Scientific Beta
An SGX and EDHEC Venture

Scientific Beta Leveraged Long/Short Index Calculation Rules Net Return

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1. Introduction

This rulebook details the Net Return Index Levels calculation in the context of leveraged Long/Short indices. It comes in conjunction with the Scientific Beta Index Calculation Rules in particular the rules to adjust for corporate actions.

2. Definitions

The following conventions will be used in subsequent parts of the document:

Review	Quarterly index review. The review ends on the 3rd Friday of March, June, September and December as per the Scientific Beta Universe Ground Rules
Cut-Off	The cut-off date for index reviews as per the Scientific Beta Universe Ground Rules
Long Branch	Long-only Scientific Beta Index hold as the Long portfolio
Short Branch	Long-only Scientific Beta Index hold as the Short portfolio
Gamma	The quarterly reviewed ratio of the amount allocated to the Short Branch over the amount allocated to the Long Branch, as per the Scientific Beta Long/Short strategy. A dollar-neutral strategy corresponds to $\gamma = 1$
Leverage	A static multiplier applied to both Long and Short allocations
Net Position	Stock net exposures in the non-leveraged Long/Short portfolio resulting from the (non-leveraged) allocations on the Long and Short Branches
Long Leg	Long-only portfolio built on the stocks having a positive exposure in the Net Position. Stocks are weighted by their normalized positive exposures
Short Leg	Long-only portfolio built on the stocks having a negative exposure in the Net Position. Stocks are weighted by their normalized negative exposures
Cash Leg	The Cash Leg is defined as the net position between Long and Short Legs
Total Return	Leg Index return, including the reinvestment of dividends (gross)
Net Return	Leg Index return, including the reinvestment of dividends (net of taxes)
Long Leg Cost	Cost associated to the Long Leg
Short Leg Cost	Cost associated to the Short Leg

3. Net Return Index

3.1. General Case

For any date *t* after review *q*, the Long/Short Index level is calculated as follows:

$$I_{(t)} = I_{(q)} + \lambda \times \left[P_q^L \times \left(r_{q,(t)}^L - c_{q,(t)}^L - c_{q,(t)}^C\right) - P_q^S \times \left(r_{q,(t)}^S + c_{q,(t)}^S - c_{q,(t)}^C\right)\right] \times I_{(q)}$$

Where

- $I_{(t)}$ is the Long/Short Index level at date *t*
- λ is the index leverage ratio
- P_q^L , P_q^S are the Effective Net Long and Short (unleveraged) positions for review *q*
- $r_{q,(t)}^L$, $r_{q,(t)}^S$ are the returns of the Long and Short Legs between end of review *q* and date *t*
- $c_{q,(t)}^L$, $c_{q,(t)}^S$ are the cumulative cost of the Long and Short Legs between end of review *q* and date *t*
- $c_{q,(t)}^C$ is the return of the Cash Leg between end of review *q* and date *t*

At review *q*, the Effective Net Long and Short positions result from the Net Long and Short positions defined by the strategy, modified by the evolution of index levels between cut-off *c* and end of review *q* as follows:

$$P_q^L = W_q^L \times \frac{L_{(q)}^L}{L_{(c)}^L} / \frac{I_{(q)}}{I_{(c)}} \qquad P_q^S = W_q^S \times \frac{L_{(q)}^S}{L_{(c)}^S} / \frac{I_{(q)}}{I_{(c)}}$$

Where date *c* corresponds to the cut-off date of review *q*, and

- W_q^L , W_q^S are the Net Long and Short positions as defined by the strategy
- $L_{(t)}^L$, $L_{(t)}^S$ are the Long Leg and Short Leg index levels at date *t*
- $I_{(t)}$ is the Long/Short Index level at date *t*

At review *q*, the strategy defined Net Long and Net Short positions are calculated by aggregation of the individual stock net positions:

$$W_q^L = +\sum_{(W_{i,q}^N>0)} W_{i,q}^N \qquad W_q^S = -\sum_{(W_{i,q}^N<0)} W_{i,q}^N \qquad W_{i,q}^N = W_{i,q}^L - \gamma_q \times W_{i,q}^S$$

Where, at review *q*

- γ_q represents the ratio of the (opposite of) allocation to the Short Branch over the allocation to the Long Branch, as per the Long/Short strategy, underlying data taken as of cut-off date.
- $W_{i,q}^L$, $W_{i,q}^S$ are the weights of stock *i* in the Long Branch and Short Branch indices as defined by their respective strategies, underlying data taken as of cut-off date.

3.2. Cross-currency Case

As per the formula detailed above, the valuation of the Long/Short index derives from the valuation of its legs.

The currency of the legs (*lc*) corresponds to their regional coverage (e.g. USD for Developed). For a Long/Short index in a different currency (*ic*), a partial hedging is implemented using a cross-currency basis swap on the Cash Leg.

