MSCI RISK WEIGHTED INDEXES METHODOLOGY

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1 INTRODUCTION

This methodology book provides an exhaustive description of the rules and guidelines followed by MSCI for construction and maintenance of the MSCI Risk Weighted Indexes. Any exceptions to these rules are reviewed and approved by the MSCI Equity Index Committee and are publically announced in advance of the implementation.

While standard MSCI market cap indexes reflect the aggregate holdings of all investors and represent the market return (equity factor or risk premium), many investors are now looking for access to other sources of systematic return (style and strategy factors) that can be captured through indexes with alternative weighting schemes. For some time, MSCI has been pioneering alternatively weighted indexes that provide exposure to systematic beta or that replicate simple investment strategies. In 2008, for example, MSCI introduced its Minimum Volatility indexes which were designed to reflect the performance characteristics of a minimum variance strategy using the Barra Global Equity Risk Model and the Barra Open Optimizer. More recently in 2010, the company introduced its Value Weighted indexes emphasizing stocks with lower valuations.

The MSCI Risk Weighted Indexes use a simple but effective and transparent process to provide passive exposure to the investable market index equity opportunity set but with lower risk than traditional cap weighted indexes. Each MSCI Risk Weighted index reweights all the constituents of a cap weighted MSCI parent index so that stocks with lower historical return variance are given higher index weights. By emphasizing low volatility stocks in this way, the MSCI Risk Weighted Indexes have historically produced higher return and lower realized volatility compared to their respective parent MSCI indexes, while maintaining reasonable liquidity and capacity. In general, MSCI Risk Weighted Indexes tend to have a bias towards stocks with lower size and lower risk. As a result, MSCI Risk Weighted Indexes provide negative exposure to two underlying systematic factors, the size factor and the volatility factor. The main potential benefits of the MSCI Risk Weighted Indexes include:

- Simple and transparent methodology to achieve lower risk
- Exposure to the entire investable market index universe, no stock selection bias
- Attractive absolute and risk adjusted historical performance
- Defensive characteristics, outperformance during recent crises
- Low concentration risk
- Moderate index turnover

The main potential applications for investors of the MSCI Risk Weighted Indexes include:

- Factor exposure: negative exposure to the size factor and the volatility factor
- Strategic asset allocation: equity market exposure with lower risk
- Tactical asset allocation: downside protection in volatile periods
- Portfolio diversification: combine with other systematic betas
- Investment research: tools to study the characteristics of low risk strategies
- Performance analysis: performance benchmarks for actively managed low risk portfolios

2 INDEX CONSTRUCTION METHODOLOGY

2.1 APPLICABLE UNIVERSE

The applicable universe includes all the existing constituents of MSCI ACWI IMI Index.

2.2 REWEIGHTING INDEX CONSTITUENTS

The MSCI Risk Weighted indexes are rebalanced at a regional level for the calculation of the security level constraint factors. The resulting indexes are then broken down further to construct regional and country sub indexes. The details of the regions are discussed in Appendix I.

All the existing constituents of the MSCI Parent Index are reweighted by their risk weights. The risk weights are derived from the respective security level price variance. The details of the re-weighting scheme are discussed in sections 2.3 and 2.4.

2.3 DETERMINATION OF RISK WEIGHTS

For a given rebalancing date, the security level price index data available until the last Friday preceding this date is used in the construction of the MSCI Risk Weighted indexes.

The security level risk weight is computed as the ratio of the inverse of the security variance to the sum of the inverse of security variance of all constituent securities in the MSCI Parent Index.

$$w_j = \frac{1/\boldsymbol{\sigma}_j^2}{\sum_1^n 1/\boldsymbol{\sigma}_j^2}$$

The security level variance ($\boldsymbol{\sigma}_j^2$), used in the above calculation, is the squared term of security level standard deviation ($\boldsymbol{\sigma}_j$) computed using weekly returns over three years prior to the rebalancing date. In case the price data are not available for a three year period, the respective country-sector average of volatility is used for that security. In the event of country-sector average being unavailable, country average volatility is used. This aims to avoid estimating risk over different volatility regimes. Security standard deviation is capped at 80% on upside and 12% on downside. Only non-zero weekly returns are considered for computation of variance to deal with stale prices due to suspensions/ market disruptions etc.

The final security level constraint factor is computed as the ratio of the final security level risk weight and security level pro forma market capitalization weight in the MSCI Parent Index.

