From Delivering to Packaging of Alpha

Designing hedge fund offerings that better fit investor needs.

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With today almost USD 1 trillion in assets under management, hedge funds have seen impressive growth over the past decade. Once only high net worth individuals invested in hedge funds, but the industry has come into the mainstream as more and more institutional investors have started at least to look at hedge funds as a distinct asset class.

Institutional investor interest comes as firms try to find ways to recover after dramatic downturns in the equity market. This is especially true where declining interest rates have increased liabilities at the same time that assets have shrunk.

From a conceptual standpoint, hedge funds are nothing but vehicles that allow investors to gain access to the benefits of very active investment strategies that were once accessible only to investment banks through proprietary trading activities. Hedge funds can be seen as the ultimate organizational form for such strategies, as they have a flexible legal structure, are regulated very little, and give strong incentives for manager performance. This organization allows for freedom in investment decisions, to include using derivatives and leverage, short-selling, and investing in illiquid securities. Hedge fund managers typically do not have to tie their performance to a reference benchmark, such as a market index or a peer group of managers. This is a notable difference from most mutual funds.[1]

Providers of these investment vehicles do not lack for arguments as to why investors should try to gain exposure to hedge funds. While researchers seem to agree that hedge funds are valuable investment alternatives, the lack of transparency of hedge fund strategies means there are still many institutional investors who wonder whether they should invest in hedge funds, and, more important, how they should invest. The classic argument of hedge fund providers—that they provide investors with access to skilled managers—does not necessarily reveal how well these products actually meet investor needs with respect to their preferences and liability constraints.

Institutional investors tend to prefer non-linear payoffs because of the non-linear nature of the liability constraints they face (see, for example, Draper and Shimko [1993]). This is particularly the case for institutional investors whose portfolio value must at all cost exceed some given value, but above that they can accept reasonable risks. For a pension fund, for example, a small change in the probability of extreme contribution rates is typically considered much more important than an equal change in the probability of an extremely high refund.

We argue that the hedge fund industry should adopt a consumer (investor)-driven perspective rather than its current producer (manager) perspective, and we call for a new type of offering with characteristics better suited to the needs of institutional investors. Using active bond portfolio management as an example, we present evidence that hedge fund managers can use derivatives not only to generate and deliver abnormal performance (alpha benefits), but also to package such performance in a way that is consistent with the modern core-satellite approach to institutional portfolio management. We also introduce a dynamic extension of this approach, which leads to a non-linear unsymmetrical control of tracking error risk—in essence a convenient way to allow investors to benefit from an option based on hedge fund managers' skills.

PERFORMANCE OF BOND TIMING ROTATION STRATEGIES

Active bond portfolio managers can implement active strategies based on active views on interest rate changes. If they think interest rates will drop, they will lengthen the duration of their portfolio so as to optimize capital gains. If they think interest rates will rise, they will shorten the duration of their portfolio so as to minimize the exposure of the portfolio to interest rate risk.

There is actually now a consensus in empirical finance that expected asset returns, and also variances and covariances, are to some extent predictable. Pioneering work on the predictability of asset class returns in the U.S. market includes Keim and Stambaugh [1986], Campbell [1987], Campbell and Shiller [1991], Fama and French [1989], and Ferson and Harvey [1991].

While the performance of tactical style allocation models is well documented in equity markets, a considerable research suggests that similar levels of predictability can be found in bond markets. The literature on predictability in bond returns has first focused on timing bonds versus stocks or bonds versus cash, not on the timing of bonds with different maturities. The objective has been to exploit predictability in a global bond portfolio and hence in the *level* of interest rates, not to try to exploit predictability on other dimensions of the shape of the yield curve such as *slope* and *curvature*.[2]

More recently, researchers have recognized the benefits of exploiting predictability in the shape of the yield curve. Dolan [1999], for example, argues that the curvature parameter of the yield curve can be predicted with simple parsimonious models, and shows that these forecasts have investment significance in the selection of bullet over barbell portfolios. Diebold and Li [2005] estimate autoregressive models for predicting Nelson and Siegel [1987] level, slope, and curvature factors. Fabozzi, Martellini, and Priaulet [2005] test for statistical significance in the predictive power of a series of economically meaningful variables, and find strong evidence of predictability in changes in the slope of the yield curve using such variables.

