PART One

Active 130/30 Extensions and Diversified Asset Allocations

CHAPTER 1

Active 130/30 Extensions and Diversified Asset Allocations

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Virtually all asset allocations have risks that are dominated by a 90 percent or greater correlation with equities. This high correlation acts as an 800-pound equity gorilla lurking behind the multiasset façade of even the most diversified allocations. The dominance of equities as risk factors is generally known, but their many significant implications have yet to be fully incorporated into either the theory or the practice of investment management. One such implication relates to the opportunity for return enhancement from active extension (AE) 130/30 strategies.

Benchmark-centric equity strategies such as active 130/30 extensions aim to have tracking errors (TE) that are largely uncorrelated with equities. Within equity-dominated allocations, these uncorrelated TEs should have little impact on fund-level volatility risk. Positive alpha opportunities from these strategies can, therefore, be particularly valuable because they can significantly increase the fund's total return with only minor increases in the overall volatility or other forms of beyond-model risk. Moreover, because such strategies relate to the basic equity assets, they help minimize any stress beta effects from short-term correlation tightening.

Active extension strategies can be designed to fit within a sponsor's existing allocation space for active U.S. equity with TEs only moderately greater than that of a comparable long-only fund. The expanded footings can open the door to a fresh set of active underweight positions and provide a wider range of alpha-seeking opportunities for both traditional and quantitative management. AE mandates are often conversions of preexisting relationships in which the sponsor has grown comfortable with a manager's alpha-seeking skills, organization infrastructure, and risk-control procedures.

A growing body of studies has addressed the potential performance benefits that can be obtained by loosening the standard long-only constraint. The early work of Jacobs and Levy (1993, 1995, 1999, 2006) on risk-controlled, long/short equity portfolios created a body of literature that served as a foundation in this area. A further dimension was analytic framework for active management developed by Grinold (1989, 2005), Grinold and Eaton (1998), and Grinold and Kahn (2000a,b,c). In recent years, the 130/30 strategy has been the direct focus for an increasing number of theoretical studies, including key papers by Clarke, de Silva, and Thorley (2002, 2004, 2005) and Clarke (2005), with further contributions on this specific topic by Jacobs and Levy, Grinold and Kahn, as well as various studies by numerous other authors (Michaud, 1993; Arnott and Leinweber, 1994; Brush, 1997; Litterman, 2005; Markowitz, 2005; Bernstein, 2006; Emrich, 2006; Winston and Hewett, 2006). Two recent articles by Jacobs and Levy (2007a,b) provide a comprehensive review of how AE compares with traditional long-only and market-neutral strategies. The current authors have also published a series of papers from 2006 to 2007 on various topics related to AE (Leibowitz and Bova, 2006a, 2007f), including articles in the *Journal of Portfolio Management* (Leibowitz and Bova, 2007b) and *Journal of Investment Management* (Leibowitz and Bova, 2007d).

At the outset, it should be noted that there are important preconditions and cautionary points for achieving value-additive AE. First, the portfolio must be able to access positive long alphas. Second, it must have the risk discipline necessary to maintain the beta target and a reasonable level of TE. Third, the alpha productivity must be extendable into the short area. Shorting differs significantly from long-only management in a number of important ways, including higher transaction and maintenance costs, the available level and continuity of liquidity, the need for more intensive monitoring and risk control, and so on. To realize the potential benefits from AE, the management organization must also have the ability to establish short positions in a risk-controlled, operationally secure, and cost-efficient fashion.

The first section of this part describes the key features of AE strategies and highlights their ability to improve an equity portfolio's alpha at the cost of increasing TE. There are a number of considerations, such as position size limits, use of generics versus active positions, and so on, that come into play when analyzing AE strategies and that can affect the results. The second section discusses AEs from the point of view of the asset owner as a way to add alpha to the overall fund return with only modest increases in overall fund risk. The higher TE from AE can be shown to be largely submerged within the beta risk that dominates the volatility of the overall fund. Moreover, AE strategies should be able to avoid the equity-correlated TEs and stress betas that could complicate the risk structure of other forms of active management.

