

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.

$$w_j = \frac{1/\sigma_j^2}{\sum_1^n 1/\sigma_j^2}$$

The security level variance (σ_j^2), used in the above calculation, is the squared term of security level standard deviation (σ_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

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

3.2.1 IPOs AND OTHER EARLY INCLUSIONS

IPOs and other newly listed securities will be added at the time of their inclusion in the MSCI Parent Index. Their constraint factor will be computed as described in Section 2.3 using their respective country-sector or country average volatility at the time of the inclusion.

3.2.2 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 Risk Weighted Indexes.

A constituent deleted from the MSCI Parent Index following a corporate event or during the Quarterly Index Review of the Parent Index will be simultaneously deleted from the MSCI Risk Weighted Index.

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

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: 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

http://www.msccibarra.com/products/indexes/international_equity_indexes/gimi/stdindex/methodology.html

| Event Type | Event details | Action |
|-------------|--|---|
| Acquisition | Risk Weighted Index constituent acquires another Risk Weighted Index constituent | Maintain acquiring company and remove acquired company |
| | Risk Weighted Index constituent acquires non Risk Weighted Index constituent | Maintain acquiring company |
| | Non Risk Weighted Index constituent acquires Risk Weighted Index constituent | Remove acquired company without adding acquiring company |
| Merger | Risk Weighted Index constituent merges with Risk Weighted Index constituent | Add new company with a constraint factor that is the weighted average of the two constituents |
| | Risk Weighted Index constituent merges with non Risk Weighted Index constituent | Add new company if MSCI links its price history to the Risk Weighted Index constituent. New company not added if price history is linked to the non Risk Weighted Index constituent |
| IPO | IPO added to Parent Index | IPO added to the Risk Weighted Index using country sector or country average as volatility estimator and determination of weight (please refer to section 2.3 for more details) |
| Spin-off | Risk Weighted Index constituent spins off security | Add spun-off security to the Risk Weighted index with the constraint factor of the spinning security, if it is included in the Parent Index |

| Event Type | Event details | Action |
|--|--|---|
| Conversion | Security A converted to B, A deleted from Parent Index, B added | B inherits constraint factors from A |
| Country Reclassification | Domicile of company reviewed: Security A deleted from country C, security B added to country D | B inherits constraint factors from A if it is added to the Parent Index, if both country C and D are part of the corresponding Regional Risk Weighted Reference Index as described in Appendix I. |
| Stock exchange reclassification | Stock exchange (price source) of company reviewed: Security A deleted, security B added | B inherits constraint factors from A if it is added to the Parent Index |
| Other Events Resulting in Changes in Number of Shares and FIFs | Changes in number of shares and subsequent FIF resulting from other events such as share placements and offerings, and debt-to-equity-swaps. | No change in Constraint Factor |

APPENDIX III: 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 $[N \times (1 - B/100)]$
- Second, all current constituents of the MSCI Risk Weighted Top N index ranked from $[N \times (1 - B/100) + 1]$ to $[N \times (1 + B/100)]$
- Third, remaining securities ranked from $[N \times (1 - B/100) + 1]$

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.

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