Proposal to adjust the PAF for rights issues

Additional document

November 2009

Background

- On October 22, 2009, MSCI Barra had announced its intention to adjust its methodology for calculating Price Adjustment Factors (PAF) for rights issues in the MSCI Indices. A PAF is applied to the market price of a security to account for a rights issue on the day it becomes effective (the ex-date).
- This proposed adjustment, which addresses clients' feedback and follows an internal analysis, will on average result in very minor differences but will enhance index replicability under certain market circumstances.
- MSCI Barra welcomes feedback on its proposal regarding the PAF used in case of rights issues and will announce its final decision on November 16, 2009.
- This document highlights the differences between the proposed "theoretical cum rights" PAF (theo-cum) and the current "theoretical ex rights" PAF (theo-ex) in cases of capital increases with preferential rights to existing shareholders (rights issues).

This proposal may or may not lead to changes to MSCI Barra's current treatment of rights issues.

Potential impact of the proposed change

- In general, the impact of this change on index performance should be modest on average. For example, when the security performance is close to the market average, the impact would be imperceptible.
- The impact would be more visible only when
  - The performance of the security is very different from the rest of the index
  - The weight of the security is important
  - The capital increase is a large one
- An example of the impact when all these three factors are combined is described on page 10.
- More generally this change represents a simplification, which may contribute to reduce the costs of perfectly replicating the index compared to the current approach.

Overview

- Usage of PAF in Index Calculation
- Characteristics of a rights issue
- Difference between theo-ex and theo-cum
- Contribution to Index Performance
- Implied Index Composition
- Rights issue illustration case
- Proposed New PAF formula
- Appendix:
  - Rights issues under Laspeyres and Paasche
  - Details of Contribution to Performance

Usage of PAF in Index Calculation

- For certain corporate events, MSCI applies a PAF at the security level in order to neutralize the impact of the price movement due solely to the event while capturing in the index only the price performance due to an intrinsic change in market value.
- The security price performance is calculated as $$\frac{P_t * PAF}{P_{t-1}} - 1$$
- The security price performance is weighted by the market capitalization at t-1, hence its contribution to the index performance is (for simplicity, all inclusion factors are ignored):

$$\sum_{i=1}^{n} w_{i,t-1} * (\frac{P_{i,t} * PAF_i}{P_{i,t-1}} - 1)$$

where $$w_{i,t-1} = \frac{NOS_{t-1} * P_{t-1}}{\sum_{i=1}^{n} NOS_{i,t-1} * P_{i,t-1}}$$

- The increase in number of shares takes place at the close of t (the ex-date) as per the MSCI Index Calculation Methodology.
- Symbols:

t-1	= cum date =one business day before the ex-date
t	= ex date = effective date of the event
NOS_{t-1}	= Number of shares at t-1
NOS_s	= Number of shares to be issued through the rights issue
P_{t-1}	= cum price = price one business day before the ex -date
P_s	= subscription price of the rights issue per new share
P_t	= ex price = price on the ex-date

Characteristics of a rights issue

- At time t-1(cum date), assuming no action, we have the following equivalence:

$$NOS_{t-1} * P_{t-1} = NOS_{t-1} * P_{theo.ex} + NOS_s * (P_{theo.ex} - P_s)$$ where

$P_{theo.ex}$ is the theoretical value of shares based on their average cost using t-1 prices and subscription prices

and $P_{theo.ex} - P_s$ is the theoretical value of a right

A right contains a long position in the shares and a short position in the cash needed to subscribe the new shares

- Assuming the cash required for the subscription of the new shares is brought on t-1, we have

$$NOS_{t-1} * P_{t-1} + NOS_s * P_s = NOS_{t-1} * P_{theo.ex} + NOS_s * (P_{theo.ex} - P_s) + NOS_s * P_s$$
$$= (NOS_{t-1} + NOS_s) * P_{theo.ex}$$

- These two different portfolios' composition do not have the same performance (unless the security has no performance)
- These two portfolios' are different in value. To make the second portfolio equal to the first it is sufficient to multiply it by the ratio of the initial market capitalization to the theoretical market capitalization after subscription to the new shares.

