ANDREW COLIN

IMPLICATIONS OF ESG INVESTMENT CONSTRAINTS ON EQUITY ATTRIBUTION

FLAMETREE TECHNOLOGIES PTY LTD

Introduction

This paper discusses the implications for the attribution analyst of introducing an on-off *investible* setting, that controls whether a fund manager may invest in individual securities or (by implication) entire sectors. The presentation expands upon, and clarifies, the ideas introduced in Gregoire (2019).[1]

[1] Gregoire, P., *Measuring the contributions of SRI/ESG investment strategies*, Journal of Performance Measurement, Fall 2019

The presence of investment constraints has several effects on the decomposition of active returns. At the most basic level, it introduces an additional source of return that should be reported separately, in addition to asset allocation and stock selection returns. The reason is that the investibility of particular securities or sectors is out of the control of the fund manager, and so the effect of this externally imposed constraint should be taken into account before measuring value added by making active investment decisions.

The investible setting is usually based on considerations around environmental, social, governance or carbon emission issues. Decision frameworks controlling how these restrictions may be made are outside the scope of this paper; for an example, see the methodology due to Legal and General Investment Management.[2]

[2] https://esgscores.lgim.com/

Investment restrictions may apply to individual securities, entire sectors, or a combination of the two. For instance, Gregoire proposes a 'best of breed' approach, in which only securities that have a sufficient ESG score are regarded as investible, while LGIM propose a similar metric-based approach.

Measuring the effects of investment restructions

The main topic discussed here is how to quantify the impact of such restrictions. We discuss ways to measure the following:

- Do investment restrictions help or hinder the fund's overall returns, and by how much?
- What is the quantitative effect of investment restrictions at the sector and security levels?

We show that by using standard attribution tools, the effects of these broad class of investment restrictions can be measured and integrated into an attribution framework.

The core idea is to run two Brinson analyses: one comparing the returns of the unrestricted benchmark to the restricted benchmark (thus measuring the effects of investment restrictions), and another comparing the returns of the restricted benchmark against the portfolio (which measures the skill of the manager). The overall returns can then be decomposed into the effects of sector and security-level decisions and restrictions.

Synthetic benchmarks

Suppose that we decide that it is only permissible to invest in a subset S of the benchmark securities B, where $S \subseteq B$. We denote the restricted benchmark by $\tilde{B}$.

[3]

When running attribution analysis to measure the skills shown by the investment manager, the analysis should be against the new restricted benchmark, not the original, since the manager presumably has no influence on the universe of investible securities. Any impact on the make-up of the investible universe should therefore be measured separately to the active return generated by the manager.

This move introduces at least one new set of returns in the attribution analysis: the difference in return between the market benchmark B and the restricted benchmark $\tilde{B}$.

To construct $\tilde{B}$, adjust the weights of the benchmark as follows:

$$\tilde{W}_i = \alpha_i W_i \tag{1}$$

where

$$\alpha_i = \begin{cases} 1 & \text{if security } i \text{ is investible} \\ 0 & \text{otherwise} \end{cases}$$

The weights of the benchmark W_i are then renormalised back to unity:

[3] For the purposes of this paper, we omit the treatment of off-benchmark securities. See, eg, Colin, A., *Mastering attribution in finance*, Pearson/FT Press, 2016 for a deeper discussion of this point.

$$\tilde{W}_i \leftarrow \frac{\tilde{W}_i}{\sum_{i \in S} \tilde{W}_i} \tag{2}$$

We denote the overall effect on returns made by imposing investment restrictions as R_{ESG}. The overall active return of the portfolio against benchmark can now be decomposed into three terms:

$$R_P - R_B = R_{ESG} + R_{AA} + RSS \tag{3}$$

where

$$R_{ESG} = \sum_{i \in B} (W_i - \tilde{W}_i) R_i \tag{4}$$

and the sum of the asset allocation R_{AA} and stock selection returns R_{SS} are the difference between $\tilde{B}$ and P.

Decomposed ESG returns

Gregoire proposes that the active return of the restricted benchmark against the market benchmark should be decomposed further to convey insight on the effects of sector and security level exclusions.

The first effect measured is at the sector level. Gregoire refers to this as the *screening effect*, which is equivalent to asset allocation in a Brinson analysis.

The second effect is the selection of investible assets within each sector. Gregoire calls this the *ESG effect*, which is equivalent to stock selection in a Brinson analysis.

The sum of the two sources of return is the overall value added to the portfolio by restricting investment decisions.

In this case,

$$R_{ESG} = R_{screening} + R_{ESG\ effect} \tag{5}$$

so that

$$R_P - R_B = R_{screening} + R_{ESG\ effect} + R_{AA} + RSS \tag{6}$$

Worked example

In the following example, we use the convention that a lower-case label refers to the portfolio, and an upper-case label to the benchmark.

