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DECISION-BASED ATTRIBUTION IN FIA

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Introduction

Decision-based attribution

Decision-based attribution recognises that asset allocation (AA) decisions are not always made in a strictly hierarchical manner.

An implicit assumption of the Brinson approach to analysing active returns is that all AA decisions are made collectively. Even if multiple managers have contributed to the allocation decision, the Brinson attribution algorithm combines the outcome of these decisions into a single set of exposures. The steps that led to these allocations are not considered. In particular, the value added by different managers when adjusting and fine-tuning allocation decisions is not measured.

This white paper describes how FIA extends the Brinson model to measure the impact of successive, iterative AA and policy decisions, thereby measuring the contribution to active return made by multiple managers, each of whom may have influenced the portfolio's overall asset allocation position. We refer to this approach as *decision-based attribution*, as described by Muralidhar (2016).[1]

[1] Muralidhar, A., *Attribution Hears a Who: The case for decision-maker based attribution*, Journal of Portfolio Management, Spring 2016

Brinson attribution: scope and limitations

The Brinson approach to portfolio attribution[2] decomposes the active return of a portfolio into asset allocation (AA) and stock selection (SS) components.

[2] Brinson, G., Hood, L.R, Beebower, G.L., *Determinants of portfolio performance*, Financial Analyst Journal, July/August 1986

The Brinson algorithm models two levels of decision: one at the macro level, where the global manager decides how much capital to invest into which sectors, and one at the micro level, where potentially different managers decide which securities to hold within each sector.

Nested Brinson attribution

A straightforward extension of the Brinson approach measures the effects of making nested allocation decisions. A global manager may be tasked with making a

top-level decision about allocation to different counties. Local country managers will then decide how much to assign to individual industries within each country, observing the constraints imposed by the global manager. The country managers' decisions will not affect the overall top-level country allocations, which have been decided by the global manager.

Nested Brinson attribution then allows the value added by the global and the country managers to be separated and measured as separate sources of income. However, this approach cannot measure the effects of overridden asset allocations, which requires a decision-based attribution capability.

For a detailed account of these topics, refer to Colin (2016)[3].

[3] Colin, A., *Mastering attribution in finance*, Pearsons/FT Press, 2016

Examples

Brinson attribution without decision-based attribution

Consider the portfolio and benchmark shown in Table 1. Here, w and r are the portfolio's weights and returns, while W and R are the benchmark's weights and returns.

Asset class	w	r	W	R	Classification
Equity	0.35	0.1	0.25	0	Liquid
Bond	0.25	0.1	0.25	0.2	Liquid
Property	0.15	0.1	0.25	-0.2	Illiquid
Alt	0.25	0.1	0.25	0.1	Illiquid

Table 1: Simple balanced portfolio

A straightforward Brinson-Fachler attribution analysis on this data generates the results shown in Table 2:

Sectors	AA (Issuer)	SS
Alt	0.0%	0.0%
Bond	0.0%	(2.5%)
Equity	(0.25%)	3.5%
Property	2.25%	4.5%
SUMMARY	2.0%	5.5%

Table 2: Results of Brinson analysis, excluding TAA overlay

The total active return of the portfolio is 7.5%, with 2% arising from asset allocation decisions, and 5.5% from stock selection decisions.

Brinson attribution with decision-based attribution

In the previous example, suppose that the portfolio asset allocations were partly decided in advance as a strategic asset allocation (SAA) decision. The SAA investment mandate is to invest 70% of the fund into liquid assets (equities, bonds) and the remaining 30% into illiquid assets (property, alternatives). Critically, the manager has discretion to adjust these proportions if they believe they can add value by doing so.

The first step in running a decision based attribution analysis is to measure the returns generated by this SAA decision, where assets are divided into liquid and illiquid categories. The overall return generated by this decision was 3.0%.

The next step is to calculate the asset allocation return generated by portfolio allocation, after subtracting the effects of the previous SAA decision. The manager's repositioning decreases the weight of the liquid assets to 60% and increases the weight of the illiquid assets to 40%.

