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Comments on Decision Based Performance Attribution

Northfield Information Services Commentary

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Question: How can performance attribution procedures be adjusted to reflect the specific strategies being employed for a particular fund?

Many investment organizations have asserted that for performance attribution studies to be meaningful, the analytical framework has to be built around the specific investment strategy being employed. Notable proponents of this view include Andre Mirabelli of Opturo and David Spaulding of Spaulding Group. This concept is often referred to as "decision based" attribution. The idea is that while standard models such as those from Northfield may explain what's going on in financial markets to make securities behave as they do, our selection of factors may not be what a particular investor uses as criteria for decisions. It is argued that you want to build your attribution process around the user's variables.

It is my view that there is merit to this argument, but it is often problematic in practice because the user's decision process is not constant across time or because the investment decision process is not entirely transparent. Even when a pension fund hires an external active manager, it is rare that the plan sponsor understands the investment process in sufficient detail to allow for a decision based approach.

However, if the investor decisions can be specified in a path dependent order, there is a fairly tractable procedure we can follow. For example, imagine we first make a decision about how much to invest in stocks and how much in real estate. Our second decision for stocks is which sectors to invest in. Our second decision for real estate is what type of properties we want. Our third decision for stocks is within each sector do we wish to invest in large companies or small. Our third decision for real estate is whether we want to invest in the US, Asia or Europe. Once this ordered procedure is known, a mathematical representation of it can be constructed. It's easy to do as long as all the decisions are based on membership groups (stock/property, sector, large/small, US/Asia/Europe). It's much messier if the decisions are based on truly continuous variables such as P/E or Market Capitalization. *One way around this difficulty is to define groups within continuous variables as we do in our attribution system's stratification reports.* Many managers have this sort of stepwise process, but many others use multiple variables in a simultaneous fashion to create explicit forecasts of expected returns.

There is one way to look at this issue that allows for "decision based" attribution within our existing performance attribution software without any modification at all. Consider the following example:

An investor has a portfolio that consists of both stocks and bonds. The benchmark is 60% of the S&P 500 and 40% of the Barclays (formerly Lehman)

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Aggregate Bond index. The investor's decision process is:

1. Determine a mix of stocks and bonds (S and B)
2. Within stocks determine weight across five defined sector groups, G1 through G5
3. Within bonds determine a weight mix of corporate bonds and government bonds (CB and GB)
4. Within each of the five stock sectors, pick stocks we like
5. Within government bonds determine a mix of short maturity government bonds (GBS) and long maturity (GBL). Within corporate bonds determine a mix of short maturity corporate bonds (CBS) and long maturity corporate bonds (CBL)

Now we do some algebra that builds the ordered nature of the decision tree into the attribution. We'll define some new factors for our model that reflect the user's decision variables in terms of their return time series:

Let
$U_{1t} = S_t - B_t$

Where
U_{1t} = the return on user factor 1 during period t
S_t = return on the stock index during period t
B_t = return on the bond index during period t

So our first factor is just the excess return on stocks relative to bonds. Our decision of how much money to put in stocks or bonds is predicated on capturing this difference. Similarly we'll define the return to the various equity sector groups (noted as G1 through G5) as "excess" return relative to stock market as a whole.

$U_{2t} = G_{1t} - S_t$
$U_{3t} = G_{2t} - S_t$
$U_{4t} = G_{3t} - S_t$
$U_{5t} = G_{4t} - S_t$
$U_{6t} = G_{5t} - S_t$

We follow the same process for bonds, expressing returns to the two bond types (noted as CB and GB) as excess returns relative to the overall bond index

$U_{7t} = CB_t - B_t$
$U_{8t} = GB_t - B_t$

Now within each bond type, we capture our maturity preferences as an excess return to the bond type sub-indices (noted as CBS and GBS for short maturities, CBL and GBL for long maturities).

$U_{9t} = CBS_t - CB_t$
$U_{10t} = CBL_t - CB_t$
$U_{11t} = GBS_t - GB_t$
$U_{12t} = GBL_t - GB_t$

So we've created twelve new factors that reflect the user's decision process. Once we have calculated the twelve factor return times series, we need only specify which securities belong to which groups (factor exposures are either zero or one). Calculation of attribution reports then proceeds based on the user defined factors of their decisions. The portions of returns not explained by the specified factors will represent the return to security selection within the stock and bond portfolios. If we pursue this process, the user defined variables can also be included in the multivariate "impact" reports that are part of our attribution system.

The problem with this approach is that it is a very incomplete picture of how risky a portfolio might be, so judging the statistical significance of an attribution result is sort of impossible without a very long time sample of return observations. It also needs to be noted that some factors can be difficult to represent, and might not have an index that includes them and that a bottom up process will not work with this approach. The investor knows whether their decisions were successful or not, but doesn't have any idea what kind of other biases or risks might have been inadvertently introduced to the portfolio by this decision process. To get around this problem, we can add these new factors to an existing Northfield risk model. I'll cover the math of how to do this in an upcoming report.