

# BORN Free

**Benchmark hedging liberates your risk budget.**

BY TRISTRAM LETT

**BENCHMARK** hedging, a process designed to reduce the investment risk in a benchmark, is not new. However, doing it successfully and efficiently is. This article has two parts: in the first we explore the process of benchmark hedging and how it is possible to efficiently implement the process. As well, we look at the benefits it provides. We then move on to put this into an important context—the use of hedge funds in institutional portfolios. This has some unexpected conclusions for those who have recently become interested in this topic. We then circle back and compare the strategy being proposed at the outset to the use of hedge funds and outline both the similarities and differences of the two approaches.

Suffice it to say at the moment, benchmark hedging is of interest for a very simple reason—it frees up risk budget.<sup>1</sup> Who would not want that flexibility? Investors then have more choice and more choice improves their welfare. The extra risk budget can be spent in whole or in part, or hoarded. Whatever one does with it, it is from the perspective of improving their circumstances. An obvious benefit to plan sponsors is the increased investment flexibility it provides.

## **DISTRIBUTION REPLICATION**

A recent development in portfolio management called distribution replication promises a viable solution to providing a means to efficiently and cheaply allow plan sponsors to remove risk from their investment portfolios without impairing their return. Lest one think that talking about return distributions is unnecessarily abstract, consider this thought. When investors

are hiring an investment manager, exactly what are they hiring? It is the manager's distribution and the underlying processes that create it. Hiring a manager is mostly about liking the mean, the standard deviation and other statistical characteristics of the manager's return distribution. Distribution replication is all about synthetically creating distributions that replicate desired statistical characteristics.

The means to accomplish this was initially developed by Professor Harry Kat and a former PhD student of his, Dr. Helder Palaro. The Kat/Palaro (K/P) process can create a custom distribution of returns on demand through a dynamic trading strategy using futures on well-known, very liquid financial markets such as equities, bonds, currencies and commodities. Dynamic trading strategies structured to replicate option payoffs have been around for over 20 years. What makes the K/P method unique is its ability to target correlation to some benchmark or bogey.

The ability to target correlation is a significant step forward because it allows investors to place powerful diversification features in their portfolios. The question now is what use can we put this distribution creation process to?

## **BENCHMARK HEDGING**

Most of the risk in institutional investment portfolios is benchmark risk. It can be expressed as a composite beta created from the weighted betas held in the asset mix policy of the fund. The average Canadian pension fund has a benchmark comprised of the following weighted betas: 40% DEX Universe Index, 35% TSX 60 Index, 12.5% MSCI EAFE Index and 12.5% S&P500 Index, all expressed in Canadian dollars.<sup>2</sup>

One point that needs to be made clear is the amount and

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Tristram Lett is managing director, Absolute Return Strategies, Integra Capital Corporation.

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kind of investment risk that exists in the average Canadian benchmark. On a capital allocation basis, 60% of the benchmark is exposed to equity risk.<sup>3</sup> However, on a risk allocation basis over 90% of the investment risk is equity risk. This fact alone should be sufficient for institutional investors who wish to examine ways to reduce the risk in the benchmark.

Many plan sponsors set tracking error limits (risk budgets) around the various betas to accommodate active management to earn incremental return. The benchmark portfolio has a return distribution that should meet the plan's liability funding requirements in as efficient a manner as possible. It has a mean, a standard deviation, skew and kurtosis that describe it. Over the past 28 years, from January 1980 until December 2007, the average Canadian pension benchmark, rebalanced monthly to its initial weights, had an annual average return of 11.5%, a standard deviation of 9.0%, skew of -0.40 and excess kurtosis of 1.8. If it is possible to create a similar portfolio synthetically through a dynamic trading strategy with no correlation to the benchmark portfolio, has something valuable been created?

Indeed it has. This portfolio can be implemented as an overlay to hedge the benchmark portfolio, by creating a portfolio invested 50% in the benchmark and 50% in the synthetic portfolio.<sup>4</sup> This would have significant risk-reducing properties, because of the lack of correlation between the two portfolios. This diversification would free up risk budget, which can be spent or hoarded, or some combination.

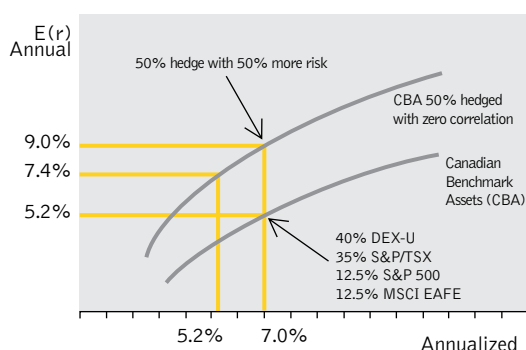
Examine the following set of efficient frontiers to appreciate what is occurring. We used the monthly seven-year data set from October 2000 to September 2007 to run the out-of-sample test.<sup>5</sup> We specified that the distribution of returns was to have a standard deviation of 7.0%, similar skew and kurtosis as the benchmark and zero correlation with the benchmark. The lower efficient frontier represents that of all the assets that Canadian pension funds invest in. We assume that the average asset mix is on the efficient frontier where indicated, though that is not necessarily true. During this period, it had the indicated risk and return coordinates.

