PERFORMANCE PERSPECTIVES
with David Spaulding

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IS MIDDAY OR INTRADAY CASH FLOW TREATMENT ACCEPTABLE?

I touched on this subject in a recent blog post,[1] but as with many such topics, more is needed. In fact, this may end up reaching an "article" level!

Let's begin, as they say, at the beginning.

Peter Dietz introduced his "Original Dietz" formula in 1966:

$$R_{OriginalDietz} = \frac{V_E - V_B - \sum C}{V_B + 0.5C}$$

Where:

- V_E = Ending value
- V_B = Beginning value
- C = Cash flows

As a result of his doctoral thesis research project, he found that many pension funds were using inappropriate methods to evaluate their managers, including the Internal Rate of Return (IRR). He felt that it was unfair and inappropriate to use a method that took cash flows into consideration, and so came up with a method to reduce their impact. This formula is quite simple, and perhaps so because of the lack of technology in 1966 (access to computers was highly limited, and there was no software available to accomplish this task). Since many who wanted to measure performance would do so by hand, we have a method that weights the flows at the middle of the period.[2] He referred to this approach as his "midpoint" method, since the flows are weighted halfway through the period.

Modified Dietz as an "approximation method"

A few years later he introduced his "day-weighted" method. It is a slight refinement to his original, which yields a more accurate result, though still an approximation of the true or exact time-weighted rate of return. The method today is called "Modified Dietz."

$$R_{ModifiedDietz} = \frac{V_E - V_B - \sum C}{V_B + \sum WC}$$

Where:

- W = the weighting factor.

1 http://www.spauldinggrp.com/is-midday-cash-flow-treatment-acceptable/

2 The "period" back then might have been a month, a quarter, or even a year.

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UPCOMING ARTICLES

The weighting factor is used to "weight" the flow, based on when it occurs during the period. Its formula comes in two forms:

$$W_{End-of-Day} = \frac{CD - D}{CD}$$

$$W_{Start-of-Day} = \frac{CD - D + 1}{CD}$$

Where:

- CD = number of Calendar Days in the period
- D = the day of the flow.

Modified Dietz as an Exact Method

The Bank Administration Institute (BAI), in their 1968 performance measurement standards white paper, identified the "Exact Method" as the ideal way to derive a time-weighted return, as it completely eliminates the effect of cash flows. With this approach, the portfolio is revalued whenever a cash flow occurs. They recognized that the likelihood of this occurring to be quite remote, given the state of technology and access to security prices at the time, so settled on an approximation method themselves as an alternative. Their approximation method uses the Internal Rate of Return in a manner quite similar to Modified Dietz. They called it the "Linked IRR," though today we generally refer to it as "Modified BAI."

Well, today's technology and access to pricing is such that many firms revalue their portfolios on a daily basis, so the once illusive Exact Method is easier to achieve. And while there are a few ways to do it, one common approach is to employ Modified Dietz. And here, the Weighting Factor (W) is set to either "1," for start-of-day treatment or "0," for end-of-day treatment of the cash flows.

The confusion about what "W" means (or, t he shock of learning that its meaning depends on the formula's application!

When we employ Modified Dietz on a monthly basis, the "W" factor is used as a timing mechanism; that is, it day-weights the cash flow so that we take into consideration *how long* the money was available for investment.

For the exact method, however, it has a totally different meaning. It does not mean "how long the money was around," or "when the flow appeared during the day." This is something that until this very moment really hasn't been spelled out. And I have come to recognize this, as a result of various conversations I've been engaged in, and so think that's it's a concept that has to be understood, in order to fully appreciate the difference in the daily (exact) vs. the monthly (approximation) employment of Modified Dietz.

BOOK REVIEW: IKE AND DICK

by Jeffrey Frank

I love history, politics, and biographies, so this book had a lot of appeal for me. I knew that the relationship between President Dwight David Eisenhower ("Ike") and his vice president, Richard M. Nixon, were strained, so I wasn't surprised by many of the book's revelations.

Nixon is a complicated character, who didn't do himself much good by many of his actions. And while his presidency opened many doors, it also carried with it the stigma of criminality. But this book isn't about his presidency; rather, it's about Ike's.