Bond indexes and futures with different maturities perform somewhat differently in different times and under different economic conditions, and there is evidence of predictability in these patterns. As a result, one may be able to implement a strategy that generates abnormal return from timing between different-maturity subindexes, using multifactor models for the returns on bond indexes, where the factors are chosen to measure the many dimensions of financial risks (market, volatility, credit, and liquidity risks).

The use of predetermined variables to predict asset returns has produced new insights into asset pricing models, and the literature on optimal portfolio selection has recognized that these insights can be exploited to improve on policies based upon unconditional estimates. For example, Kandel and Stambaugh [1996] argue that even a low level of statistical predictability can generate economic significance, and abnormal returns may be

EXHIBIT 1
Tactical Style Timing Portfolio

	Portfolio Risk and Return Analysis				Benchmark
Hit Rate	100.00%	75.00%	70.00%	50.00%	
Annualized Return	9.09%	6.42%	5.84%	3.54%	3.58%
Cumulative Return	66.56%	43.35%	38.61%	21.76%	22.11%
Cumulative Excess Return	44.45%	21.24%	16.50%	−0.36%	
Annualized Excess Return	5.50%	2.84%	2.26%	−0.04%	
Annualized Volatility	3.15%	3.21%	3.53%	3.54%	3.21%
Annualized Tracking Error	1.11%	1.76%	1.83%	1.95%	
Information Ratio	4.97	1.61	1.23	−0.02	

attained even if the market is timed successfully only one of 100 times.

We attempt to outline the benefits of bond maturity rotation strategies for European fixed-income investors. We use monthly data over 1993–2003 for two European broad-based bond futures, the Euro Bund and Euro Schatz futures, to show how systematic maturity rotation strategies can generate significant outperformance.

We focus on futures based on short-term and long-term notional contracts rather than a medium-term notional contract (the Euro Bobl), because it is well known that bond portfolios with relatively similar duration are typically very highly correlated, and predictive models work better when applied to dissimilar asset classes (see, for example, Martellini, Priaulet, and Priaulet [2003]).

Base Case Experiment

To assess the performance of a maturity style timer with various levels of forecast ability, we calculate the profit generated by investing 100% at the beginning of each month in the Euro Bund or Euro Schatz futures with the highest return in the next month. Exhibit 1 shows the performance of a tactical style timer over January 1999–August 2004.

In this experiment, 100% of the portfolio is invested in the best-performing contract with various degrees of predictive ability depicted by hit rates ranging from 50% (no predictive ability) to 100% (perfect timing). For hit rates lower than 100%, the winning months are drawn randomly in the sample period. The benchmark is invested at 50% in each futures contract, and theoretically available cash is invested in the risk-free asset (EONIA: Euro OverNight Index Average); rebalancing occurs at the beginning of each month to bring the allocation back to neutral.

The performance of a style timer with perfect forecast ability who has invested 100% of a portfolio at the beginning of the year in the best-performing style for the year generates an impressive information ratio of 4.97. Of course, the assumption of perfect timing ability is not realistic. Realistic performance for a successful style timer might be a hit rate of around 70%. This produces 2.26% excess return and 1.83% annual tracking error with respect to the equally weighted benchmark, which results in an information ratio equal to 1.23 (see Grinold and Kahn [2000] for an empirical distribution of information ratios among active managers).[3]

Absolute Return Approach

Maturity rotation strategies can also be used to generate absolute return benefits. Exhibit 2 shows the performance of a strategy that simultaneously implements long-short positions generated by a style timer producing a 70% hit rate. A long position in the futures contract that is perceived as likely to outperform is combined with a short position in the futures contract perceived as likely to underperform while maintaining a zero duration.

Four levels of leverage are tested, from 1 to 4. In the case of leverage fixed at 1 (respectively, 2, 3, and 4), about 100% of initial capital is invested in the cash-equivalent (EONIA), and long-short positions together represent a 100% (respectively, 200%, 300%, and 400%) exposure in absolute value.[4]

Exhibit 2 suggests that the benefits of maturity rotation strategies can be implemented in an absolute return approach, with a substantial potential for outperformance, as can be seen from an excess return with respect to the EONIA rate. While outperformance naturally increases with leverage, the benefits of maturity rotation strategies are obvious even at modest leverage levels. Note that

EXHIBIT 2
Absolute Return Approach

Portfolio Leverage	1	2	3	4	EONIA
Annualized Return	4.10%	4.78%	5.44%	6.19%	3.37%
Cumulative Return	26.11%	30.98%	35.83%	41.61%	21.00%
Annualized Volatility	0.74%	1.41%	2.03%	2.76%	0.29%

such outperformance is generated with very little volatility.[5]