ACTIVE MANAGEMENT WITH ALPHA RANKING MODELS

In a benchmark-centric management process, a portfolio is structured to maintain a targeted beta relative to the stated benchmark. An active position is then based on the expectation of a positive return in excess of the security's beta-adjusted return. Portfolio managers generally have some formal or informal process for classifying these prospective active positions in a descending sequence based on their expected excess return. Alpha ranking models can be used to approximate such classifications. The base case ranking model in Exhibit 1.1 is based on an exponential alpha decay with a beginning alpha of 5 percent that declines to 1.5 percent by the 25th position.

An active position is established by assigning a differential weight to the security that is above (or below) its weight in the benchmark. Note that even in long-only portfolios, active positions can take the form of either overweights or underweights. However, the exposition is greatly simplified by treating the long-only active positions as if they were all overweights. The long-only portfolio, therefore, consists of 25 active positions, each having a 2 percent weight for a net activity level of 50 percent. The remaining nonproactive component of the portfolio is assumed to serve as a source of funds, as well as to help maintain the fund's target beta.

The alpha contribution of each active position is represented by the product of its alpha (from the alpha ranking model) and its 2 percent active weight. The sum of all such alpha contributions adds up to the expected portfolio alpha. As shown in Exhibit 1.2, for the 25 position long-only portfolio, the cumulative alpha attains a level of 1.5 percent.

The key for both fundamental and quantitative managers in moving from a long-only to an AE portfolio is to have some sort of alpha ranking system. For quantitative managers, this is quite easy because their models

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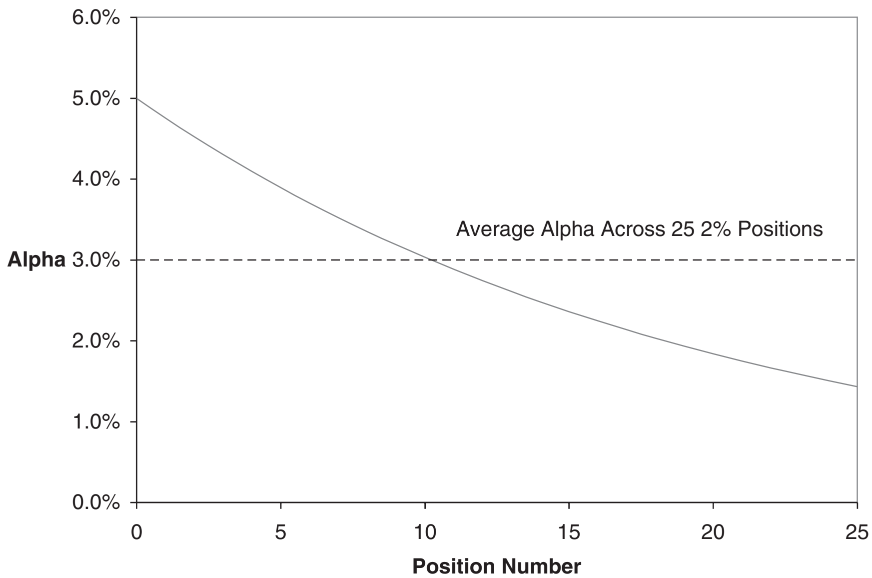