The upper efficient frontier is derived from mixing a like portfolio in all cases but with zero correlation in a 50/50 combination with all other asset mix combinations. Point A represents where the average Canadian asset mix, now hedged 50/50 with the synthetic portfolio, sits. Over this period, the combined portfolio had a 5.2% standard deviation with a 7.4% average return. The higher return is peculiar to the sub-period and is not the portfolio expectation over the longer term. Theoretically the hedged portfolio should have the same mean, but a lower risk.

The plan sponsor now has a range of choices. It can stay at this position and enjoy the lower total fund volatility relative to its benchmark. Or, it can "spend" some or all of its 1.8% freed-up risk budget (7.0% - 5.2%) to further improve its performance. We tested this by increasing the standard deviation of the hedging portfolio by 50%, leaving all other characteristics constant. This had the effect of increasing the risk of the hedged benchmark to 7.0%, the risk in the original benchmark, but it also led to an increase in performance of 1.6% to 9.0% (Point B). At the margin, each unit of additional risk from the initial hedged position produced 0.88% of incremental return.

The range of options shows the benefit from benchmark hedging. This flexibility born from employing a zero correlated replicant has great value to any investor.

**FIGURE 1**  
Canadian Benchmark Assets (October 2000 - September 2007)



# INVESTORS ARE TRYING TO POSITION THEMSELVES ON THE RIGHT-HAND SIDE OF THE DISTRIBUTION. DOING SO INVOLVES A HIGH DEGREE OF SELECTION RISK.

## THE SYNTHETIC HEDGING PORTFOLIO

The synthetic hedging portfolio is constructed from very liquid futures exposures in major markets. The most common ones used are Eurodollars (LIBOR), five-year Treasury Bonds, 10-year Treasury Bonds, S&P 500, Russell 2000, FTSE 100, DAX, Nikkei 225 and GSCI. Most of the positions are long, but some are short from time to time to ensure the creation of the desired risk profile and correlation. Never is the portfolio net short. Small trades are made daily as it adjusts itself to the changing risk characteristics that emerge in the marketplace in order to maintain its position versus the specified characteristics and correlation.

Two very important implications result from the structure of the hedging portfolio, plus a number of ancillary benefits. First, the exposures used are all markets which earn risk premia and therefore have a distribution of returns with a positive mean. In other words, they are beta-based distributions.

Second, the correlation is far less likely to “phase lock” like the correlations with alpha-based strategies. This is one of the more problematic characteristics of well-diversified portfolios of alpha generators: whenever there is a market crisis, all the carefully crafted diversification disappears just when it is needed the most. Other benefits of the synthetic portfolio are its complete transparency, its immediate liquidity, its low fees and the lack of headline risk.

## WHAT IS ALPHA?

Hedge funds are being carefully considered by institutional investors for inclusion in their portfolios. However, a number of their characteristics are proving daunting for them. Lack of transparency and liquidity, high fees, phase-locking correlation and potential headline risk are the most often cited. Hedge funds are marketed as sources of alpha. Below we explore the nature of alpha because it is often misconceived. The role of alpha in a portfolio is not unlike what the benchmark hedging process is accomplishing. Alpha is not generally thought of as a risk management tool, but that is its central role in portfolio management.

Alpha is not always well understood. Regard the yellow distribution (Figure 2), and ask the question, “what is it that investors will pay fees of 2 and 20 for in the alpha

distribution?” This distribution has a mean of 0%, a standard deviation of 3.5% and a correlation with almost all other assets/strategies of zero.

Now regard the gray distribution (Figure 3). This distribution has a mean of 10%, a standard deviation of 14% and a correlation greater than 50%, with many other assets/strategies. The yellow distribution can be acquired for a fee of 2 and 20, the gray for a fee of under 10 basis points. Which one would you want in your investment program?

Surprisingly, both, because the lack of correlation that accompanies pure alpha makes it a superior diversifying asset, particularly with the higher-risk beta component. Dr. Martin Leibowitz said at a recent conference, “any uncorrelated asset in a portfolio is gold.”<sup>6</sup> Because we seek this and wish to employ it in portfolios, it means that we are all risk managers. As long as the alpha earns a premium to the risk-free rate, we are better off.