$$\frac{NOS_{t-1} * P_{t-1}}{NOS_{t-1} * P_{t-1} + NOS_s * P_s}$$

Difference between theo-ex and theo-cum

- A theo-cum PAF renders today's price comparable to yesterday's price and is defined as: $PAF_{theo.cum} = \frac{P_{theo.cum}}{P_t}$

  where $P_{theo.cum}$ is the theoretical value of shares today on a pre-rights issue basis = $\frac{P_t * (NOS_{t-1} + NOS_s) - P_s * NOS_s}{NOS_{t-1}}$

  The theoretical security price performance is: = $\frac{P_t * PAF_{theo.cum}}{P_{t-1}} - 1 = \frac{P_{theo.cum}}{P_{t-1}} - 1 = \frac{NOS_{t-1} * P_t + NOS_s * (P_t - P_s)}{NOS_{t-1} * P_{t-1}} - 1$

  We can observe that this theo-cum performance combines the performance of both the existing shares $NOS_{t-1} * P_t$ and the rights to subscribe to the new shares $NOS_s * (P_t - P_s)$ as shown in the above formula.

- A theo-ex PAF renders yesterday's price comparable to today's price and is defined as: $PAF_{theo.ex} = \frac{P_{t-1}}{P_{theo.ex}}$

  where $P_{theo.ex}$ is the theoretical value of shares based on the average cost using t-1 prices and subscription prices = $\frac{NOS_{t-1} * P_{t-1} + NOS_s * P_s}{NOS_{t-1} + NOS_s}$

  The theoretical security price performance is: = $\frac{P_t * PAF_{theo.ex}}{P_{t-1}} - 1 = \frac{P_t}{P_{theo.ex}} - 1 = \frac{P_t * (NOS_{t-1} + NOS_s)}{NOS_{t-1} * P_{t-1} + NOS_s * P_s} - 1$

  We can observe that this theo-ex performance is the performance of a pure long position on the security, as would be the case when the shares are fully funded, i.e. when $NOS_s * P_s$ is paid on t-1.

Contribution to Index Performance

- As the security performance is weighted by the market cap at t-1, which is $NOS_{t-1} * P_{t-1}$, we can compare the contribution to performance in terms of market capitalization: (refer to appendix for equation developments)
- In the case of a theo-cum PAF, the contribution to performance is:

$$(1) \quad [NOS_{t-1} * P_{t-1}] * [\frac{P_{theo.cum}}{P_{t-1}} - 1] = [NOS_{t-1} * (P_t - P_{t-1}) + NOS_s * (P_t - P_s)]$$

- And in the case of a theo-ex PAF, the contribution to performance is:

$$(2) \quad [NOS_{t-1} * P_{t-1}] * [\frac{P_t}{P_{theo.ex}} - 1] = [NOS_{t-1} * (P_t - P_{t-1}) + NOS_s * (P_t - P_s)] * [\frac{NOS_{t-1} * P_{t-1}}{NOS_{t-1} * P_{t-1} + NOS_s * P_s}]$$

- As seen in equation (1), the contribution to index performance in terms of market capitalization with a theo-cum PAF is the difference (from t-1 to t) of the already existing shares $NOS_{t-1} * (P_t - P_{t-1})$ and the value of the rights $NOS_s * (P_t - P_s)$ as shown in the last terms of the equation.
- As seen in equation (2), the contribution to index performance in terms of market capitalization with a theo-ex PAF can be expressed as a fraction of the contribution under a theo-cum PAF. The fraction corresponds to the ratio of the initial market capitalization at t-1 to the theoretical market capitalization after subscription of the new shares, which we have already seen on page 5.
  - The effect of this ratio is to reduce the performance resulting from the exposure to the rights, which contain a long position in the new shares and a short position in the cash needed to subscribe to them. In other words this ratio “deleverages” the exposure to the rights, such that the index remains only exposed to the security performance during the ex-day.

