PERFORMANCE PERSPECTIVES
with David Spaulding

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A FUNDAMENTAL RULE OF CONTRIBUTION (ABSOLUTE ATTRIBUTION)

I was recently asked to review a client's implementation of contribution. While they were employing a transaction-based approach, they failed to tie out to the total return.

Recall that the basic equation for contribution is: $c_i = w_i r_i$

where:
c = the security or sector's contribution effect
w = the security or sector's weight for the period
r = the security or sector's return for the period
i = the specific security or sector.

$$\sum_{i=1}^{n} c_i = R$$

And, the expectation is:

where:
n = the number of securities or sectors
R = portfolio return.

That is, the sum of the individual contribution effects should equal the portfolio's return.

This is what we might call the "holdings-based" approach to contribution. A problem arises when there are transactions: we will usually not be able to tie out to the return if there are trades or cash flows. Therefore, we must adjust both the weight (to account for changes from trades or cash flows) and the return. Once we do this, we should be able to tie out.

$$c_i = \left(w_i + \sum_{j=1}^{m} f_j \right) r_i = w_i' r_i$$

where:
f = cash flow
j = the jth flow for security or sector i
w' = the adjusted weight.

However, in this particular case, we couldn't. I took a look and found something that previously hadn't struck me: the sum of their cash flows did not equal zero. Why should they have equaled zero? Well, since there were no external flows, I expected that the internal flows should all cancel out, resulting in them equaling the sum of the external flows, and in this case that would be zero.

The particular portfolio I was given to review was basic enough in that we would have expected there to be no issues with reconciling to the return:

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- no external flows
- a few trades
- a few dividend payments received
- all long positions.

Because there were no external flows, the portfolio's return was extremely simple to derive:

$$R = \frac{V_E}{V_0}$$

where:
V_E = Portfolio's value at the end
V_0 = Portfolio's value at the beginning

In this case, if the sum of the internal flows is not zero, it would be impossible for us to tie out.

But why? We should be able to see some math behind this assertion; I'll try.

The following statement should hold:

$$\sum_{i=1}^{n} r_i \neq R$$

That is, to obtain the portfolio's return, we cannot simply add the returns of its individual sectors or securities. This is probably obvious.[1] In order to get anything like this to work, we need to include each security's (or sector's) weights, which we do here:

$$\frac{\sum_{i=1}^{n} v_i r_i}{\sum_{i=1}^{n} v_i} = \sum_{i=1}^{n} w_i r_i = \sum_{i=1}^{n} c_i = R$$

where:
v = the beginning value of the individual security or sector.

A security or sector's weight is for the start of the period, and is arrived at by dividing its starting value by the total portfolio value (or, the sum of all the security or sector weights). Note that in this expression, we rely only on the individual security (or sector) returns and weights, and these weights are based on what they started the period with. I.e., we do not include cash flows.

If there are internal flows, then we must adjust the weights to account for them. Thus, we modify the first term of this equation slightly, in order to capture the flows:

$$\frac{\sum_{i=1}^{n}\left(v_i + \sum_{j=0}^{m} f_j\right) r_i}{\sum_{i=1}^{n}\left(v_i + \sum_{j=0}^{m} f_j\right)}$$

1 If not, send me a note and I'll explain.

Speaking of new rules…asset owner guidance

John Simpson did a "guest blog" post[6] for me on the proposed changes to the asset owner guidance statement. He and Ashley Reeves sat through a webinar on the topic; I wasn't able to, so asked John to put this piece together.

The draft has been published,[7] and the public comment period is open through October 29, 2016.

We will host a webinar on October 10 at 11 AM EST to discuss the changes as well as to provide comments from a few asset owners. To learn more, please contact Patrick Fowler (PFowler@SpauldingGrp.com).

6 http://www.spauldinggrp.com/draft-revisions-gips-asset-owner-guidance-statement-planned/

7 https://www.gipsstandards.org/standards/Documents/Guidance/exposure_draft_public_comment_revised_asset_owner.pdf

Recall that the denominator in this expression is the portfolio's starting value. Meaning:

$$\sum_{i=1}^{n}\left(v_i+\sum_{j=0}^{m}f_j\right)=V_0$$

In our portfolio's case, there are no cash flows, meaning that the sum of the beginning values of the sectors or securities has to equal the total portfolio value. I.e.,

$$\sum_{i=1}^{n}\left(v_i+\sum_{j=1}^{m}f_j\right)=\sum_{i=1}^{n}v_i=V_0$$

It therefore follows that the sum of the internal flows must equal zero.