But as Hamlet noted in his oft-quoted soliloquy, “ay,

FIGURE 2  
Distribution of Alpha Returns

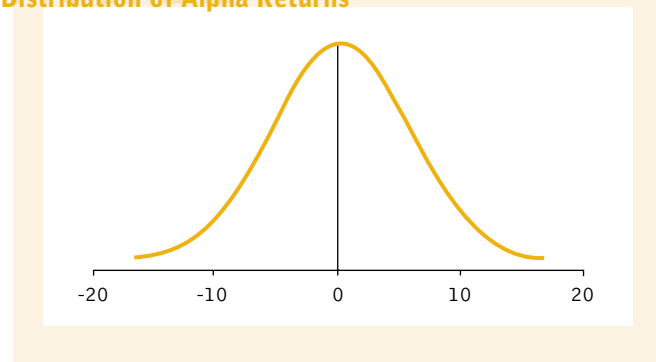
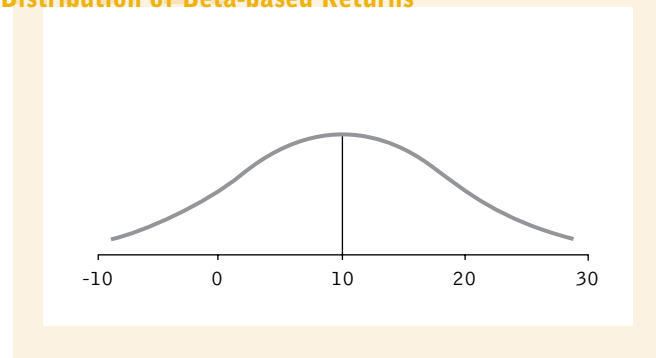


FIGURE 3  
Distribution of Beta-based Returns



there's the rub." Alpha is not lying in fields waiting to be harvested. It is very difficult to create, thus it is very special. And thus it has special value. Look back at Figure 2, the alpha distribution. Note again that its mean is zero. This means that the production of alpha is a zero sum game. For every winner, there must be a loser. The only way winners gain from losers is through the anonymity of the marketplace because no loser would willingly take a loss. Investors are trying to position themselves on the right-hand side of the distribution. Doing so involves a high degree of selection risk.

As noted earlier, the alpha distribution of returns also has a number of characteristics that makes fiduciaries uncomfortable. Lack of liquidity, lack of transparency, gating, high fees and headline risk all are difficult for fiduciaries to countenance in the context of the selection risk they are taking.

Essentially what has occurred through the advanced dynamic trading strategy of Kat/Paloro is the creation of a portfolio from blue distributions that has the desirable characteristic of a positive mean and the even more valuable characteristic of the alpha (yellow) distribution of zero correlation with everything. This makes it a superior risk management tool to alpha. But is it alpha?

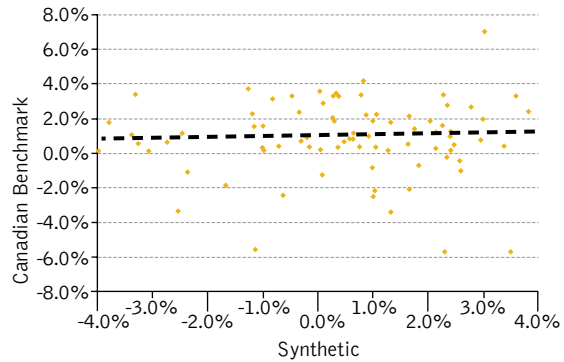
The following scattergram plots the synthetic hedging fund against the average Canadian pension fund benchmark. It is readily apparent there is no correlation. The broken regression line confirms the near zero beta and the positive alpha. From a statistical point of view it is alpha created from dynamically managing betas.

Of course there will be those who argue this is not alpha, as it was created by a passive, mechanical strategy. We are sympathetic to those arguments, but in the end who really cares? Certainly not the investor. If he can get a distribution of returns with a positive mean, controlled variance, stable zero correlation, total transparency and liquidity, and reasonable fees, why would he care what greek letter it bore?

Institutional investors now have a choice of how to manage benchmark risk in their portfolios. They can seek out pure alpha sources, mindful of the inherent selection risk they are employing in their portfolios to remove some of the beta risk. Or, they can use the synthetic portfolio creation process of Kat and Paloro to do the same thing but without the attendant baggage that hedge funds bring to the party.

Each has drawbacks which plan sponsors must decide between if they plan to go this route. The K/P process, because it is proprietary, will never be fully transparent

**FIGURE 4**  
**Canadian Benchmark versus Synthetic Hedging Portfolio Returns**  
 (March 1995 - September 2007)



to its users. Comfort can only be gained by talking to other users and doing simulations. However, this is now a process with which institutional investors are familiar when hiring managers. In the end, the value to plan sponsors in hedging their benchmark beta risk is significant. Gaining the flexibility to better tune their investment program in order to meet their objectives is the result. ■

#### ENDNOTES

1. Freeing up risk budget is the equivalent of saying that investment risk has been reduced. Many plan sponsors set a risk target for their investments (the budget) and allow a certain latitude or variance around it called tracking error (which can also be budgeted). This variance is to allow for the production of alpha.
2. The Canadian equity component in the average asset mix has been falling lately in response to changes in the foreign property rule and is expected to continue to fall.
3. During the period 1984-2004, equity risk averaged 15% standard deviation and long bond risk 5% standard deviation. In variance terms (the correct unit of measurement) equity risk is five times higher (225 units of variance) than long bond risk (25 units of variance).
4. This is not necessarily the optimal combination.
5. We chose this sub-period, because all the major futures markets that exist today are represented. Further, the system requires an additional 36 months of data to create the copulas which drive the correlation engine. Therefore the setup is initiated three years earlier.
6. Global Absolute Return Congress (ARC), Boston, October, 2007.

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