Implied Index Composition

- The neutral, or passive, composition on t-1 (as captured by the theo-cum approach) is the one that requires no action and therefore has an exposure to the rights: $NOS_{t-1} * P_{t-1} = NOS_{t-1} * P_{theo.ex} + NOS_s * (P_{theo.ex} - P_s)$

  The composition during and at the end of the ex-date t is $NOS_{t-1} * P_t + NOS_s * (P_t - P_s)$

  The performance at the end of the ex-date can be calculated as: $$\frac{NOS_{t-1} * P_t + NOS_s * (P_t - P_s)}{NOS_{t-1} * P_{t-1}} = \frac{P_t * PAF_{theo.cum}}{P_{t-1}}$$

- By contrast, the implied index composition of the theo-ex PAF is not a neutral, or passive, one. Why?

  In order for a portfolio to replicate the performance of shares only (i.e. eliminating the exposure to the rights), without bringing yet the cash required for the subscription, a theo-ex PAF approach would require that part of the shares cum rights are sold on t-1 to raise enough cash to 'deleverage' the neutral composition.

  The number of shares to be sold on t-1 is proportional to the capital increase $\frac{NOS_s * P_s}{NOS_{t-1} * P_{t-1} + NOS_s * P_s}$

  The implied composition of the portfolio is hence:

  $NOS_{t-1} * P_{t-1} * \frac{NOS_{t-1} \cdot P_{t-1}}{NOS_{t-1} * P_{t-1} + NOS_s * P_s}$ in shares, and the equivalent of $NOS_{t-1} * P_{t-1} * \frac{NOS_s * P_s}{NOS_{t-1} * P_{t-1} + NOS_s * P_s}$ in cash

  which can also be expressed as $\frac{NOS_{t-1} * P_{t-1}}{NOS_{t-1} * P_{t-1} + NOS_s * P_s} * [NOS_{t-1} * P_{theo.ex} + NOS_s * (P_{theo.ex} - P_s) + NOS_s * P_s]$

  where $P_{theo.ex} - P_s$ is the theoretical value of a right and $NOS_s * P_s$ is the cash required to exercise these rights in order to get fully subscribed new shares $NOS_s * P_{theo.ex}$

Rights issue illustration case

- Rights 2 NOS_s : 3 NOS_{t-1} @ P_s = GBP 3
- P_{t-1} = 4 GBP
- P_t = 3.384 GBP
- Initial Security Weight = 5%
- Capital increase of 50% (2 new shares to be subscribed at GBP 3 divided by 3 cum shares at GBP 4)
- Performance of the individual stock on the ex-date = -6% versus performance of the index =0%

$$P_{theo.ex} = 3.6$$

$$P_{theo.ex} - P_s = 0.6$$

$$A = \frac{NOS_{t-1} * P_{t-1}}{NOS_{t-1} * P_{t-1} + NOS_s * P_s} = 0.6666$$

Index composition	Index composition with Theo-ex	Index composition with Theo-cum
Shares	$A * NOS_{t-1} * P_{theo.ex} = 0.6666 * 3 * 3.6 = 7.2$	$NOS_{t-1} * P_{theo.ex} = 3 * 3.6 = 10.8$
Rights	$A * NOS_s * (P_{theo.ex} - P_s) = 0.6666 * 2 * 0.6 = 0.8$	$NOS_s * (P_{theo.ex} - P_s) = 2 * 0.6 = 1.2$
Cash	$A * NOS_s * P_s = 0.6666 * 2 * 3 = 4$	

	Theoretical Price	PAF	Security performance at t	Country Index performance at t (*)
Theo-ex approach	$P_{theo.ex} = 3.6GBP$	$PAF_{theo.ex} = 1.1111$	-6.00%	-0.30%
Theo-cum approach	$P_{theo.cum} = 3.64GBP$	$PAF_{theo.cum} = 1.07565$	-9.00%	-0.45%

At the end of the ex-date of the rights issue, by using a theo-ex PAF, the country index has outperformed by a 15 basis points a benchmark that would have used a theo-cum PAF.