The analysis shows that this decision cost the portfolio 1.0%. All the value generated by asset allocation decisions was made at the initial 70/30 level decision, while the subsequent allocation decision made a loss.

Stock selection returns, and the overall active return, are unaffected by the inclusion of the SAA decision in the analysis, and the overall return is the same as the previous example. Results are summarised in Table 3.

Sectors	w	W	AA (SAA)	AA (Issuer)	SS
Alt	25.0%	25.0%		1.5%	0.0%
Property	15.0%	25.0%		0.0%	4.5%
SAA (Liquid)	(10.0%)	0.0%		(0.5%)	0.0%
Illiquid assets	30.0%	50.0%	1.5%	1.0%	4.5%
Bond	25.0%	25.0%		(1.0%)	(2.5%)
Equity	35.0%	25.0%		0.0%	3.5%
SAA (Illiquid)	10.0%	0.0%		(1.0%)	0.0%
Liquid assets	70.0%	50.0%	1.5%	(2.0%)	1.0%
SUMMARY	100.0%	100.0%	3.0%	(1.0%)	5.5%

Table 3: Results of Brinson analysis, including SAA decision

Data requirements for decision-based attribution

Implementing decision-based attribution requires some addition information in addition to the standard requirements of conventional Brinson analysis.

- Data on additional asset allocation decisions. We call this extra information an *overlay*.

  In FIA, overlay data is supplied as a separate file, containing dates, decision name, sector names, and allocations.

  Allocations for each decision level at each date must add to 1.

  The name of the file in which this data is provided is passed to FIA using the **DBAFile** setting.

  Sample overlay data is shown in Table 4.

Date	Decision	Category	Value
01-Jan-25	SAA	Liquid	0.7
01-Jan-25	SAA	Illiquid	0.3
01-Jan-26	SAA	Liquid	0.75
01-Jan-26	SAA	Illiquid	0.25

Table 4: Sample overlay data for SAA decisions at two dates

  Note that data only needs be supplied at dates when allocations change. If no date is supplied, the overlay is assumed to be in place from the start of the calculation period.

- Decision classification information for the securities in the portfolio and benchmark. For instance, if one level of management decision is *SAA*, then each security should have a SAA classification. This classification follows the same format as other FIA classification data. Sample classification data is shown in Table 5.

Equity	Issuer=Equity|SAA=Liquid
Bond	Issuer=Bond|SAA=Liquid
Property	Issuer=Property|SAA=Illiquid
Alt	Issuer=Alt|SAA=Illiquid

Table 5: Sample classification data for decision-based attribution

- Names of the allocation decisions, and the order in which they were made. This is typically supplied as a

list of decision variables, such as *TAA, SAA, Country*. These names must correspond to decision names in the overlay file.

Names of the allocation decisions are then appended to the **BrinsonAllocationSectors** switch. In the first example above, this is set to

BrinsonAllocationSectors=Issuer

In the second, it reads

BrinsonAllocationSectors=SAA, Issuer

FIA can then be run as usual, and the effect of the additional allocation decisions will be shown in the reports under the supplied names.

Discussion

FIA makes use of **dummy securities** to run DA attribution. These do not affect the return of the overall portfolio as their overall net exposures and returns are always zero. They are used to modify the exposures of various sectors to mirror the allocation decisions taken by upstream managers.

This algorithm can be applied to multiple levels of decision. For instance, if a portfolio is managed using a combination of strategic, tactical and sector-level allocation decisions that all contribute to the overall asset allocation, then the effect of each decision may be measured and shown on an attribution report.

The algorithm is an extension of the Brinson approach, and dovetails cleanly with FIA's existing calculation capabilities.

Decision allocation can be applied to all types of portfolios, including hybrid and fixed income holdings.

FIA allows decision-based attribution to be run concurrently with a standard Brinson analysis, and the results of both displayed on the same report.

Further information

For more information on FIA, or a demonstration of FIA running decision-based attribution on your data, please contact the author at andrew.colin@flametree.global.