Introducing a Portable Alpha Strategy

Before the alpha benefits of the absolute return strategy can be transported to a portfolio reflecting an investor's strategic asset allocation, further adjustments need to be made to align its exposure with the exposure of the investor's benchmark. For the sake of illustration, we consider an investor with a core position invested in medium-term bonds, which could be achieved by trading the Euro Bobl futures contract.[6]

In Exhibit 3, we repeat the experiment as in Exhibit 2, except that we add an additional investment in the Euro Bobl futures contract equivalent to 100% of initial capital, fully collateralized with EONIA. The net exposure of the portfolio with respect to the bond market is thus identical to the exposure of the Euro Bobl futures contract, which is assumed to represent the investor's strategic bond allocation.

Three levels of leverage are tested, from 2 to 5. For example, with leverage fixed at 2, about 100% of initial capital is invested in the cash-equivalent (EONIA); exposure to the Euro Bobl notional contract comes to 100%; and long-short positions together represent a 100%; exposure in absolute value. Net exposure varies over time in order to maintain zero duration. Positions are rebalanced monthly.

BOND MATURITY ROTATION UNDER A CORE-SATELLITE APPROACH

The abnormal performance generated from maturity rotation strategies can be transported to a core portfolio invested in a broad-based index (possibly through a derivatives position) such as a medium-term bond index. We demonstrate how fixed-income derivatives can be used in the context of core-satellite portfolio management.

Most active managers still have dominant passive exposure to their benchmark. Instead of paying high fees on the passively managed part of their portfolio, the core-satellite approach suggests investing passively in a low-fee index fund (or an enhanced index product) as the core portfolio and also in a variety of satellite active managers with higher tracking error. In its purest form, this approach produces an investment in market-neutral managers who provide only portable alpha benefits without passive exposure to the index, so that they compensate active managers only for their abnormal returns, not for their passive exposure to rewarded sources of risk.

Bond Maturity Rotation Strategies as Portable Alpha Investment Vehicles

An absolute return version of the bond maturity timing strategy appears to be perfectly suited for investors who want to use hedge funds to add portable alpha

EXHIBIT 3
Absolute Return Approach— Adding Euro Bobl Futures Contract

Portfolio Leverage	2	3	4	EONIA	Euro Bobl + EONIA
Annualized Return	4.72%	5.40%	6.06%	3.37%	3.99%
Cumulative Return	30.22%	35.28%	40.33%	21.00%	24.91%
Annualized Volatility	3.38%	3.43%	3.59%	0.29%	3.47%

EXHIBIT 4
Core-Satellite Portfolio Management

Satellite		Portfolio Risk and Return Analysis
10%	Annualized Return	4.20%
	Cumulative Return	26.39%
	Cumulative Excess Return	1.48%
	Annualized Excess Return	0.21%
	Annualized Volatility	3.43%
	Annualized Tracking Error	0.20%
	Information Ratio	1.04
20%	Annualized Return	4.40%
	Cumulative Return	27.88%
	Cumulative Excess Return	2.97%
	Annualized Excess Return	0.41%
	Annualized Volatility	3.40%
	Annualized Tracking Error	0.40%
	Information Ratio	1.04
30%	Annualized Return	4.61%
	Cumulative Return	29.38%
	Cumulative Excess Return	4.47%
	Annualized Excess Return	0.62%
	Annualized Volatility	3.39%
	Annualized Tracking Error	0.60%
	Information Ratio	1.04

benefits to their long-only portfolio without modifying their passive exposure to a reference index, as it allows for a separate control on the tracking error of the satellite and core portfolios. This ensures that the overall portfolio is consistent with a target level of deviation with respect to the chosen benchmark.

Exhibit 4 shows the performance of a core-satellite portfolio approach. The core portfolio is invested passively in medium-term notional contracts (Euro Bobl futures) fully collateralized with EONIA, and the satellite portfolio is based upon a timing strategy on the short-versus long-term futures contracts (leverage fixed at 4, i.e., about 300% (in absolute value) in long and short positions in order to keep a zero duration at any time + 100% invested in cash-equivalents (EONIA) + 100% invested in Euro Bobl futures contracts).

We assume for the satellite portfolio a realistic 70% hit rate. Allocations to the satellite portfolio range from 10% to 30%. The results demonstrate that the alpha benefits can be successfully transported to a core portfolio reflecting the strategic asset allocation of the investor.

