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White Paper: In investments, nobody wants stale numbers

Investments

In investments, nobody wants stale numbers: **Evaluate alternative assets from a fresh perspective!**

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Executive Summary

Preamble

Allocation to alternative asset classes such as private equity, infrastructure, real estate and unlisted credit seems to be gaining ever more traction globally. In the US, private assets have become the #1 asset class in recent times, with allocations increasing from about 4% to around 20% for institutional investors over a 20-year period (Willis Towers Watson, February 2018). Locally too, we've seen a similar trend amongst retirement funds.

Why all the hype? It would seem that alternatives have become an increasingly attractive asset class primarily for their potential for superior returns, access to a liquidity premium and diversification benefits, all offsetting the relative complexities.

But all is not as simple as it would seem as regards the allocation to alternatives, in the context of a balanced portfolio. If you want to build better portfolios, you need to go about it with scientific rigour and an explicit (robust) process.

In this article we show you how to achieve a better informed, more realistic picture than you would ordinarily achieve through simply including alternative assets at face value. We do this specifically by adjusting for stale and infrequent pricing to reveal the unobserved volatilities and relationships, adjusting the estimations and, in so doing, building smarter portfolios.

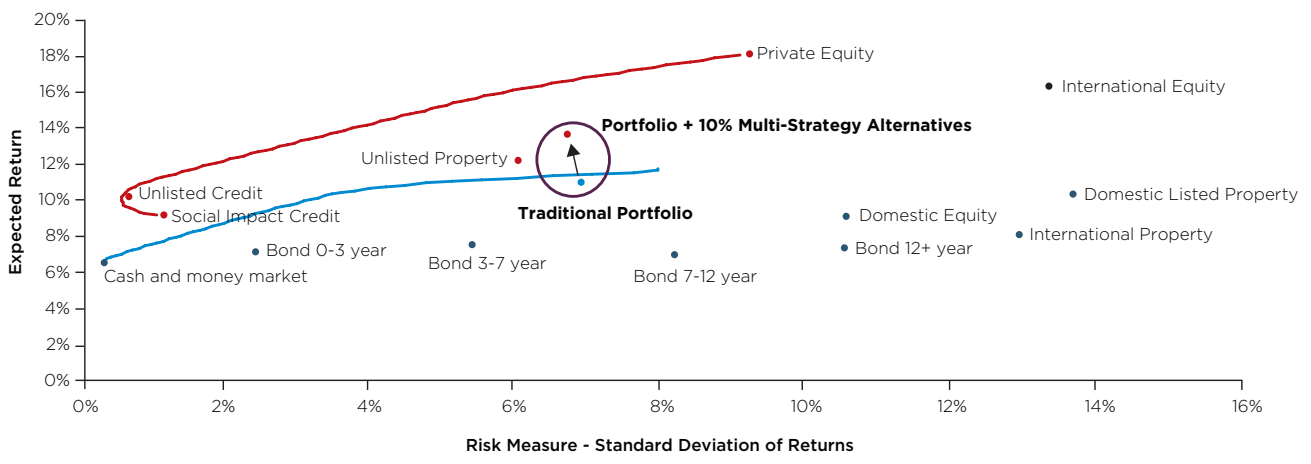
Introduction

The inclusion of alternative assets into institutional investment portfolios has gained traction over the last couple of years. Common arguments in support of this have largely centered around the following two claims:

- Alternatives increase the overall expected portfolio returns by offering positive (above benchmark) returns.
- Alternative assets carry strong diversification benefits, i.e. the additional returns that alternative assets generate are, to some extent, unrelated to the returns generated from traditional assets.

These claims are backed up when one assesses the opportunity sets of investments (the "efficient frontier") of traditional (listed) assets versus alternative (unlisted) assets and compares them naïvely:

Efficient Frontiers: Traditional Portfolios - Reg 28 compliant (BLUE) vs Alternatives Portfolios (RED)
Demonstrating the impact of the inclusion of a 10% multi-strategy alternatives portfolio



Part of this naïveté of simplistically including alternatives comes from the estimation of the inputs (means and covariance matrix) used to generate the opportunity set. The expected volatility of the returns of alternative assets and, more importantly, their co-movement (correlation) with traditional assets is often subject to the analyst stepping on what we could call a "statistical minefield". More specifically, alternative assets exhibit considerable asymmetry of information through the following (note, this is not an exhaustive list):

1. **Stale pricing:** because of the time lag due to the quarterly pricing of unlisted (alternative) assets, the price or asset values reported over certain evaluation periods do not reflect the most current market information of the underlying assets, and don't reflect the interim volatility that you would see in listed assets which are priced daily or even intra-daily. In effect, reported returns are likely to have been smoothed and are unrepresentative of realistic market conditions.
2. **Limited trading/transactions** of the underlying assets, which makes any market-to-market valuations unrealistic and often subjective.
3. **Survivorship bias:** only those funds that have survived are considered as part of the investable universe of assets, while failed funds are often not included. This would make a certain class of alternative assets appear more attractive than they otherwise should be.

In this research paper, our primary objective is to show how investors can deal with this phenomenon of inaccurate pricing by utilising several robust statistical techniques that are both intuitive and easy to explain. Furthermore, we also consider the important subjects of how to compare alternative (unlisted) assets with their traditional asset counterparts by adjusting for stale pricing, and how to 'unsmooth' perceived returns and introduce the unseen volatility. In short, how do we compare a private equity fund subject to stale pricing, with a listed equity fund?