Consider the following portfolio and benchmark, containing eight securities divided into two sectors.

Table 1: Portfolio and benchmark

Sector	Security	Investible?	w	W	r	R	Active return
A	1	1	16.12%	16.82%	-4.21%	-0.92%	-0.52%
A	2	0	0.00%	16.24%	1.89%	-4.05%	0.66%
A	3	1	23.34%	16.12%	-0.14%	-4.39%	0.68%
A	4	1	24.10%	0.46%	1.86%	0.10%	0.45%
B	5	1	12.06%	4.63%	-3.50%	2.69%	-0.55%
B	6	0	0.00%	10.81%	-4.18%	-1.54%	0.17%
B	7	0	0.00%	25.78%	-0.15%	0.96%	-0.25%
B	8	1	24.37%	9.14%	3.42%	3.30%	0.53%
TOTAL			100.00%	100.00%	0.15%	-1.01%	1.16%

Securities 2, 6 and 7 are deemed to be uninvestible, so do not appear in the managed portfolio. The overall active return is 1.16%.

Using this data, we can now calculate the weights of the ESG portfolio by using equation (2).

Table 2: ESG benchmark and effects

Sector	Security	Investible?	W	R	W_ESG	Screening (AA)	ESG effect (SS)
A	1	1	16.82%	-0.92%	35.65%	-0.58%	0.17%
A	2	0	16.24%	-4.05%	0.00%	0.50%	0.00%
A	3	1	16.12%	-4.39%	34.18%	-0.55%	0.16%
A	4	1	0.46%	0.10%	0.97%	-0.02%	0.00%
B	5	1	4.63%	2.69%	9.82%	0.05%	0.20%
B	6	0	10.81%	-1.54%	0.00%	-0.11%	0.00%
B	7	0	25.78%	0.96%	0.00%	-0.26%	0.00%
B	8	1	9.14%	3.30%	19.38%	0.10%	0.40%
TOTAL			100.00%	-1.01%	100.00%	-0.86%	0.95%

The returns of B and $\tilde{B}$ at the sector and portfolio level are shown in table 3. These can be used in the standard expressions for asset allocation and stock selection to give the results in the last two columns of table 2.

Table 3: Benchmark sector returns

Sector	R	R_ESG
A	-3.063%	-2.582%
B	1.007%	3.093%
TOTAL	-1.013%	-0.925%

$$r_i^{AA} = (W_i^{ESG} - W_i)R_S(i \in S) \tag{7}$$

$$r_i^{SS} = (R_i^{ESG} - R_i)W_i^{ESG}(i \in S) \tag{8}$$

Finally, the asset allocation and stock selection for return generated between B^{ESG} and P are calculated in a similar manner:

Table 4: Portfolio and ESG benchmark sector returns

Sector	r	R_ESG
A	-0.413%	-2.582%
B	1.130%	3.093%
TOTAL	0.149%	-0.925%

Table 5: Managed AA and SS returns

Sector	Security	Investible?	w	r	R	W_ESG	AA	SS
A	1	1	16.12%	-4.21%	-0.92%	35.65%	0.32%	0.35%
A	2	0	0.00%	1.89%	-4.05%	0.00%	0.00%	0.00%
A	3	1	23.34%	-0.14%	-4.39%	34.18%	0.18%	0.51%
A	4	1	24.10%	1.86%	0.10%	0.97%	-0.38%	0.52%
B	5	1	12.06%	-3.50%	2.69%	9.82%	0.09%	-0.24%
B	6	0	0.00%	-4.18%	-1.54%	0.00%	0.00%	0.00%
B	7	0	0.00%	-0.15%	0.96%	0.00%	0.00%	0.00%
B	8	1	24.37%	3.42%	3.30%	19.38%	0.20%	-0.48%
TOTAL	0	0	100.00%	0.15%	-1.01%	100.00%	0.41%	0.66%

In summary, the results are as shown in Table 6.

Table 6: Summary attribution returns

Screening (AA)	-0.8614%
ESG effect (SS)	0.950%
AA	0.41%
SS	0.66%
TOTAL	1.1622%

Table 1: Summary attribution returns for ESG portfolio

The security restrictions have led to a loss at the sector level, because the restricted benchmark overweights poorly performing sectors against the underlying benchmark. However, at the security level the restrictions worked in the manager's favour.

Worked example

A spreadsheet containing the details of the above calculation is available from the author.

Discussion

Gregoire proposes a second adjustment to the synthetic benchmark, where weights in each sector are adjusted by a constant so that their sum equals the sector holdings in the benchmark.

It is not clear why he suggests this. If this new benchmark is used, in place of the ESG benchmark specified in equations [1] and [2], then the allocation return in the subsequent analysis is always zero. We do not proceed further with this line of analysis and always use the synthetic benchmark given here.