I've read a variety of books on World War II, and so have some understanding of Ike's leadership during the European campaign. I can't say why, exactly, but I am not as enamored with him as many others are. To me, the heroes of that war were the ones on the ground, not those who were primarily in the background.

As for his presidency, I'd say it was somewhat lackluster. And his treatment of Nixon was, in a word, deplorable.

Nixon learned from Ike's chief of staff, Walter Bedell Smith, who also served in that capacity during the war, that Ike didn't like to do the tough jobs, like reprimanding or firing. Instead, he would turn to others for that, and Nixon, like Smith, was often the one chosen. This isn't necessarily an unusual trait for leaders, but it speaks to the man, I believe.

I have come away from the book with increased dislike for Ike, and greater sympathy for Nixon. It is well written, not tedious, and quite revealing. I recommend it.

In case of the exact method, the question really boils down to this: was the money that came eligible to be invested? That is, could the manager spend the money? Not, did they choose to or not, but rather, did they have the ability to invest it?

If the manager learns of a cash flow at the start of the day, clearly they have the ability to invest it. But what if they learn about it at noon, or 2:00 PM, or five minutes before the close? Well, in theory they should be able to invest it at any of these times, but there may be factors at work that actually don't allow them to invest it.

In an earlier discussion on this topic, I was told of a manager whose policy was only to make purchases at the start of the day. And so, if money became available after 11 AM, it would not be spent, and so would always be treated as an end-of-day flow. That seemed quite reasonable to me.

But if the manager has a policy that any funds that become available at any time during the day, prior to 3:30 PM, for example, could be invested, then any such flow needs to be treated as start-of-day.

Why not weight the flow based on when it occurred? Because the daily application of Modified Dietz is not an approximation method: it's an exact method.

Let's consider this example. A portfolio starts the day with $100,000 that's invested in a single stock valued at $10 a share. An inflow of $50,000 occurs, and is immediately invested in this same stock, also at $10 a share. At the end of the day the stock price has risen to $12. What's the return? The following table provides the results, using three cash flow timing methods.

		Returns, based on how cash flows are treated		
		Mid-Day Treatment	Start-of-day treatment	End-of-day treatment
V_B	100,000	24.00%	20.00%	30.00%
CF	50,000			
V_E	180,000			

It should be evident that the correct return is 20.00 percent, since the stock price rose from $10 to $12.

- The end-of-day approach resulted in a return that is overstated. The cash flow is ignored (by carrying a weight of zero in the denominator), meaning that the entire gain for the day ($30,000) was attributed solely to the start-of-day value.
- The midday cash flow method gave us a return that is also overstated. Since the gain attributed to the cash flow was only applied to half of its amount (because a weight of 0.5 was used in the denominator), we get an overstatement.
- The start-of-day approach gave us the correct result. It attributed the gain from the flow to the full amount of the flow (by using a full weight of 1.0 in the denominator).

Some firms elect to go with the midday approach, thinking that it's a nice compromise between the start- and end-of-day methods. Others think that if the firm is informed of the flow around the middle of the day, then the midday weighting would seem to be appropriate.

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One software vendor we know of actually supports multiple daily weightings that range from 0.0 to 1.0 (i.e., 0.0, 0.1, 0.2, ... 0.9, 1.0). This is, in my view, a clear indication of the confusion as to what the "W" represents. They are attempting to treat it in a daily method in the same manner that we would treat it monthly. But again, we're not employing Modified Dietz as a "daily approximation," but rather a "daily exact" formula.

In the above example we recognize that the investment of the $50,000 cash flow resulted in a $10,000 gain. We also know that the portfolio's starting value ($100,000) resulted in a $20,000 gain. In total, there was appreciation for the day of $30,000. If we separate them into two parts we have:

$$Gain_{FromStartingValue} = \frac{20,000}{100,000} = 20\%$$

$$Gain_{FromCashFbw} = \frac{10,000}{50,000} = 20\%$$

$$Gain_{Total} = \frac{30,000}{150,000} = 20\%$$

If, by chance, the flow occurred at or about noon, would we want to treat the flow as a midday event? Absolutely not, because since we were able to invest it, we want all of it to be factored into the formula, and any gain/loss attributable to it to be joined with the gain/loss that came from the rest of the portfolio. And, if the flow occurred at 3:30, we wouldn't want to use a factor of something like 0.1, since the money was only around for a small percentage of the day.