The cross-currency exchange rate is thus applied to the excess returns of the legs over the cash.

$$r^{L}_{q,(t)} - c^{C}_{q,(t)} = \left(r^{L\ lc}_{q,(t)} - c^{C\ lc}_{q,(t)}\right) \times \left(\mathrm{s}^{\mathrm{lc\ ic}}_{(\mathrm{t})} / \mathrm{s}^{\mathrm{lc\ ic}}_{(\mathrm{q})}\right)$$

$$r^{S}_{q,(t)} - c^{C}_{q,(t)} = \left(r^{S\ lc}_{q,(t)} - c^{C\ lc}_{q,(t)}\right) \times \left(\mathrm{s}^{\mathrm{lc\ ic}}_{(\mathrm{t})} / \mathrm{s}^{\mathrm{lc\ ic}}_{(\mathrm{q})}\right)$$

Where

- $r^{L}_{q,(t)}$, $r^{S}_{q,(t)}$ is the returns of the Long and Short Legs between end of review *q* and date *t* in index currency *ic*
- $r^{L\ lc}_{q,(t)}$, $r^{S\ lc}_{q,(t)}$ is the returns of the Long and Short Legs between end of review *q* and date *t* in legs currency *lc*
- $c^{C\ lc}_{q,(t)}$ is the return of the Cash Leg between end of review *q* and date *t* in legs currency *lc*
- $\mathrm{s}^{\mathrm{lc\ ic}}_{(\mathrm{t})}$ is the (direct) exchange rate between legs currency *lc* and index currency *ic*

The use of a cross-currency basis swap implies extra cost which is added to $c^{L}_{q,(t)}$ and detailed in the section 4.2Long Leg Cost.

4. Costs

4.1. Cash Leg

The net position between Long Leg and Short Leg represents the Cash Leg. On a daily basis, the return of the Cash Leg in currency ccy, since end of latest review, is calculated as follows:

$$c_{q,(t)}^{C\ ccy} = \left(1 + ON_q^{ccy}\right)^{d_{q,(t)}} - 1$$

- $d_{q,(t)}$ is the number of calendar days between end of review *q* and date *t*
- ON_q^{ccy} is the average Overnight Rate at quarterly review *q*, determined as the average of the Overnight Rate on all calendar dates in the previous quarter, from cut-off date to cut-off date.

  The Overnight Rate depends on the currency *ccy*:

  - USD US Federal Funds Effective Rate
  - EUR EMMI Euro OverNight Index Average (EONIA)

4.2. Long Leg Cost

The Long Leg Cost consist of financing Cost, assessed from the average Overnight Rate and Liquidity Spread, associated to the Long Leg portfolio. On a daily basis, the cumulative Long Leg Cost, since end of latest review, is calculated as follows:

$$c_{q,(t)}^{L} = d_{q,(t)} \times LC$$

- $d_{q,(t)}$ is the number of calendar days between end of review *q* and date *t*
- LC the financing costs include a liquidity spread to account for the risk premium to pay for. It is measured as an historical average of the Interbank Rate - OIS spread.

  The fixed value used in the index valuation is equal to 55bps.

  In case of a cross-currency L/S (see 3.2), *LC* is set to 65bps to account for the cost of the cross-currency basis swap.

4.3. Short Leg Cost

The Short Leg Cost consists of borrowing cost, reduced by the lending income, associated to the Short Leg portfolio. On a daily basis, the cumulative Short Leg Cost, since end of latest review, is calculated as follows:

$$c_{q,(t)}^{S} = d_{q,(t)} \times BC$$

- $d_{q,(t)}$ is the number of calendar days between end of review *q* and date *t*
- BC the stocks short in position (the short leg) need to be borrowed from a third-party which leads to account for Borrowing Costs in the index valuation. In average over a long period of time, the Borrowing Costs can be estimated as equal to 20 bps.

4.4. Withholding Taxes

As per the Net Index calculation formula given in 3, the Long Leg evolution is expressed by its Net Return. Withholding taxes are deduced from incomes received on this position. The detail of withholding tax rates can be found in the Scientific Beta Index Calculation Rules. They are determined to reflect the maximum tax rates applicable to foreign institutional investors.

For more information, please contact:
Séverine Cibelly on: +33 493 187 863 or by e-mail to: severine.cibelly@scientificbeta.com

Scientific Beta HQ & Asia-Pacific
2 Shenton Way
#02-02
SGX Centre I
Singapore 068804
Tel: +65 6713 7578

Scientific Beta R&D
393 promenade des Anglais
BP 3116 - 06202 Nice Cedex 3
France
Tel: +33 493 187 863

Scientific Beta—Europe
10 Fleet Place, Ludgate
London EC4M 7RB
United Kingdom
Tel: +44 207 332 5600

Scientific Beta Germany
ONE, Brüsseler Straße 1-3
Frankfurt, 60327
Germany

Scientific Beta—North America
One Boston Place, 201 Washington Street
Office 2606, Boston, MA 02108
United States
Tel: +1 857 239 8891

Scientific Beta—Chicago
155 North Wacker Drive, Suite 4250
Chicago, IL 60606
United States
Tel: +1 312 803 4993

Scientific Beta—Melbourne
Level 27, 101 Collins Street
Melbourne Victoria 3000
Australia
Tel: +61 3 9653 6411

Scientific Beta—Sydney
Level 35, 100 Barangaroo Avenue
Sydney NSW 2000
Australia
Tel: +61 2 8114 4588

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