PERFORMANCE PERSPECTIVES
with David Spaulding

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MORE ON INTERACTION

Interaction continues to be one of the more challenging concepts to deal with …this is probably one of the reasons many avoid it completely, by combining it with either selection or allocation. Defining it in a simple manner is especially challenging. A software vendor, who I won't name here, defined interaction as follows: "Interaction effect is the portion of the portfolio's excess return attributable to combining allocation decisions with relative performance. This effect measures the strength of the manager's convictions. The interaction effect is the weight differential times the return differential. A group's interaction effect equals the weight of the portfolio's group minus the weight of the benchmark's group times the total return of the portfolio's group minus the total return of the benchmark's group."

Let's recall the formula for interaction:

$$Interaction = (w_i - \overline{w}_i) \times (r_i - \overline{r}_i)$$

Where
r_i = portfolio returns
w_i = portfolio weight
$\overline{r}_i$ = benchmark returns
$\overline{w}_i$ = benchmark weight

It's not hard to agree with the opening sentence ("Interaction effect is the portion of the portfolio's excess return attributable to combining allocation decisions (i.e., the weight differences, portfolio minus benchmark) with the relative performance (return differences, portfolio minus benchmark)"). and the statement that it's "the weight differential times the return differential." But the statement that it "measures the strength of the manager's convictions" isn't so obvious to me. I don't think that it's often so easy to really understand what's going on without some analysis, which often isn't employed.

Let's go through an example. For simplicity, we'll use the formulas for the Brinson-Hood-Beebower model. Recall that these formulas are:

$$Selection = \overline{w}_i \times (r_i - \overline{r}_i)$$

$$Allocation = \overline{r}_i \times (w_i - \overline{w}_i)$$

	Weights		Returns		Attribution Effects		
Sector	Portfolio	Benchmark	Portfolio	Benchmark	Allocation	Selection	Interaction
A	30%	20%	-1%	1%	0.10%	-0.40%	-0.20%
B	20%	30%	1%	-1%	0.10%	0.60%	-0.20%

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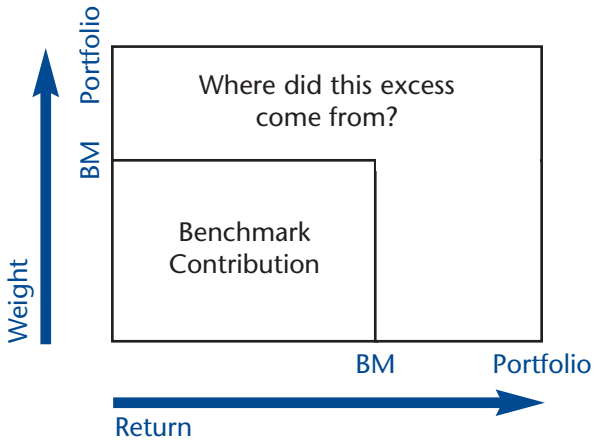
In looking at our table, we see that both sectors received the exact same interaction effect. But what do these numbers in isolation reveal? Surely not the same thing. The manager chose to overweight sector A, relative to the benchmark; however, his performance wasn't as good. The overweighting of a positively performing sector (from the benchmark's perspective) is deemed a good thing, thus the 10 basis points in allocation; however, the underperformance yielded a negative selection effect. Why do we have a negative interaction? Because we're multiplying a positive weight differential with a negative underperformance.

The manager chose to underweight sector B. Underweighting a negatively performing sector (again, from the benchmark's perspective) is felt to be a good decision, thus we once again get a positive allocation; however, the outperformance resulted in a positive selection. The negative interaction resulted from multiplying a negative weight differential times a positive return difference.

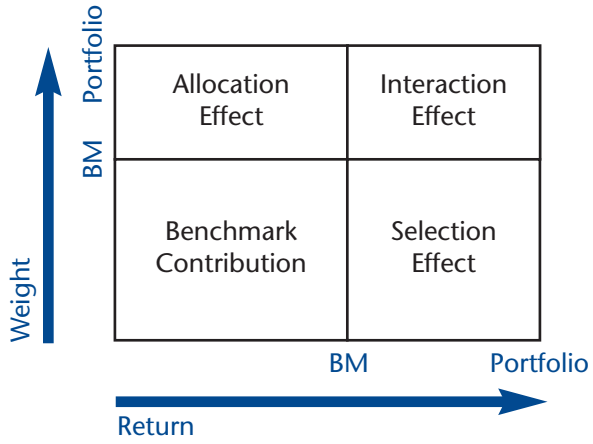
I began to offer a totally different approach to these terms several months ago, but held off because of concerns with how the ideas may be received; I may take this up in the coming months. But to get back to this definition, I don't see how the strength of a manager's convictions is revealed in the interaction…perhaps one of our readers can enlighten me.

COMBINING INTERACTION SHIFTS THE CREDIT (OR BLAME)…A GOOD IDEA?