I don't believe it is difficult to see that we can easily extend this to the broader statement that the sum of the internal flows has to equal the sum of the external.

There's probably a bit more math here than we really need, but I hope I made my point.

Internal flows that are not also external flows must "pair off":

	Cash	Affected Security
Buy	Outflow	Inflow
Sell	Inflow	Outflow
Income	Inflow	Outflow

And internal flows that are external will only be represented a single time within the portfolio (that is, for subportfolio returns):

	Cash	Affected Security
Transfer in, deliver in, free receive		Inflow
Transfer out, deliver out		Outflow
Contribution	Inflow	
Withdrawel	Outflow	

While we're on the subject of cash flows, I occasionally see firms include all flows (internal and external) when they calculate returns at the portfolio level. First, this should be a waste of time, since the internal have to cancel each other out, so why bother? Second, sometimes the pairing off doesn't work, in which case there are problems with the calculation.[2]

I think that it's time for our segment of the industry to acknowledge the existence of "fundamental laws." I have attempted this in the past, with, for example, the "laws" I crafted for relative attribution.[3]

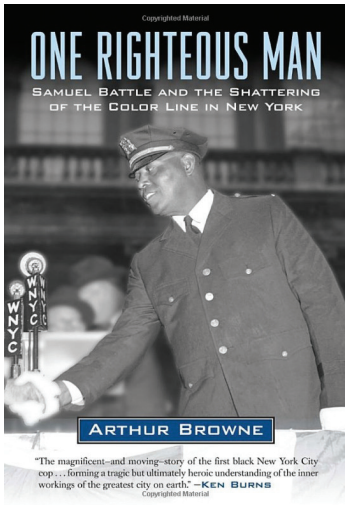
2 Not long ago I was asked to do a "non-GIPS" verification for a client. I discovered that their software used all flows. But it quickly became clear that they didn't pair them off, which resulted in, for some unknown reason, an error that was most often, by far, biased in the positive direction, thus their returns were overstated: not a good thing.

3 (1) That the attribution model used should align with the investment process; (2) that the sum of the attribution effects should equal the excess return (the major issues here are the use of holdings-based models, which typically result in residuals (i.e., cases where the sum of the effects doesn't equal the excess return) and the use of geometric models, which require a smoothing factor to get the numbers to tie out (but of course here we're not talking about summing but rather multiplying); (3) that the sum of the linked attribution effects should equal the linked excess return (which, for arithmetic models, requires a smoothing factor).

BOOK REVIEW

"One Righteous Man: Samuel Battle and the Shattering of the Color Line in New York"

by Arthur Browne



I suspect that the name "Samuel Battle" is unknown to most Americans. It turns out that he was the first black person to become a police officer in New York City. This hardly seems to be sufficient reason for a biography, but the biography is much more than that, and quite good.

New York seems to have stood almost alone among northern cities at the start of the 20th century; Philadelphia, Chicago, Boston all had integrated police forces, as did the major cities of New Jersey (Trenton, Camden, and Newark), NYC's neighbor. At that time, Brooklyn was an independent city, and had black officers, though they were not permitted to actually be police officers: they were cops in name only.

Samuel Battle chose to pursue the goal of becoming a police officer, mainly because of the benefits it would bring to him and his family, though it was quite a challenge. Not only did he become the city's first black cop, but also its first black sergeant and lieutenant.

The book proceeds along multiple tracks. Along with telling the story of Battle and his struggles with the city's police department, he tells the story of Wesley Williams, who became the city's first black fireman.

Beyond these stories, the author provides background on the struggles of black people throughout the nation at that time: it is quite difficult at times to stomach the abuse many received. He also provides quite a bit of interesting trivia. For example, while we know that it was Jackie Robinson who broke the "color barrier" in baseball, most of us don't know who did it in football: Kenny Washington and Woody Strode, who were members of the 1939 UCLA Bruins' "Gold Dust Trio." They signed with the LA Rams. What's particularly interesting is who the third man of this "Trio" was: Jackie Robinson!