Methodology and results:

To date, the question of stale pricing in academic literature has been relatively sparse with the majority of the work done on real estate assets. A general (conceptual) framework was given by (Geltner, 1991) where he showed how to undo the effects of smoothing (appraisal-based returns). Following this, the work of (Connor, 2003) showed how the basic model by (Geltner, 1991) could be extended to any arbitrary alternative asset, and he included real examples to illustrate his point. A different approach for mutual funds was developed by (Qian, 2011) where the stale pricing component was explicitly broken down into different segments and subsequently analysed.

After considering all the techniques found in the academic literature, we developed variations of the statistical techniques used, and we therefore now present two approaches that can be used. The fundamental premise is that for every alternative asset subject to stale pricing, we hypothesize that there are two processes. The stale prices observed constitute a **"smoothed" asset price process (SAP)** while the actual **real (unobserved) asset price process (RAP)** is the process we are actually trying to estimate.

The link between the processes is simple and intuitively given by:

$$SAP = \sum_{n=1}^{N} RAP_{t-n} * Wt\text{-}n$$

The formula simply states that smoothed (observed) prices are related to the actual prices by simply smoothing them as a weighted sum of the previous *N* prices. The weights, w_{t-n}, are assumed to be constant and add up to one. The key challenge for us rests on estimating the weights as this will allow us to correct the volatility of alternative assets and, more importantly, correctly estimate the co-movement (covariance) of an alternative asset with its traditional counterpart. The estimation of the weights is where we utilise two methods.

The first method simply uses the stale prices and measures how "stale" they are. The measure of this "staleness" is given by what statisticians call the autocorrelation function. This function is needed to determine the values called autocorrelations and to determine how many of them there are, i.e. the value of *N*. From there on, the methods of (Connor, 2003) can be used to derive the weights. It must be noted that this not a trivial task and requires multi-objective optimization techniques to accurately estimate the weights. Our contribution is designed to make this process more robust and improve upon Conner's estimates considerably.

The second method assumes that every alternative asset has an appropriate counterpart in the traditional asset space. Here the weights are inferred by the traditional asset's price process and by using the SAP (smoothed asset price) process. The exercise involves using a regression equation where the betas to the lagged traditional asset prices are determined, and then the weights are inferred from those betas. This process is iterative until we find the maximum number of time periods we have to go in order to determine *N*. More precisely:

$$SAP = \beta_O + x_1 * \beta_1 + \cdots + x_N * \beta_N$$

The x_i represent the traditional asset prices, and for example x_2 represents the second lagged traditional asset's return, i.e. the previous two periods' return. From here the weights are simply:

$$W_i = \frac{\beta_i}{\beta_O + \beta_1 + \cdots + \beta_N}$$

The key differences between the above two methods represent different methods of thinking about alternative assets and what would be a suitable basis to account for stale pricing. Generally, the first method is likely to work for most cases and the second method can generally be employed in formulaic appraisals, i.e. the smooth process depends on a market value of some traditional asset (which is typically seen in property valuations).

As a practical example, we will look at a Sanlam Private Equity Fund[1] and compare this to the Shareholder Weighted All Share Index (SWIX) using both methods. We have performed the comparison for the time period **30 April 2010 to 31 January 2018**, assuming monthly returns on both indices. The following table details the weights and some statistical analysis:

Lag Length	Autocorrelations	Weights Method 1	Weights Method 2
0	100.00%	19.17%	13.06%
1	0.82%	0.56%	0.00%
2	22.58%	80.27%	86.94%

We can also compare the effects on the covariance structure for each of the estimators:

	Original	Method 1	Method2
Standard Deviation of Returns	8.85%	10.73%	10.07%
Correlation Coefficient of Returns	-2.29%	-9.98%	-15.44%

What this means in practical terms is that for the first method, the volatility of the Private Equity Fund has been increased from 8.85% to 10.73%, and for the second method the increase has gone up to 10.07%. Correspondingly, the correlation coefficient between the Private Equity Fund and the SWIX has decreased from -2.29% to -9.88% for the first method, and for the second method the figures are from -2.29% to -15.44%.

The weights given in the above table can also be used to adjust the correlation and covariance structures between the Private Equity Fund and other assets.

"The main take-away from this example is that by addressing the issues of stale pricing, we have effectively found a method that more accurately represents the true volatility of the fund and its relationship with the market".

Comparison of alternative to traditional assets using different valuation periods with embedded stale pricing:

A challenge in evaluating alternative assets is the comparison of daily returns from traditional assets to quarterly data from alternative assets. Clearly it is easy to simply aggregate the daily data into quarterly data and then, after adjusting for stale pricing using either method presented, compare the time series.

The problem, however, is that by using this approach, information is lost in the aggregation procedure. As an example, having three monthly returns of -2%, -1, 5% aggregated gives 1.8% over a quarter. If there are many such positive and negative months, then the aggregation procedure may result in the volatility being understated (note that no adjustment needs to be made to the returns).

To remedy the situation, it might be easier to aggregate up the estimated volatility (typically of the traditional asset) by using the "square root of time" rule (for a far more superior method, see (Gencay, 2004)) for use in the covariance matrix.

The greater problem with the covariance matrix is not the volatility but the correlation of the traditional asset versus the alternative asset. As such, low frequency estimation (i.e. monthly and quarterly data) of any correlation coefficient measures will be unstable. Our proposed method for dealing with this consists of estimating the correlation coefficients as is and then using these estimates as part of a full covariance re-estimation.

[1]Source: Sanlam Investment Management

Conclusion:

We have shown that by applying a simple method, we are able to adjust for stale pricing that may occur when investing in alternative assets. We have proposed two methods that can be used and have shown by a simple example that they should be comparable. The effect of our method is to show that actual (but unobserved) asset volatilities can be corrected and, by extension, increased, and a slight correction will be made to the correlation structures that exist between listed and unlisted assets. This will then give us a rigorous basis for including alternative assets into traditional portfolio.

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