EXHIBIT 1.1 Alpha Ranking Model
Source: Morgan Stanley Research

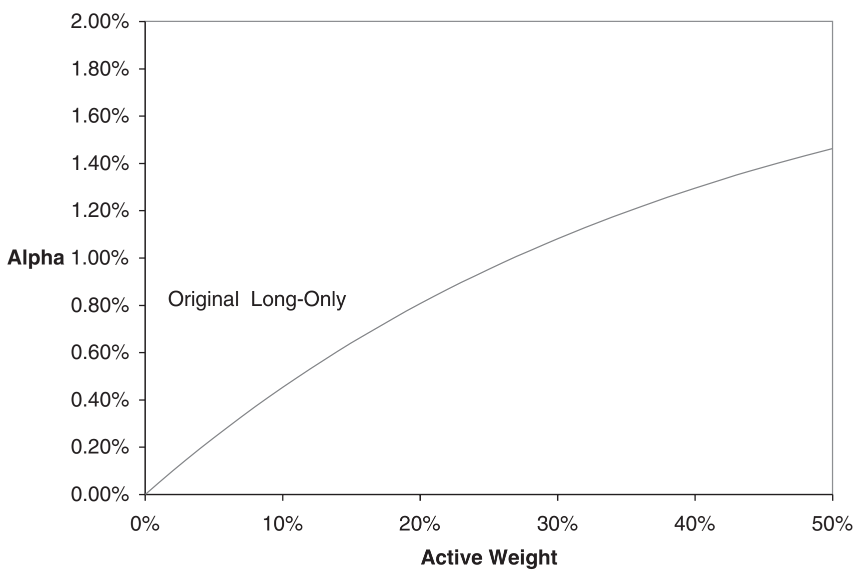

EXHIBIT 1.2 Portfolio Alpha
Source: Morgan Stanley Research

typically already rank all stocks in their universe. However, for fundamentals managers, the ranking system may be more implicitly expressed in terms of conviction tiers. The question for fundamental managers becomes whether they were actively avoiding certain stocks by underweighting them, or simply using these underweights as a source of funds.

TRACKING ERROR MODELS

With the target beta pinned down by assumption, the remaining source of volatility risk is the portfolio's TE. The three factors that determine the TE are the residual volatilities of each position, the portfolio weightings, and the correlations or factor effects that exist between the positions.

At the security level, the TE is simply the residual volatility of the excess return; that is, the standard deviation of the security's return above or below its beta-adjusted market return. At the portfolio level, when the portfolio beta is tightly targeted at 1, the TE measures the deviation of portfolio returns around the benchmark.

With uncorrelated positions in the long-only portfolios, projected TEs in the range of 1 to 2 percent will be well below the observed TEs of 4 percent or higher seen in most actively managed portfolios. This discrepancy between the observed TEs and the theoretical uncorrelated values implies that there is typically some degree of correlation among the various positions. These correlations, even at a minimal level, can have a significant effect on the TE and can, therefore, have a meaningful impact on portfolio performance.

Exhibit 1.3 shows how the TE grows as positions are added to the long-only portfolio under assumed pairwise correlations (ρ_L) of zero and +0.05. For the 25-position long portfolio, the TE ends up at 2 percent for the uncorrelated case, and at 3 percent for an assumed +0.05 pairwise correlation among all 25 active positions. Thus, it takes only a slight increase in pairwise correlation to generate significant increases in the TE.

THE ACTIVE EXTENSION

The ability to take short positions provides access to a fresh set of underweights. These new underweights are assumed to have alphas that coincide with the corresponding long-only alpha ranking model, less some given shorting cost, taken to be 0.50 percent in the base case example. The shorter, dashed line that starts at a 4.50 percent alpha in Exhibit 1.4 schematically depicts a 30 percent AE. In essence, these new underweights are picking off