Also, it turns out that the polio epidemic began as a result of improvements in New York City's health program: by doing such a good job cleaning things up, children weren't exposed to the virus that protected them from getting the disease, a clear case of unintended consequences.

The author also provides the reader with a back story of Battle's attempt to get Langston Hughes to write his biography.

The book is well written, interesting, and informative. I recommend it.

KEEP THOSE CARDS & LETTERS COMING

We appreciate the emails we receive regarding our newsletter. Mostly, 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.

BRIEF RECAP: GIPS ANNUAL CONFERENCE

Once again, The Spaulding Group sponsored the GIPS Annual. And, I was there (I missed last year's). While I didn't sit in on all of the sessions, I did pick up a few "tidbits" that are worth sharing with you.

While there wasn't a "2015" edition, there apparently will be a 2020, and plans are already in the works to have the draft available in 2018. Changes will include a restructuring of the Standards, which seems like quite a monumental task to me.

I've never seen a document with a section zero before,[4] so perhaps that will go away. There's talk of combining real estate and private equity into the body of the document: that should be interesting, too.

Several new guidance statements are coming, including one on risk. Risk is such a challenging area, it will be quite intriguing to discover what's proposed.

There are plans to expand the use of the internal rate of return, something I've favored for about two decades. We had a client several years ago who managed exactly the same way as a private equity manager:

- closed end partnership
- controlled the cash flows
- got involved with (or at least had some influence over) the management of the companies they invested in.

The only difference was they invested in public, not private equities. To me, this was kind of a "if it walks like a duck, talks like a duck,..." scenario, that screamed for the IRR. However, the governing body didn't agree with me on this.

I tweeted[5] that I didn't understand what difference it is for a fund to be closed or open ended, either. Recall that the requirement for IRR with private equities only applies to closed end funds. Why?

We can expect proposed revisions to the Verifier Independence guidance, that will spell out in a bit more detail what verifiers cannot do. I'm aware that some verifiers push the envelope a bit on independence, so having further rules should prove helpful.

We will also see suggested changes to supplemental information, that will include a change to make the requirement for supplemental only applicable to information contained within the actual composite presentation. I think this is a great idea, and look forward to the draft.

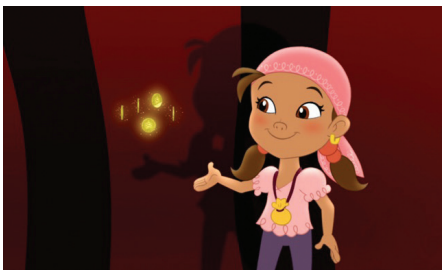
These drafts are expected in 2017, meaning it will be a busy time for us to review and comment!

4 The reason for this is an interesting one. The 2005 edition introduced it, since it was felt that some preliminary material was needed. Rather than renumber the sections (e.g., I to II, II to III), they just added a zero.

5 https://twitter.com/DSpauldingAtTSG/status/778938116568715264

Coin	Label	Opposite
1	LLL	HHH
2	HHB	LLB
3	LLH	HHL
4	HBH	LBL
5	LBB	HBB
6	HBL	LBH
7	LHL	HLH
8	HLB	LHB
9	LHH	HLL
10	BLL	BHH
11	BHB	BLB
12	BBL	BBH
13	BLH	BHL

PUZZLE TIME



July Puzzle

Recall that this month's puzzle came from the *Wall Street Journal*[8]; it's titled "The Old Coin Game."

In the Palace of Mystery, a barker announces "Step right up," calls one of the performers. "I have here 14 authentic gold doubloons. Ah, well, I cannot tell a lie – one of the doubloons might not be authentic, but for sure the leftmost one is. If there's a fake doubloon, it's either heavier or lighter than a real doubloon, but I can't remember which. Here's a two-pan balance scale. You can put any coins you like on either side, and it will show you whether the left group of coins is heavier, lighter, or the same weight as the right group of coins. I'll bet you I can determine whether there is a counterfeit coin, and if iso, which one it is and whether it is heavier or lighter, using the scale fewer times than you do."

How many times must they use the scale to be guaranteed to identify the possible counterfeit?