This analysis strongly suggests bond derivatives can be used to implement a very broad and thorough set of bond portfolio strategies. Investors can use them not only to create diversified core positions around which they can add value but also to implement their (satellite) active portfolio strategy.

Bond Maturity Rotation Strategies as Dynamic Core Portfolio Management

We can extend the core-satellite approach to a dynamic context, where we let the proportion invested in the active portfolio vary as a function of the current outperformance of the global portfolio with respect to the benchmark.

Tracking error is not necessarily bad. Like good and bad cholesterol, there is good tracking error—outperformance with respect to the benchmark—and bad tracking error—underperformance. If they severely restrict the amounts invested in active strategies as a result of tight tracking error constraints, investors obviously miss an opportunity for significant outperformance.

A methodology we introduce in Amenc, Malaise, and Martellini [2004] allows investors to gain full access to good tracking error, while holding bad tracking error to a reasonable threshold, using an optimal dynamic adjustment of the proportions of total wealth invested in the core versus satellite portfolios. This method can be seen as a natural extension of constant-proportion portfolio insurance (CPPI), originally designed to ensure absolute performance. In other words, the traditional CPPI technique, designed to ensure absolute risk management, continues to apply in a benchmarked portfolio management process, provided that the risky asset is reinterpreted as the satellite portfolio, which is riskier then the benchmark, and the risk-free asset is reinterpreted as the core portfolio, not risky with respect to the benchmark.

The method results in an increase in the proportion allocated to the satellite when the satellite has outperformed the benchmark. An accumulation of past outperformance increases the cushion, and therefore enhances the potential of a more aggressive (and hence higher tracking error) strategy in the future. If, on the other hand, the satellite has underperformed with respect to the benchmark, the method results in a tighter tracking error strategy (through a reduction in the proportion invested in the satellite portfolio) in an attempt to guarantee the relative performance objective.

More formally, we denote by $V(t)$ the portfolio value at date t, which consists of the sum of two components, a *floor* whose value is denoted by $F(t)$, and a *cushion* whose value is denoted by $C(t)$: $V(t) = F(t) + C(t)$. By definition, the floor value at any time t is given by $F(t) = k\%B(t)$, where $B(t)$ is the value at time t of the investor's benchmark portfolio, and k is the guaranteed level. For example, if $k = 0.95$, the method aims at ensuring that the value of the core + satellite portfolio never drops below 95% of the value of the benchmark (relative return guarantee).

As in traditional CPPI, the amount $A(t)$ invested in the actively managed satellite [whose value at time t is denoted by $S(t)$] is given at each decision date by $A(t) = mC(t)$, where m is the multiplier, while the remaining amount $V(t) - E(t)$ is passively invested in the investor's benchmark core portfolio [whose value at time t is denoted by $B(t)$].[7]

The portfolio value dynamics are expressed as:

$$dV_t = A_t \times \frac{dS_t}{S_t} + \left(V_t - A_t\right)\frac{dB_t}{B_t}$$

The dynamics of the cushion value are given by:

$$\begin{aligned} dC_t &= dV_t - dF_t \\ &= \underbrace{A_t}_{=mC_t} \times \frac{dS_t}{S_t} + \left(\underbrace{V_t}_{=C_t+F_t} - \underbrace{A_t}_{=mC_t} \right)\frac{dB_t}{B_t} - \underbrace{dF_t}_{=F_t \times \frac{dB_t}{B_t}} \end{aligned}$$

or:

$$\begin{aligned} \frac{dC_t}{C_t} &= \left(m\frac{dS_t}{S_t} + (1-m)\frac{dB_t}{B_t} \right) \\ &= \frac{dB_t}{B_t} + m\left(\frac{dS_t}{S_t} - \frac{dB_t}{B_t} \right) \end{aligned} \tag{1}$$

