MSCI MOMENTUM INDEXES METHODOLOGY

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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 VI for further details on the methodology of MSCI Momentum Tilt Indexes.

2   INDEX CONSTRUCTION METHODOLOGY

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-month Price Momentum = ((P_{T-1}/P_{T-7})-1) – (Local Risk-free rate)

12-month Price Momentum = ((P_{T-1}/P_{T-13})-1) - (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, typically the 3M LIBOR rate or short-term deposit rate. The details of the same are provided in Appendix V.

2.2.1   RISK-ADJUSTED MOMENTUM VALUE

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

Risk-adjusted Price Momentum$_i$ = Price Momentum$_i$ / σ_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-month Momentum Z-score*0.5 + 12-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:

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

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 MSCI MOMENTUM INDEXES

3.1 SEMI-ANNUAL INDEX REVIEWS

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

In general, the MSCI Momentum Indexes follow the event maintenance of the Parent Index.

3.2.1 IPOS AND OTHER EARLY INCLUSIONS

IPOs and other newly listed securities will only be considered for inclusion at the next MSCI Index review in the MSCI Momentum Index, even if they qualify for early inclusion in the Parent Index.

3.2.2 ADDITIONS AND DELETIONS DUE TO CORPORATE EVENTS

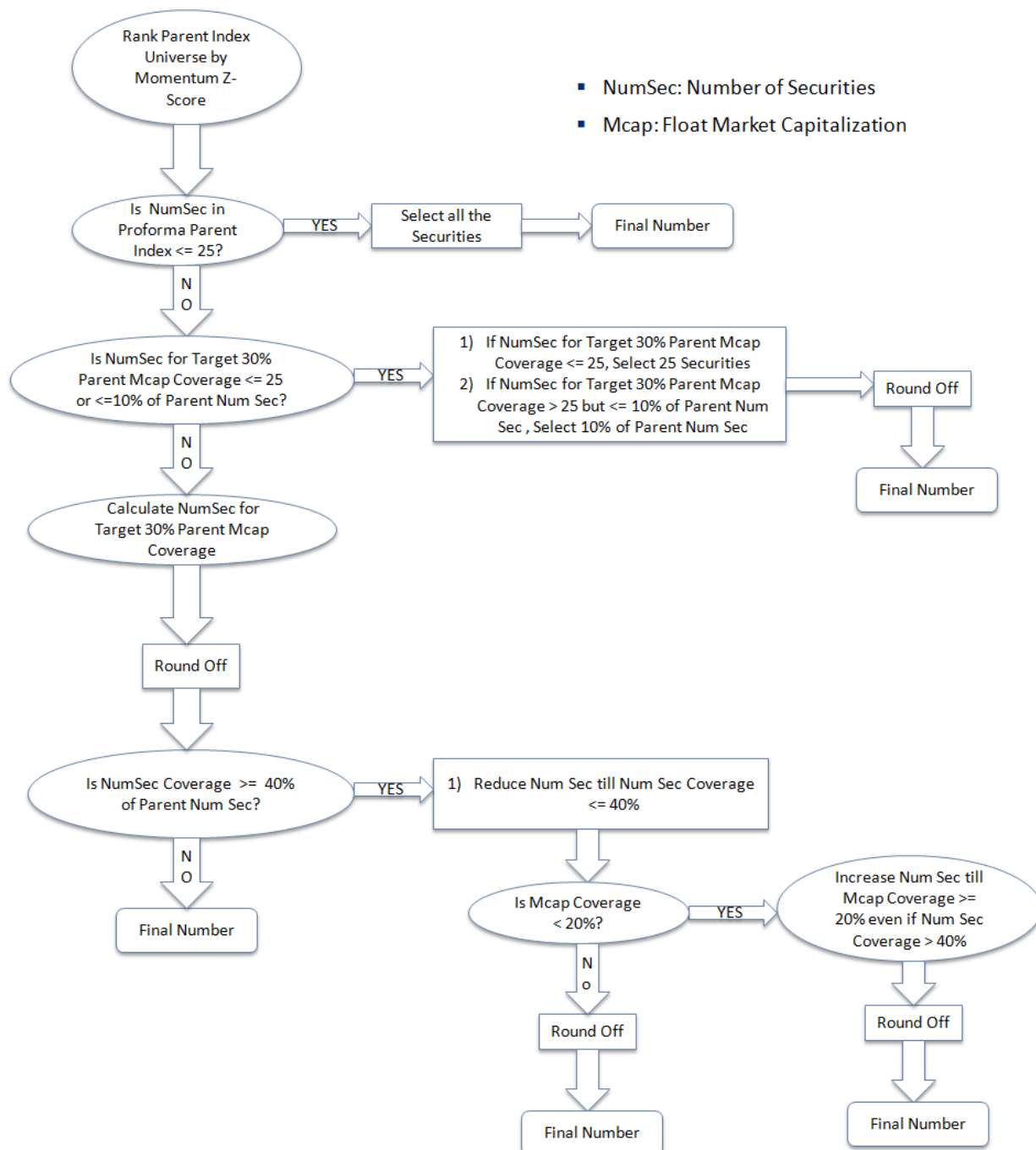The general treatment of additions and deletions due to corporate events aims at minimizing the turnover in the MSCI Momentum Indexes. A constituent deleted from Parent Index following a corporate event or during the Quarterly Index Review of the Parent Index will be simultaneously deleted from the MSCI Momentum Index.