I'll confess that the solution is far from obvious. Here it is, taken directly from the source.[9]

The Old Coin Game. Just three weighings always suffice to determine whether there is a fake coin and if so, which one it is and whether it is lighter or heavier. How is that possible? One must take care to use all of the possible outcomes of the weighings; each time, either the left-hand pan can be lighter (L), heavier (H), or they can balance (B). So a possible outcome, for example, would be LBH, meaning that on the first weighing, the left-hand pan would be lighter, on the second they would balance, and on the third weighing they would be heavier. We want to arrange the coins on each weighing so that each outcome means something different. There are $3\times3\times3 = 27$ possible outcomes, and we have to distinguish 27 possible states: no fake, or each of thirteen coins being lighter or heavier ($1 + 13\times2 = 27$ also; note the 14th coin we already know is genuine). The clever idea is to label each coin with the outcome that will identify it as counterfeit, and then also use the labels to figure out which pan to put it on each time. So for example, if we put the coin labeled LBH on the left hand side for the first weighing, off the scales altogether for the second weighing, and on the right-hand side in the last weighing (to try to make the left-hand pan heavier than the right), and if that's the only coin in each of those conditions, then if the weighings actually come out as LBH, we know that coin is fake and lighter. What if it is heavier? That flips everything, so an outcome of HBL would tell us that this coin is the fake and it is heavier than a real coin. So we have to be careful, we can't use any label and its opposite label, otherwise they would clash on the outcomes. To find a set of labels with no interference between the label of one and the opposite of another, we make a table, attempting to be systematic (see accompanying table).

8 "Varsity Math." *The Wall Street Journal*. July 2-3, 2016. Page C13.

9 http://momath.org/home/varsity-math/varsity-math-week-43/

This month's puzzle

I've taken this month's puzzle from a new group I've joined on Facebook:

Hope you like it!

OK, so we have used up all of the possible outcomes, except for "BBB" which will correspond to the case that there is no fake, so everything always balances because all of the coins weigh the same amount. There is just one problem left; the above labels for the coins ends up with five coins in the left pan and four coins in the right pan on every weighing, which will clearly always make the left pan come out heavier. In order for the balance to be able to respond to one coin being slightly off, we must have the same number of coins on each side. Fortunately, we have the 14th known, good coin: we simply leave that on the right-hand pan as a counterweight through all of the weighings. Now when we perform the weighings, if it comes out as one of the labels, that coin is lighter; as the opposite of one of the labels, that coin is heavier, and as "BBB", the coins are all fair.

I was apparently not the only one stumped by this, though our friend, Anthony Howland, did submit the correct response. Here is his submission:

As I seem to be running out of time this month, I will go for the easy answer.
The question simply asks how many times, and not how to achieve the result.

So, the answer is 3 … Why? Well …

There are 13 coins each of which could be lighter or heavier - thus 26 possible results.

Each weighing has three possible outcomes (Heavier, Lighter, Same) and from each of these outcomes, a new branch is made in the decision tree.

After three outcomes (optimally chosen), there could be a total of 27 results - enough to deduce which of the 26 possible results is correct.

I am assuming that it is possible to make this optimal choice and I guess the proof of that is somewhat more complex.

So … there's the answer to the problem - possibly lazy, possibly just efficient!

THE SPAULDING GROUP'S 2016 INVESTMENT PERFORMANCE MEASUREMENT CALENDAR OF EVENTS

DATE	EVENT	LOCATION
November 3-4	Performance Measurement Forum	Barcelona, Spain
November 16	Asset Owner Roundtable Meeting	Austin, TX (USA)
November 17-18	Performance Measurement Forum	Austin, TX (USA)
December 6-7	Fundamentals of Performance Measurement	New Brunswick, NJ (USA)
December 8-9	Performance Measurement Attribution	New Brunswick, NJ (USA)
February 14-15, 2017	Fundamentals of Performance Measurement	Chicago, IL (USA)
February 16-17, 2017	Performance Measurement Attribution	Chicago, IL (USA)
March 7-8, 2017	Fundamentals of Performance Measurement	San Francisco, CA (USA)
March 9-10, 2017	Performance Measurement Attribution	San Francisco, CA (USA)

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CE Qualified Activity CFA Institute

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