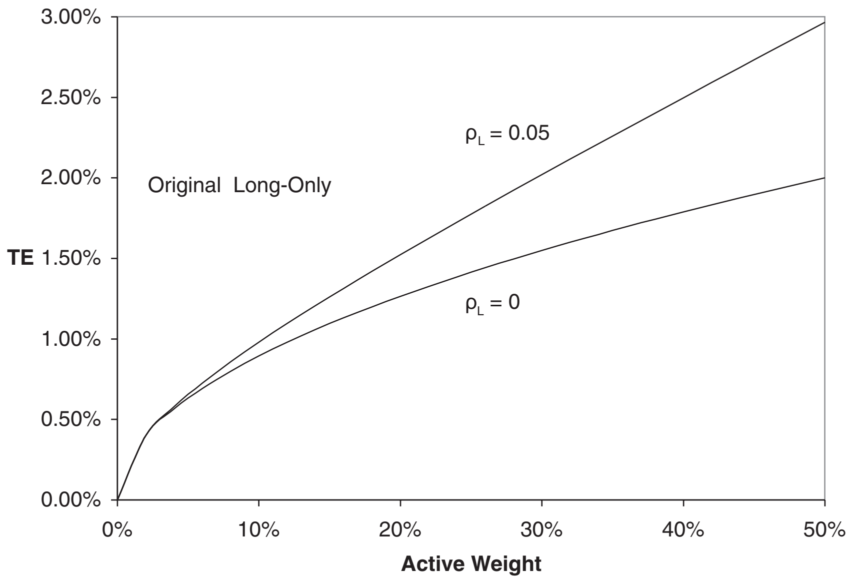

EXHIBIT 1.3 Uncorrelated versus Correlated TE
Source: Morgan Stanley Research

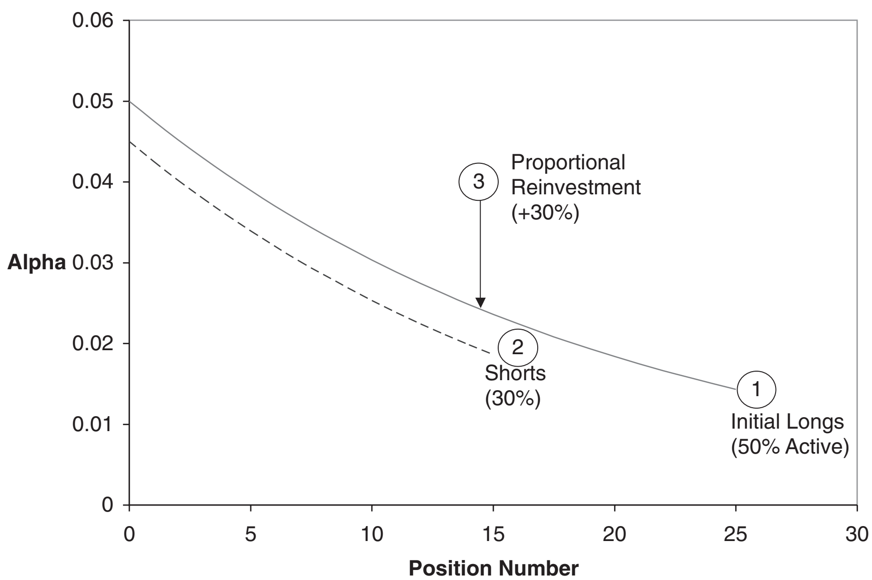

EXHIBIT 1.4 AE: Proportional Reinvestment
Source: Morgan Stanley Research

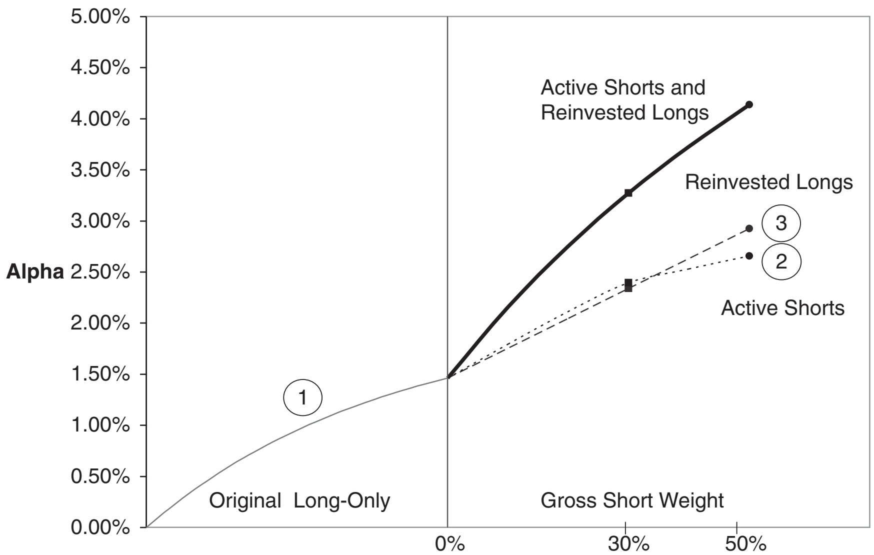

EXHIBIT 1.5 Alpha versus Gross Short Weight
Source: Morgan Stanley Research

the early cream of the alpha ranking curve. The gross short weight determines the number of 2 percent positions in the short portfolio while adding proportionally to the size of the 25 long positions.

Exhibit 1.5 displays the build of the cumulative alpha from the (1) initial long-only portfolio (25 position/50% active weight), (2) the new active shorts, and (3) the enhanced long position funded by the reinvested proceeds. With the combination of the added short alphas and proportional reinvestment into the long alphas, the portfolio alpha rises from 1.5 percent in the long-only case to 3.3 percent for the 30 percent extension, and 4.1 percent for the 50 percent extension.

The size of potential alpha improvement often seems disproportional given the modest 30 percent or so level of extension. This seemingly high alpha effect becomes more understandable when the extension percentage is placed in the context of a portfolio's activity level. A long-only portfolio with a 100 percent gross weight will typically have active weights in the 50 to 60 percent range. Thus, a combination of a 30 percent AE and a corresponding 30 percent reinvestment has the potential to double the activity level of the original long-only portfolio. Indeed, it was a recognition of this high-powered impact of even a 120/20 extension that motivated some of the early interest in these strategies.

TRACKING ERROR UNDER ACTIVE EXTENSION

As the extension process adds new positions and/or augments the active weights, the TE increases accordingly. In the earlier discussion of the long-only portfolio, there were two different correlation assumptions:

1. Totally uncorrelated, and
2. A pairwise correlation of +0.05 between all positions.

The uncorrelated case is the most optimistic, leading to significantly smaller TEs than the correlated case.

In moving to the AE, this discussion on correlations becomes somewhat more complicated. The most conservative path would be to assume positive correlations of +0.05 *within* the long portfolio (ρ_L) and *within* the short portfolio (ρ_S). By itself, this assumption would lead to significantly greater TEs, as the short weight expands. However, with a long/short portfolio structure, the treatment of the correlation $\rho_{L,S}$ *between* the short and long positions can also have a meaningful impact on the TE.

Exhibit 1.6 displays three different cases of correlations between the longs and shorts. In the case, $\rho_{L,S} = +0.05$, the new short positions reinforce the factor risks present in the long portfolio. The TE expansion is much more