For simplicity, we now assume that both the actively managed satellite and the benchmark portfolio values are driven by geometric Brownian motions:

$$\begin{aligned} dS_t &= S_t \mu_S dt + S_t \sigma_S dW_t^S \\ dB_t &= B_t \mu_B dt + B_t \sigma_B dW_t^B \end{aligned}$$

where W_B and W_S are two standard Brownian motions, with correlation coefficient given by:

$$E\left(dW_t^S \times dW_t^B\right) = \rho dt$$

Equation (1) may thus be rewritten as:

$$\begin{aligned} \frac{dC_t}{C_t} &= \left[\mu_B + m\left(\mu_S - \mu_B\right)\right]dt + \\ &\quad m\sigma_S dW_t^S + (1-m)\sigma_B dW_t^B \end{aligned} \tag{2}$$

or:

$$\frac{dC_t}{C_t} = \mu dt + \sigma dW_t \tag{3}$$

where W is also a standard Brownian motion and:

$$\begin{aligned} \mu(m) &= \mu(m) = \mu_B + m\left(\mu_S - \mu_B\right) \\ \sigma = \sigma(m) &= \sqrt{m^2\sigma_S^2 + (1-m)^2\sigma_B^2 + 2m(1-m)\sigma_S\sigma_B\rho} \end{aligned}$$

The stochastic differential Equation (3) can be solved to yield:

$$C_T = C_0 \exp\left[\left(\mu - \frac{1}{2}\sigma^2\right)T + \sigma W_T\right] \tag{4}$$

or equivalently:

$$C_T = C_0\left[\left(\frac{S_T}{S_0}\right)^m\left(\frac{B_T}{B_0}\right)^{1-m}\exp\left[-m(1-m)\sigma_S\sigma_B\rho T\right]\right] \quad (5)$$

Equation (5) can be used to generate closed-form solutions for the first and second moments of excess return of the portfolio with respect to the guaranteed floor value:

$$E\left(\ln\frac{C_T}{C_0}\right) = T\left[\mu(m)-\frac{1}{2}\sigma^2(m)\right]$$
$$\mathrm{Var}\left(\ln\frac{C_T}{C_0}\right) = T\,\sigma^2(m)$$

From inspection of these equations, we note that:

- If $m = 0$, then $\mu = \mu_B$ and $\sigma = \sigma_B$, as it must be because the fraction invested in the actively managed satellite is zero, and the whole portfolio (floor + cushion) is invested in the benchmark index. On the other hand, if $m = 1$, then $\mu = \mu_S$ and $\sigma = \sigma_S$, as it must be since the investment in the satellite is exactly equal to the cushion value.
- If $m > 1$, then $\mu < \mu_S$ if $\mu < \mu_B$. This reflects the fact that it is not desirable that the average return on the actively managed satellite be lower than the expected return on the benchmark portfolio, as this can lead, for sufficiently high multiplier values, to a negative expected return μ that would result in a long-term decline in cushion value. On the other hand, when $\mu_S > \mu_B$, we obtain that the higher the multiplier value, the higher the expected return on the cushion position, but also the higher the cushion volatility.

Overall, this approach allows for dissymmetric management of tracking error, ensuring that underperformance of the portfolio with respect to the benchmark will be limited to a given level, while letting the investor gain greater access to excess returns that might be generated by the active portfolio. This can be measured in terms of the ratio of an *upside information ratio* (defined as the volatility of the excess return of the portfolio conditional on outperformance) and a *downside information ratio* (similar to downside risk: volatility of the excess return of the portfolio over the benchmark conditional on underperformance).

That ratio should be equal to 1.0 when tracking error is symmetrically distributed; it should be higher than 1.0 when the good tracking error is found to exceed the bad tracking error.

Exhibit 5 presents the results of the experiment in the case of a guarantee equal to 95% of the benchmark's performance and an active portfolio invested in a maturity rotation strategy with a hit rate equal to 70%.[8] Assuming that 100 million are initially invested in the strategy, we test from different values for the multiplier m ($m = 2$, 3, 4, or 5). The higher the multiplier, the more the investor will participate in a sustained relative increase in satellite versus core portfolio value. Yet the faster the portfolio value will approach the floor in case of a sustained decline in satellite versus core portfolio value.

As the cushion approaches zero, exposure to the satellite also converges to zero, which in principle (i.e., in continuous time) prevents the portfolio value from ever breaching the floor value. In practice, however, because of discrete trading, the portfolio value can fall below the floor value if there is a sharp decline in relative value before the investor has a chance to trade.

From this analysis, it appears that the optimal multiplier value should be a declining function of the relative risk of the satellite versus the core (i.e., the propensity for the satellite to severely underperform the benchmark) and an increasing function of trading frequency.

The performance in Exhibit 5 can perhaps best be understood by noting that the ratio of information ratios (upside IR divided by downside IR, in absolute value) is significantly higher than 1.0, and almost equal to 2.0, whatever multiplier value we use. This result suggests that good tracking error has been efficiently captured, while the level of bad tracking error has been kept at a reasonable threshold.