As noted above, we often see firms combine the interaction effect with either selection or allocation. While this avoids the need to explain the term, it can also add credit (or blame) where it shouldn't be. Let's begin with a graphical representation of the allocation effects:

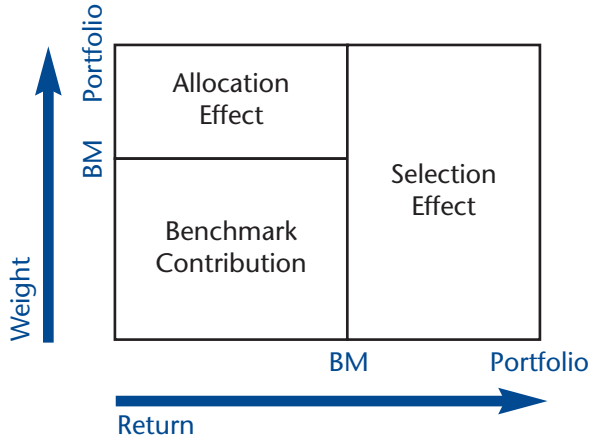


Our first graphic shows the portfolio's overall return and how the benchmark contributed to it. In relative attribution we're attempting to identify the source(s) for the excess return. A classic way to show this appears in our next graphic.



You can hopefully see how these boxes tie into our formulas shown above (e.g., selection effect being the benchmark's weight times the difference in returns, portfolio minus benchmark).

When we combine effects, for example by using the portfolio's weight in the selection effect, our graphic changes and we eliminate our interaction effect.



But have we eliminated it or simply added it to the selection effect, meaning that the term should really be called "Selection with Interaction" or "Selection and Interaction"?

Let's look at one more example, shown in our second table.

	Weights		Returns		Attribution Effects		
Sector	Portfolio	Benchmark	Portfolio	Benchmark	Allocation	Selection	Interaction
C	20%	30%	2.5%	1.5%	-0.15%	0.30%	-0.10%
				Combining Interaction with Selection			
				0.20%			

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We see that the manager has underweighted sector C, which results in a negative allocation effect (because of the benchmark's positive return). This negative weight differential, coupled with the positive outperformance, yields a negative interaction effect.

When we combine interaction with selection, we see that the manager's selection effect (which had been 30 bps) is now lower by 10 bps; but is this because of selection or allocation? Obviously the inverse can and does happen, where the selection decision benefits from positive allocation decisions, but does this really make sense?

IT'S ALL GREEK TO ME

In our last newsletter we discussed the issue of Greek letters in formulas and how I felt that this can be a bit intimidating.

Two of our readers quickly responded with comments:

From Anthony Howland, *Performa*:

As always an entertaining read.

Being from the "old school" where we had the delight of learning the "classics" such as Latin, I believe the reason for the use of Greek is that it was a language commonly learnt by scholars so was not "Greek" to them! It provided a range of additional "symbols" to be used and, at that time, the people using them knew what they were. Perhaps the problem is that education has slipped – maybe your courses could include a brief section on Greek symbols and CGIPS could also include a couple of questions!

He followed this up with an additional comment:

My problem was never being able to write/draw the symbols but I have to confess I use them a lot – maybe I need to modernize! One very practical client said to me on signing with us that "if I ever showed him another Greek symbol, he'd kick my ass!". One of my favourite jokes is "Two cats are sitting on a roof – one slid off because it had a low mu" – ie coefficient of friction – I particularly like the joke as you tell it to 20 people, 1 thinks it is hilarious and 19 think you're insane!

And from our second reader:

Symbols outside the modern version of the Latin alphabet (e.g. Greek letters) do impart a certain mystique to disciplines that use such special characters regularly, but I would rank this pretty far down on the list of reasons why they are used.

KEEP THOSE CARDS & LETTERS COMING

We appreciate the occasional e-mail we get regarding our newsletter. Occasionally, we hear positive feedback while at other times, we hear opposition to what we suggest. That's fine. We can take it. And more important, we encourage the dialogue. We see this newsletter as one way to communicate ideas and want to hear your thoughts.

As you note, a few special cases like σ (sigma – I don't know if my use of the Symbol font will travel well in email, so I'll echo the names of special characters) have passed into general use, at least for some purposes. π (pi) is another example.

Otherwise, in mathematics at least, the main reason for using special characters is to support parallel style. Sometimes it is necessary to discuss several different types of related objects at the same time – e.g. points, line segments, rectangles and rectangular solids. In such cases, good style calls for denoting objects of the same type with a single symbol set, while using recognizably different symbol sets for objects of different types. Thus for points one might use upper-case letters A, B, C…, and for line segments one might use lower-case letters a, b, c…But what next? Depending on context, one could use special font characteristics such as italic and/or bold (but modern mathematical text tends to reserve bold for vectors, matrices and other multidimensional critters). Or one could use e.g. Greek letters.

Another reason is history. The use of Greek symbols goes back a long way in published mathematics (it predates Euler). Up to the end of the nineteenth century, most good Western universities required a good knowledge of classical Latin, and a fair number of them also required at least a passing familiarity with classical Greek. Indeed, Latin and Greek were requirements even at good high schools (but more in Europe than in the US). It is only in modern times that we have stopped thinking that knowledge of classical Latin and Greek is an essential part of a liberal education – so it is only in modern times that Greek letters have become intimidating to a majority of literate readers. However, a large number of standard uses of the Greek alphabet had already evolved in mathematics by the time this happened. There are good reasons for preserving such established usages (it makes it easier to read older literature, for one thing), but the result of doing so is that the mathematical notation in question has stayed more or less the same while most of the surrounding academic context has been dumbed down. So it goes.