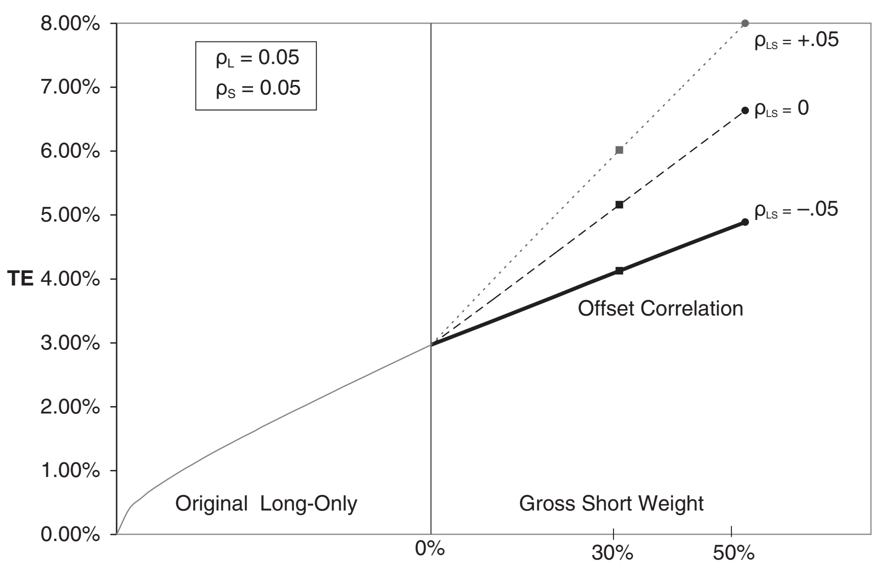

EXHIBIT 1.6 TE and the Long/Short Correlation
Source: Morgan Stanley Research

severe due to the continued emphasis on the same factor risks. With a zero pairwise correlation between the longs and shorts, they are assumed to be subject to different factor risks. The independence of the two factor risks materially reduces the TE. With a −0.05 offset correlation between the long and short positions, the short offsets act to significantly lower the TE. This offset case shows one of the potential benefits of AE as the short portfolio takes out unproductive factor effects within the long portfolio, such as an excessive size or growth bias.

With a positive correlation between the longs and shorts ($\rho_{L,S} = +0.05$), the portfolio is essentially reinforcing its risk exposures, which leads to significant increases in TE. At 30 percent extension, the TE rises to 6 percent, as more correlated positions are added to the portfolio. With a zero pairwise correlation between the longs and shorts, the TE is slightly lower at 5.2 percent for the 30 percent extension. However, to achieve the lowest possible TE curve, short positions are needed that can act as offsets to the longs ($\rho_{L,S} = -0.05$).

INFORMATION RATIOS

Exhibit 1.7 combines the alphas and TEs from Exhibits 1.5 and 1.6 to form alpha/TE or information ratio (IR) curves for each scenario. With $\rho_{L,S} = +0.05$ and $\rho_{L,S} = 0$, the IRs rise at the outset, peak at 0.55 and 0.63 at extension weights of 20 percent and 30 percent, respectively, and then decline slightly with further extensions. In the $\rho_{L,S} = -0.05$ case, the TE drops significantly due to the offsetting correlation, enabling the IR to rise to 0.79 for a 30 percent extension and ultimately reaching 0.85 at a 50 percent weight.

Exhibit 1.8 plots these same three correlation cases in alpha versus TE space. All cases have the same 3.3 percent alpha at 30 percent and 4.1 percent alpha at 50 percent. However, the TEs are quite different, with the $\rho_{L,S} = +0.05$ and $\rho_{L,S} = 0$ both exceeding a TE of 5 percent, even before reaching the 30 percent extension level. In contrast, the $\rho_{L,S} = -0.05$ maintains a TE below 5 percent even for a 50 percent extension. Thus, it can be seen that AE strategies can benefit significantly by making good use of this offset potential.

USING GENERICS IN ACTIVE EXTENSION

One of the key benefits from AE is derived from the opportunity to augment both the active long and short positions in the portfolio. However, there may be situations when limited active opportunities are on either the long or the short side, resulting in a need to complete with generic investment vehicles. Generic investments that correspond to the equity benchmark can

