Annual Index Reviews in May and November, subject to meeting certain trigger criteria that are described below. The steps for triggering ad-hoc rebalancing are described as follows:

1. At every T-9 date (where T is a month-end date), annualized volatility of the Parent Index (V_t) is computed. The annualized volatility is computed using trailing 3-months daily returns of the index as of month-end date of the previous month.

Annualized Volatility $V_t = \sqrt{250} * (\text{standard deviation of daily returns over trailing 3 months})$

2. The monthly change in volatility is computed as

$$\delta = (V_t / V_{t-1}) - 1$$

where V_{t-1} = Annualized Volatility computed at T-9 of previous month

3. If $\delta > \text{Threshold}$, ad-hoc rebalancing is triggered in that month at T-9 date.

4. Threshold is defined as,

Threshold = 95th percentile of monthly changes in volatility over available history of the Reference Index

- Reference Index for MSCI Momentum Indexes based on countries/regions categorized under Developed Markets is MSCI World Index.
- Reference Index for MSCI Momentum Indexes based on countries/regions categorized under Emerging Markets is MSCI Emerging Markets Index
- Reference Index for MSCI ACWI Momentum Index is MSCI World Index

As the ad-hoc rebalancing is triggered due to recent changes in Momentum, only 6-month Price Momentum value is used to compute Momentum score at the ad-hoc rebalancing date, instead of the combination of 6-month and 12-month Price Momentum that is used in SAIR as described in Section 2.

Appendix IV: Short-Term Rates

Country	Short Term Rate Description
AUSTRALIA	AUD Target Cash Rate from Reserve Bank of Australia
AUSTRIA	Euribor 3 Month*
BELGIUM	Euribor 3 Month*
BRAZIL	Savings Rate, 1 Month
CANADA	Canadian Dollar 3 Month Bank Bill (Yield Curve Constituent)
CHILE	Deposit Rate, 3 Month
CHINA	Shanghai Interbank Offered Rate 3M
COLOMBIA	Deposit Rate
CZECH REPUBLIC	Czech Krona 3 Month Pribor rate
DENMARK	Danish Krone 3 Month Deposit
EGYPT	Discount Rate
EMU	Euribor 3 Month*
FINLAND	Euribor 3 Month*
FRANCE	Euribor 3 Month*
GERMANY	Euribor 3 Month*
GREECE	Euribor 3 Month*
HONG KONG	Hong Kong Dollar 3 Month HIBOR rate
HUNGARY	Hungarian Forint 3 Month Bubor rate
INDIA	Indian Rupee 3 Month NSE MIBOR rate
INDONESIA	Indonesian Rupiah 1 Month JIBOR rate
IRELAND	Euribor 3 Month*
ISRAEL	Israeli Shekel 3 Month Telbor rate

* Prior to August 2021 Quarterly Index Review, MSCI Momentum Indexes will use 3 Month Euro LIBOR, 3 Month CHF LIBOR and 3 Month GBP LIBOR instead of 3 Month Euribor, Overnight SARON and Overnight SONIA respectively

Country	Short Term Rate Description
ITALY	Euribor 3 Month*
JAPAN	Japanese Yen 1 Month TIBOR, EUROYEN Deposits rate
KOREA	Yield on stabilization bond based on Korea Securities Dealers Association
MALAYSIA	Malaysian Ringgit 3 Month KLIBOR rate
MEXICO	Treasury Bills, 1 Month
MOROCCO	Money Market Rate
NETHERLANDS	Euribor 3 Month*
NEW ZEALAND	Treasury Bills, 1 Month
NORWAY	Norwegian Prime Lending & Deposit rate
PAKISTAN	Money Market Rate
PERU	Discount Rate
PHILIPPINES	Treasury Bills rate
POLAND	Polish Zloty Forward Rate Agreement (FRA) 3 month
PORTUGAL	Euribor 3 Month*
RUSSIA	Discount Rate, 3 Month
SINGAPORE	Singapore Dollar 1 Month SIBOR rate
SAUDI ARABIA	Saudi Arabian Riyal 3 Month Deposit rate
SOUTH AFRICA	South African Rand 3 Month Jibar rate
SPAIN	Euribor 3 Month*
SWEDEN	Swedish 3 Month Stibor rate
SWITZERLAND	Overnight SARON*
TAIWAN	Taiwan Dollar 1 Year Deposit rate
THAILAND	Thai Baht 3 Month BKIBOR rate

* Prior to August 2021 Quarterly Index Review, MSCI Momentum Indexes will use 3 Month Euro LIBOR, 3 Month CHF LIBOR and 3 Month GBP LIBOR instead of 3 Month Euribor, Overnight SARON and Overnight SONIA respectively

Country	Short Term Rate Description
TURKEY	Turkish Lira 3 Month Tryibor rate
UNITED ARAB ESTIMATES	UAE Dirham 1 Month Aeibor rate
UNITED KINGDOM	Overnight SONIA*
USA	3-month T-Bill rate

* Prior to August 2021 Quarterly Index Review, MSCI Momentum Indexes will use 3 Month Euro LIBOR, 3 Month CHF LIBOR and 3 Month GBP LIBOR instead of 3 Month Euribor, Overnight SARON and Overnight SONIA respectively

Appendix V: Constructing the MSCI Momentum Tilt Index

The MSCI Momentum Tilt Indexes aim to reflect the performance of a Momentum strategy with high investment capacity. The MSCI Momentum Tilt Indexes are created by including all the constituents in the Parent Index and tilting the market capitalization weights of securities, based on Momentum Score. By comparison, the MSCI Momentum Indexes are constructed by selecting a set number of securities from the Parent Index with an aim to emphasize the Momentum factor.

The MSCI Momentum Tilt Index includes all the existing constituents of the Parent Index for which Momentum Scores are available. Please refer to section 2.2 for further details on Momentum Score computation. The MSCI Momentum Tilt Index follows the same weighting scheme as the MSCI Momentum Index. Please refer to section 2.4 for further details on weighting scheme. The MSCI Momentum Tilt Index follows the same rebalancing schedule and corporate events treatment as the MSCI Momentum Index and as described in section 3

Methodology Book Tracked Changes

The following sections have been updated since March 2013:

- Update of introduction to MSCI Momentum Indexes to include introduction to MSCI Momentum Tilt Indexes
- Addition of appendix V containing the methodology details of MSCI Momentum Tilt Indexes

The following sections have been modified since June 2014:

- Description of the treatment applied to spun-off securities in Appendix IV: Corporate Events Treatment

The following sections have been modified since September 2014:

Clarification on the calculation of Momentum Z-score in Section 2.2.2

- Updates to the Short-Term rates and description in Appendix IV: Short-Term Rates

The following sections have been modified since May 2017:

- Appendix IV in the previous version of the methodology book describing the Corporate Events treatment has been deleted. The details on the Corporate Events treatment are now included in Section 3.2.

The following sections have been modified effective August 2021:

- The methodology book has been updated to reflect the transition to short-term rates from LIBOR.

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