Please refer to Appendix IV for more details on the treatment of corporate events.

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

- NumSec: Number of Securities
- Mcap: Float Market Capitalization

Rank Parent Index Universe by Momentum Z-Score

Is NumSec in Proforma Parent Index <= 25?

YES → Select all the Securities → Final Number

NO

Is NumSec for Target 30% Parent Mcap Coverage <= 25 or <=10% of Parent Num Sec?

YES →
1) If NumSec for Target 30% Parent Mcap Coverage <= 25, Select 25 Securities
2) If NumSec for Target 30% Parent Mcap Coverage > 25 but <= 10% of Parent Num Sec , Select 10% of Parent Num Sec
→ Round Off → Final Number

NO

Calculate NumSec for Target 30% Parent Mcap Coverage

Round Off

Is NumSec Coverage >= 40% of Parent Num Sec?

YES →
1) Reduce Num Sec till Num Sec Coverage <= 40%

Is Mcap Coverage < 20%?

YES → Increase Num Sec till Mcap Coverage >= 20% even if Num Sec Coverage > 40% → Round Off → Final Number

No → Round Off → Final Number

NO → Final Number

**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

- NumSec: Number of Securities
- Mcap: Float Market Capitalization
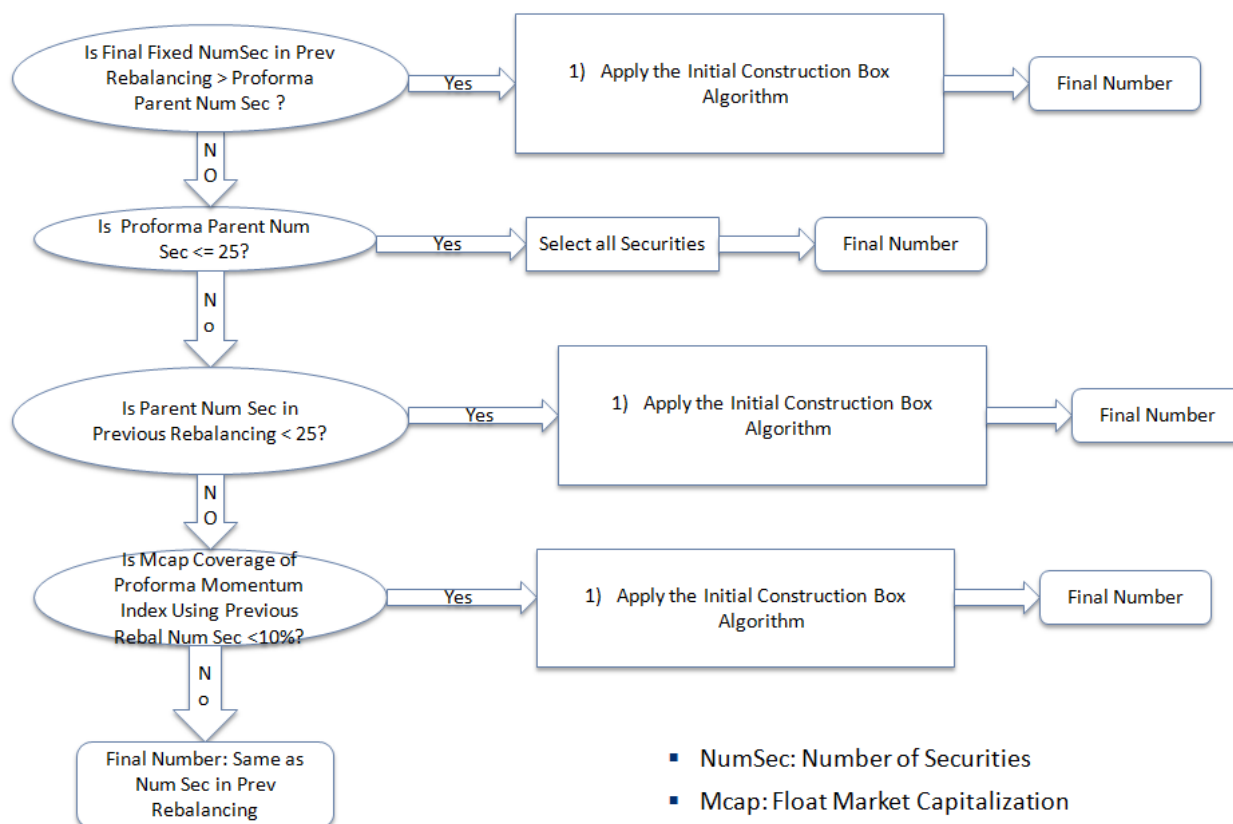
APPENDIX II: ISSUER WEIGHT CAPPING