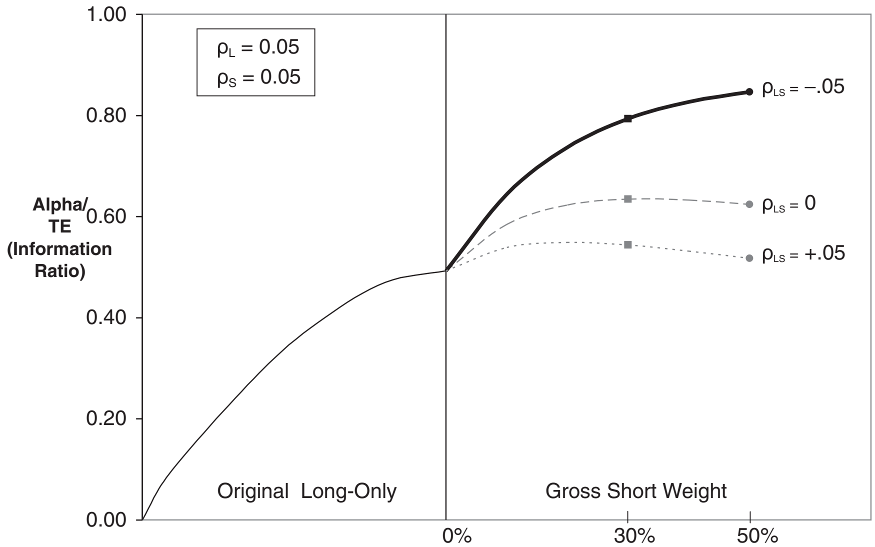

EXHIBIT 1.7 Alpha/TE Ratio for Different Long/Short Correlations
Source: Morgan Stanley Research

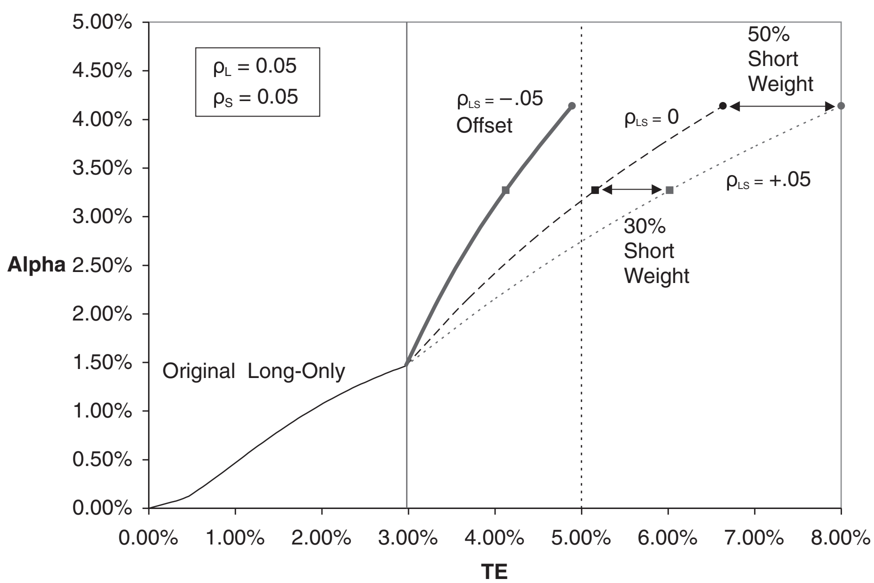

EXHIBIT 1.8 Alpha versus TE for Different Long/Short Correlations
Source: Morgan Stanley Research

either generate proceeds (if short) or consume investment funds (if long). Thus, they can be used to keep the net exposure at 100 percent and fund beta at 1. At this point, it is assumed that such generics have neither alpha nor TE effects (Leibowitz and Bova, 2007g,h).

Exhibit 1.9 shows the TEs for the base case with both active longs and active shorts (SA/LA) together with two extreme generic cases. An offset correlation of $\rho_{L,S} = -0.05$ is now assumed throughout. The top curve represents a short generics/long actives (SG/LA) case where generics are shorted to provide funds for active reinvestment in the long positions. Because these generic shorts are assumed to create no offset to the long positions, the TE is quite high. At the other extreme, the lower curve reflects the case where shorts are invested actively but the proceeds must be invested in generic longs. In this case, the active shorts do provide an offset to the original long portfolio, while the generic longs are TE-free. Consequently, this short actives/long generics (SA/LG) case has TEs that are even lower than the original long-only portfolio.