Something similar happened with Fraktur (old German typeface), which was standard in the mathematical literature of several northern European countries until they modernized typefaces after WW2. A number of uses of Fraktur had already become standard before the modernization in certain parts of the modern mathematical literature (viz., those parts originally created by mathematicians who wrote in German). If the early literature has already supplied a special character set that can be used to support parallel style as discussed above, there isn't any obvious reason to change the notation.

Another example is Cantor's use of ℵ (aleph) in connection with transfinite cardinal numbers, and some other mathematical symbols come from even more obscure sources. And of course the literature on options includes among its "Greeks" the non-Greek symbol vega, although κ (kappa) seems to be gaining ground as a synonym for vega.

All of that having been said, I agree that not all of the preceding considerations apply to things like general-purpose performance measurement articles, where a significant part of the intended audience may not have had any special mathematical training beyond calculus, or sometimes just college algebra.

Some symbols, such as ∫, Σ and Π (integral, iterated sum and iterated product) are in such widespread use that avoiding them would be perverse – although the last one is likely to be less familiar to some readers than the other two. Aside: the integral sign derives from an old English variant of Fraktur, not from Greek – http://en.wikipedia.org/wiki/Long_s has a nice short treatment.

Some other symbols, such as τ (tau) and ο (omicron), aren't as widespread – but they closely resemble their counterparts in the Latin alphabet, so their use seems harmless. I might also put things like ω (omega) into this category – a reader unfamiliar with the Greek alphabet would almost certainly treat it as if it were a w, even though it is actually a lower-case omega.

For things like δ, λ, ψ etc., one probably should pause for a moment to consider whether one's intended audience might be better served by another notation. However, that doesn't imply that abbreviations like EMV and BMV are notationally better if one's intended audience happens to contain a fair number of readers who lack a strong math background – that is a different question entirely, and the answer isn't nearly as obvious as it might at first seem to be. There are at least two arguments against using such abbreviations:

1. *Judged in terms of normal style conventions for mathematical text, they are stylistically bad. Someone who reads a lot of material that follows the aforementioned conventions is accustomed to reading a text string like EMV as "E times M times V". Granted, this is only a minor nuisance – but it is a nuisance. On this question, my views are identical to those of Marcia Stigum (the author or co-author of several superb standard references that deal with the money markets) – she loathes most multiletter abbreviations.*

2. *Instead of EMV and BMV, why not VMF (valeur marchande finale) and VMI (valeur marchande initiale)? These acronyms are really used in French – see e.g. http://www.rbcfonds.com/pdf/tools/monthly_val_f.pdf. One's first response is likely to be that abbreviations based on French or German or whatever don't make sense if one is writing in English – which is true, of course. My point, though, is different: readers who do know English, but who are not native speakers of English, may not be able to guess what EMV and BMV are abbreviations of. I faced a similar problem when I translated Dr. Bernd Fischer's Performanceanalyse in der Praxis – he sometimes uses abbreviations based on German, and it sometimes took me a while to puzzle out what he meant.*

I wouldn't expect you to change your mind based on the above, nor do I think you should – yours is a legitimate point of view, but I don't share it in all respects. The preceding is only aimed at showing that a case can be made for some possible alternatives.

Both readers offer quite a bit of additional insight and we appreciate them taking the time to share their thoughts.

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September 14-15	Performance Measurement Attribution Training	Boston, MA (USA)	September 4
September 14-15	CGIPS/ CIPM Principles Preparation Class	Boston, MA (USA)	September 8
September 18-19	Introduction to Performance Measurement Training	Los Angeles, CA (USA)	September 11
September 20-21	Performance Measurement Attribution Training	Los Angeles, CA (USA)	September 11
September 25-26	CGIPS/ CIPM Principles Preparation Class	Princeton, NJ (USA)	September 22
October 9-10	Introduction to Performance Measurement Training	New York, NY (USA)	October 2
October 11-12	Performance Measurement Attribution Training	New York, NY (USA)	October 2
October 18	Fixed Income Attribution Symposium FIA	Philadelphia, PA	October 17
October 23-24	Introduction to Performance Measurement Training	Dallas, TX (USA)	October 16
October 25-26	Performance Measurement Attribution Training	Dallas, TX (USA)	October 16
November 9-10	Performance Measurement Forum	Milan, Italy	November 3
November 14-15	Introduction to Performance Measurement Training	Portland, OR (USA)	November 7
November 16-17	Performance Measurement Attribution Training	Portland, OR (USA)	November 7
Nov. 30 - Dec. 1	Performance Measurement Forum	Orlando, FL (USA)	November 24
December 5-6	Introduction to Performance Measurement Training	Chicago, IL (USA)	December 1
December 7-8	Performance Measurement Attribution Training	Chicago, IL (USA)	December 1

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