2.4 DETERMINATION OF FINAL SECURITY LEVEL RISK WEIGHTS IN MSCI COUNTRY / REGIONAL INDEXES

The final security level risk weights in the respective MSCI Country / Regional Indexes is determined by applying the security level constraint factor derived in section 2.3 on the corresponding market cap weights in the MSCI Country / Regional indexes and renormalizing them accordingly.

3 MAINTAINING MSCI RISK WEIGHTED INDEXES

3.1 SEMI-ANNUAL INDEX REVIEWS

The MSCI Risk Weighted 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 of the MSCI Global Investable Market Indexes. The pro forma MSCI Risk Weighted Indexes are announced nine business days before the effective date.

3.2 ONGOING EVENT RELATED CHANGES

The general treatment of corporate events in the MSCI Risk Weighted 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 Risk Weighted Index, the changes made to the Parent Index during intermediate Index Reviews will be neutralized in the MSCI Risk Weighted Index.

The following section briefly describes the treatment of common corporate events within the MSCI Risk Weighted 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 be added to the index at an estimated full market capitalization adjustment factor on the date of security inclusion.
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: REGIONAL INDEXES

MSCI defines the following six regional reference risk weighted indexes which are constructed from the respective regional parent indexes using the methodology as described in this document. Any other country/regional sub indexes are then derived from the reference indexes as described below:

	MSCI Regional Risk Weighted Index	MSCI Parent index	Derived Indexes
1	MSCI AC Asia Pacific IMI Risk Weighted Index	MSCI AC Asia Pacific IMI Index	Any Asian regional/country index
2	MSCI Europe & Middle East IMI Risk Weighted Index	MSCI Europe & Middle East IMI Index	Any Europe regional/country index
3	MSCI EM EMEA IMI Risk Weighted Index	MSCI EM EMEA IMI Index	Any EMEA regional/country index
4	MSCI AC Americas IMI Risk Weighted Index	MSCI AC Americas IMI Index	Developed and Emerging Americas (e.g. USA, Canada)
5	MSCI AC Asia Pacific & Europe & Middle East IMI Risk Weighted Index	MSCI AC Asia Pacific & Europe & Middle East IMI Index	Any index that combines countries included in 1 with countries included in 2 (e.g., EAFE)
6	MSCI ACWI IMI Risk Weighted Index	MSCI ACWI IMI	Any index that combines countries included in 1,2,3 and/or 4 (e.g., World, World ex USA)

APPENDIX II: MSCI RISK WEIGHTED TOP N INDEXES

The MSCI Risk Weighted indexes reweight all the constituents of an MSCI Parent index based on their historical volatility. MSCI can also create MSCI Risk Weighted Top N indexes that select only N number of securities from the MSCI Parent index with the lowest historical volatility and apply risk weighting on these securities, where N is a parameter defining how many securities are selected for inclusion.

For the initial construction of such an index, all constituents of the MSCI Parent index are ranked based on their risk weight as defined in section 2.3 and the top N constituents based on those weights are selected for inclusion in the MSCI Risk Weighted Top N index. These N constituents are then weighted based on the risk weights to construct the MSCI Risk Weighted Top N Index.

The MSCI Risk Weighted Top N indexes are rebalanced on a semi-annual basis, coinciding with the Semi-Annual Index Reviews of the MSCI Risk Weighted Indexes (see section 3.1). At each Semi-Annual Index Review, the constituents of the MSCI Parent index are ranked based on their risk weight as defined in section 2.3 and N constituents are selected for inclusion in the MSCI Risk Weighted Top N index. In the selection process, a buffer B%, for example 20%, on the number of securities is used to reduce turnover in the MSCI Risk Weighted Top N Indexes. Securities are selected in the following order till N securities have been selected:

- First, all securities ranked from 1 to [N x (1 - B/100)]
- Second, all current constituents of the MSCI Risk Weighted Top N index ranked from to [N x (1 - B/100) + 1] to [N x (1 + B/100)]
- Third, remaining securities ranked from [N x (1 - B/100) + 1]

The pro forma MSCI Risk Weighted Top N Indexes are announced nine business days before the effective date.

The event maintenance for the MSCI Risk Weighted Top N indexes is similar to the MSCI Risk Weighted indexes (see section 3.2), with the exception of IPOs and other early inclusions which are not included in the MSCI Risk Weighted Top N indexes at the time of their inclusion in the MSCI Parent Index and are only reviewed for inclusion at the following Semi-Annual Index Review.

The following sections have been modified since June 2014:

- Appendix II 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.

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ABOUT MSCI

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Our line of products and services includes indexes, analytical models, data, real estate benchmarks and ESG research.

MSCI serves 98 of the top 100 largest money managers, according to the most recent P&I ranking.

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