(*) assuming a zero performance for the rest of the index

Proposed New PAF formula

Proposed new PAF = $\frac{P_{theo.cum}}{P_t}$ if $P_s < P_{t-1}$ otherwise PAF = 1

If the shares issued from the rights issue are entitled to forthcoming dividends paid by the company,

$$P_{theo.cum} = \frac{P_t * (NOS_{t-1} + NOS_s) - P_s * NOS_s}{NOS_{t-1}}$$

Otherwise, when the shares issued from the rights issue are not entitled to the forthcoming announced dividend paid by the company and if $P_s < P_{t-1} - GD$

$$P_{theo.cum} = \frac{P_t * (NOS_{t-1} + NOS_s) - NOS_s * (P_s + GD)}{NOS_{t-1}}$$

Where GD = Gross dividend per share as announced by the company.

Appendix

Rights Issues under Laspeyres and Paasche

Details of Contribution to Performance

Rights Issues under Laspeyres and Paasche

- The calculation of the MSCI Indices uses a chain-linked Laspeyres concept, whereby only shares outstanding on t-1 should contribute to the index performance on t

  This explains why the weighting for the performance on t is based on $NOS_{t-1} * P_{t-1}$

  and it is only after the close of t that the weighting changes to $(NOS_{t-1} + NOS_s) * P_t$

- By contrast, in a calculation based on a chain-linked Paasche concept, the new shares issued on t should also contribute to the index performance on t

  Therefore the weighting for the performance on t should be based on $NOS_{t-1} * P_{t-1} + NOS_s * P_s$ which corresponds to an immediate injection of cash for the subscription (as of the close of t-1), resulting in a full exposure to the new shares

- This is captured by a theo-ex approach where performance is $\frac{P_t * (NOS_{t-1} + NOS_t)}{NOS_{t-1} * P_{t-1} + NOS_s * P_s} - 1$

- The contribution to performance in market capitalization is: $NOS_{t-1} * (P_t - P_{t-1}) + NOS_s * (P_t - P_s)$ which is identical to the contribution with Laspeyres and the theo-cum approach

- The index performance is however slightly different because the denominator (the index total market capitalization) has been increased with Paasche to include $NOS_s * P_s$ while it has remained unchanged with Laspeyres

Details of Contribution to Performance

- In the case of a Theo-ex PAF, the contribution to performance is:

$$[\frac{P_t}{P_{theo.ex}} - 1] * [NOS_{t-1} * P_{t-1}] = [\frac{P_t}{\frac{P_{t-1} * NOS_{t-1} + P_s * NOS_s}{NOS_{t-1} + NOS_s}} - 1] * NOS_{t-1} * P_{t-1}$$

$$= \frac{P_t * (NOS_{t-1} * P_{t-1}) * (NOS_{t-1} + NOS_s)}{P_{t-1} * NOS_{t-1} + P_s * NOS_s} - NOS_{t-1} * P_{t-1}$$

$$= \frac{P_t * (NOS_{t-1} * P_{t-1}) * (NOS_{t-1} + NOS_s) - NOS_{t-1} * P_{t-1} * (P_{t-1} * NOS_{t-1} + P_s * NOS_s)}{P_{t-1} * NOS_{t-1} + P_s * NOS_s}$$

$$= \frac{NOS_{t-1} * P_{t-1}}{NOS_{t-1} * P_{t-1} + P_s * NOS_s} * [NOS_{t-1} * (P_t - P_{t-1}) + NOS_s * (P_t - P_s)]$$

- In the case of a Theo-cum PAF, the contribution to performance is:

$$[\frac{P_{theo.cum}}{P_{t-1}} - 1] * [NOS_{t-1} * P_{t-1}] = [\frac{\frac{P_t * (NOS_{t-1} + NOS_s) - P_s * NOS_s}{NOS_{t-1}}}{P_{t-1}} - 1] * NOS_{t-1} * P_{t-1}$$

$$= [\frac{P_t * (NOS_{t-1} + NOS_s) - P_s * NOS_s}{NOS_{t-1} * P_{t-1}} - 1] * NOS_{t-1} * P_{t-1}$$

$$= P_t * (NOS_{t-1} + NOS_s) - P_s * NOS_s - P_{t-1} * NOS_{t-1}$$

$$= NOS_{t-1} * (P_t - P_{t-1}) + NOS_s * (P_t - P_s)$$

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