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 = √250 * (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 δ > 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: CORPORATE EVENTS TREATMENT

This appendix describes the treatment of the most common corporate events in the MSCI Indexes. Details regarding the treatment of all other corporate events not covered in this appendix can be found in the MSCI Corporate Events Methodology book, available at

https://www.msci.com/index-methodology

Event Type	Event details	Action
Acquisition	Momentum Index constituent acquires another Momentum Index constituent	Maintain acquiring company and remove acquired company
	Momentum Index constituent acquires non Momentum Index constituent	Maintain acquiring company
	Non Momentum Index constituent acquires Momentum Index constituent	Remove acquired company without adding acquiring company
Merger	Momentum Index constituent merges with Momentum Index constituent	Add new company with a constraint factor that is the weighted average of the two constituents
	Momentum Index constituent merges with non Momentum Index constituent	Add new company if MSCI links its price history to the Momentum Index constituent. New company not added if price history is linked to the non Momentum Index constituent
IPO	IPO added to Parent Index	Security will be considered for inclusion in the Momentum Index at the next Semi-Annual Index Review
Spin-off	Momentum Index constituent spins off security	Add spun-off security if it is in parent index
Conversion	Security A converted to B, A deleted from Parent Index, B added	B will not be added to the Momentum Index
Country Reclassification	Domicile of company reviewed: Security A deleted from country A, security B added to country B	B will not be added to the Momentum Index
Stock exchange reclassification	Stock exchange (price source) of company reviewed: Security A deleted, security B added	B will not be added to the Momentum Index
Other Events	Changes in number of shares and	No change in Constraint Factor

Event Type	Event details	Action
Resulting in Changes in Number of Shares and Foreign Inclusion Factors (FIF)	subsequent FIF resulting from other events such as share placements and offerings, and debt-to-equity-swaps	

APPENDIX V: SHORT-TERM RATES

Country	Short Term Rate Description
AUSTRALIA	AUD Target Cash Rate from Reserve Bank of Australia
AUSTRIA	Euro 3 Month Libor rate
BELGIUM	Euro 3 Month Libor rate
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	Czeck Krona 3 Month Pribor rate
DENMARK	Danish Krone 3 Month Deposit
EGYPT	Discount Rate
EMU	Euro 3 Month Libor rate
FINLAND	Euro 3 Month Libor rate
FRANCE	Euro 3 Month Libor rate
GERMANY	Euro 3 Month Libor rate
GREECE	Euro 3 Month Libor rate
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	Euro 3 Month Libor rate
ISRAEL	Israeli Shekel 3 Month Telbor rate
ITALY	Euro 3 Month Libor rate
JAPAN	Japanese Yen 1 Month TIBOR, EUROYEN Deposits rate

Country	Short Term Rate Description
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	Euro 3 Month Libor rate
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	Euro 3 Month Libor rate
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	Euro 3 Month Libor rate
SWEDEN	Swedish 3 Month Stibor rate
SWITZERLAND	Swiss Franc 3 Month Libor rate
TAIWAN	Taiwan Dollar 1 Year Deposit rate
THAILAND	Thai Baht 3 Month BKIBOR rate
TURKEY	Turkish Lira 3 Month Tryibor rate
UNITED ARAB ESTIMATES	UAE Dirham 1 Month Aeibor rate
UNITED KINGDOM	Great Britain Pound 3 Month Libor rate
USA	3-month T-Bill rate

APPENDIX VI: 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.

The following sections have been updated since March 2013:

Section 1: Introduction

- Update of introduction to MSCI Momentum Indexes to include introduction to MSCI Momentum Tilt Indexes

Appendix VI: Constructing the MSCI Momentum Tilt Indexes

- Addition of appendix VI containing the methodology details of MSCI Momentum Tilt Indexes

The following sections have been modified since June 2014:

Appendix IV: Corporate Events Treatment

- Description of the treatment applied to spun-off securities

The following sections have been modified since September 2014:

Section 2.2.2: Calculating the Momentum Score

Clarification on the calculation of Momentum Z-score

Appendix V: Short-Term Rates

- Updates to the Short-Term rates and description

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