CONCLUSION

Although researchers seem to concur on the appeal of hedge funds as valuable investment alternatives, because of the lack of transparency of hedge fund strategies, many institutional investors wonder whether and how they should invest in hedge funds.

We argue that more meaningful hedge fund solutions can be designed if we recognize that the marketing and packaging of alpha is as important to investors as the delivery of alpha. That is, as the hedge fund industry is preparing to welcome a wave of institutional money, it will have to develop different products designed to meet

EXHIBIT 5
Performance of Relative Return CPPI

Guarantee = 95% of Benchmark Performance	Initial Cushion = 5 M€				Benchmark
68-Month Analysis					EONIA +
	m = 2	m = 3	m = 4	m = 5	
Satellite Leverage = 4					Euro Bobl
Satellite Initial Weighting	10%	15%	20%	25%	
Cumulative Return	26.52%	27.45%	28.47%	29.58%	24.91%
Annualized Return	4.22%	4.35%	4.49%	4.64%	3.99%
Annualized Volatility	3.42%	3.40%	3.38%	3.37%	3.47%
Annualized Excess Return	0.23%	0.35%	0.49%	0.65%	-
Annualized Tracking Error	0.22%	0.36%	0.51%	0.67%	-
Information Ratio	1.01	0.99	0.98	0.97	-
Upside Information Ratio	2.40	2.42	2.43	2.43	-
Downside Information Ratio	−1.25	−1.24	−1.23	−1.22	-
Ratio of Information Ratios	1.93	1.95	1.98	1.99	-
Net Assets as of 08/31/2004	126,386,815	127,130,197	127,877,185	128,627,792	-
Guaranteed Value as of 08/31/2004	118,665,278	118,665,278	118,665,278	118,665,278	-
Difference	7,721,537	8,464,919	9,211,908	9,962,515	-
Monthly Drawdown	−1.85%	−1.79%	−1.73%	−1.65%	−1.95%

different investors' needs on the basis of a given alpha-generation process.

Our illustrations suggest that futures and options allowing for the transformation of raw alpha into portable alpha can be used in the design of these products, which can be used in a modern core-satellite approach to portfolio management. Institutional investors may find a dynamic and non-linear version of this approach particularly appealing, as it would allow them to benefit from an unsymmetric control of tracking error risk and greater access to the potential benefits of abnormal returns generated by hedge funds, without all the associated risks.

ENDNOTES

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[1]Absolute return benchmarks (such as the risk-free rate plus *x* basis points) are typically used, however, and benchmarking of hedge fund returns though peer grouping is becoming more and more common.

[2]Research on tactical asset allocation decisions involving bond markets includes Shiller [1979], Fama [1981], Shiller, Campbell, and Schoenholtz [1983], Campbell [1987], Fama and Bliss [1987], Campbell and Shiller [1991], Ilmanen [1995, 1997], Bekaert, Hodrick, and Marshall [1997], Lekkos and Milas [2001], Baker, Greenwood, and Wurgler [2003], and Ilmanen and Sayood [2002].

[3]In the case of 68 observations (i.e., monthly observations between January 1999 and August 2004), a hit rate of at least 70% is significantly greater than 0.5 at the 0.5% level.

[4]Net exposure varies over time in order to always keep a zero duration. Positions are rebalanced monthly.

[5]Like Arnott and Miller [1996] or Amenc et al. [2004], we also test an option overlay portfolio that can serve a return enhancement purpose in trendless periods of the market cycle, typically difficult market environments for timing strategies. In untabulated results, we were able to show that the strategy with the suitably designed option overlay returns more than the one without the option overlay in 90% of the months when the Bund-Schatz spread is narrower than 1% in absolute value.

[6]The same approach can be adopted to transport the alpha benefits of the bond maturity rotation strategy to any benchmark portfolio.

[7]We assume throughout a constant multiplier value. The method can easily be extended to allow for a time-varying multiplier value.

[8]These results cannot be achieved using traditional active managers. This is because an institutional investor cannot easily and economically terminate, increase, or reduce the size of positions in a given manager; this can be done easily with futures. Another major benefit of futures in the context of dynamic asset allocation decisions is liquidity. Whenever the institutional investor needs to change the allocation to the core versus the satellite, it can do so very easily. That is much more difficult with traditional active asset management.

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