Were we able to invest the funds? Yes. Did we? Yes. And so, the full weight of the flow must be captured.

Can I prove that there's a difference between the "W" in approximation methods and the "W" in exact?

It's quite simple. Let's say that in the above example, you want to weight the flow based on when it occurred during the day. Okay, so you may want to vary it from 0.1 to 0.9. And what do you get?

W=0.1	W=0.2	W=0.3	W=0.4	W=0.5	W=0.6	W=0.7	W=0.8	W=0.9
28.57%	27.27%	26.09%	25.00%	24.00%	23.08%	22.22%	21.43%	20.69%

Would you really want to use one of these returns, knowing that in reality the return is 20.00 percent? These are all *approximations* to the true return; and that true return is readily available if you simply recognize that unlike a monthly application, the weight doesn't speak to *when* the flow occurred.

Why a portfolio with only a single security?

I chose to use this very simple example to make a point.

Are there many portfolios with a single security in it? Probably not. But, that's not the point. By using something simple like this, the meaning of the appropriate way to treat the "W" factor could be conveyed.

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.

Of course, I could have used a portfolio with 20 or 50 securities, with varying changes in market value during the day, and a flow that was invested in several different securities, some that gained, some that lost, and some that didn't change by the close of trading.

But why, to make it more realistic? What's the point of that?

We're talking about explaining a formula and why the "exact" approach is very different from the "approximation." Let's not complicate a situation.3

In conclusion

Do not confuse what "W" represents in Modified Dietz.

- Approximation approach: W is a day-weighiting factor, to time the flow during the period
- Exact approach: W indicates whether the flow was available to be invested (=1) or not (=0)

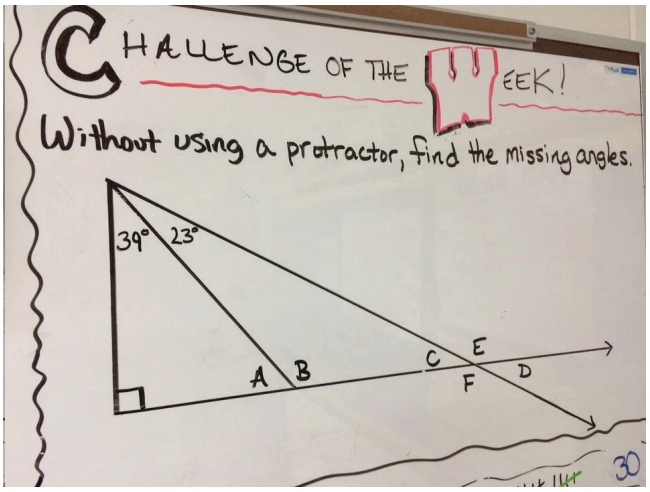
Any fractional use of W in a daily application is simply wrong, and the reflection of a misunderstanding as to what W represents. The result will be an error.

Make sense? Let me know what you think.

PUZZLE TIME

Since the July edition was delayed a bit, and in order to avoid a similar delay with this one, it's going out before we've given our readers the chance to try the puzzle. And so, we will provide the solution for it, along with the solution to this month's puzzle, in our September issue.

But, as for this month's, please try this:



3 Interestingly, one individual who was critical of this example is a fan of Occam's razor (the "rule of simplicity").

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October 16-17, 2017	Fundamentals of Performance Measurement	Los Angeles, CA
October 18, 2017	PMAR West Coast	Los Angeles, CA
October 19-20, 2017	Performance Measurement Attribution	Los Angeles, CA
November 9-10, 2017	Performance Measurement Forum	Rome, Italy
November 14, 2017	Asset Owner Roundtable	Orlando, FL
November 15-16, 2017	Performance Measurement Forum	Orlando, FL
December 2017	Performance Measurement for Non-Performance Professionals Webcast	
December 11-12, 2017	Fundamentals of Performance Measurement	New Brunswick, NJ
December 13-14, 2017	Performance Measurement Attribution	New Brunswick, NJ

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