The alpha curves in these two generic cases are the same as the short-only and reinvested long-only alpha curves in Exhibit 1.5. By combining these

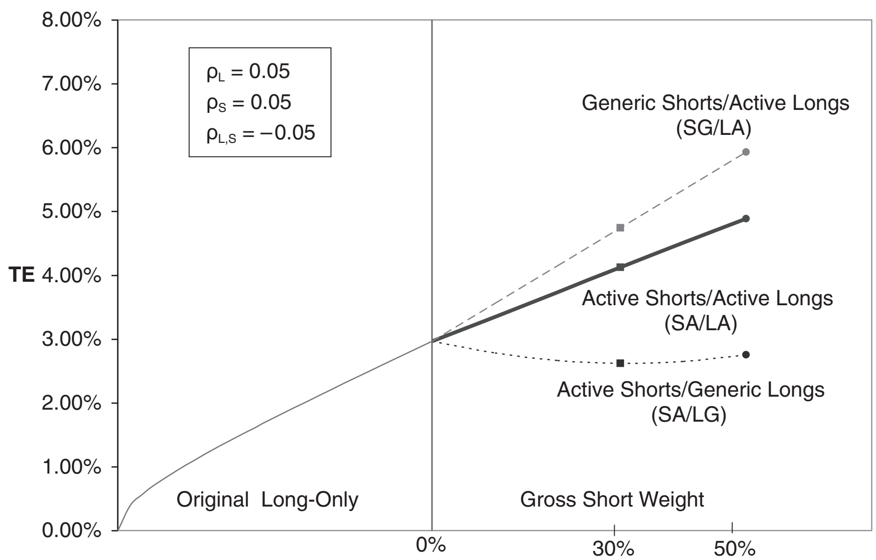

EXHIBIT 1.9 TE versus Short Weight: Generics on the Short and/or Long Sides
Source: Morgan Stanley Research

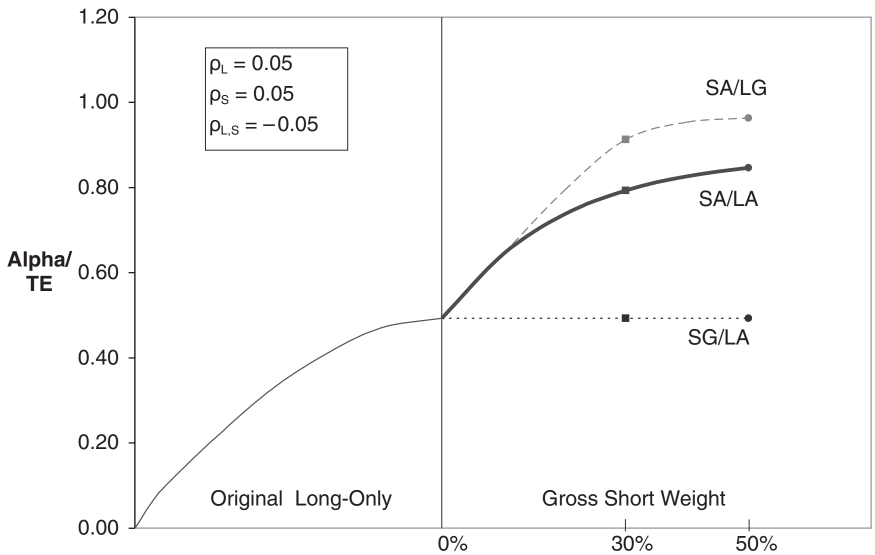

EXHIBIT 1.10 Alpha/TE versus Short Weight: Generics on the Short and/or Long Sides
Source: Morgan Stanley Research

alphas with the TEs in Exhibit 1.9, one obtains the alpha/TE IR shown in Exhibit 1.10 for a range of short weights. Exhibit 1.11 plots these same results as alphas versus TEs.

In Exhibit 1.10, the base AE case (SA/LA) with active investment on both sides has the benefit of the two alpha sources together with TEs that fall between the two extreme cases. This combination enables the base case to dominate the short generics (SG/LA) case at every TE for all extension weights of up to 50 percent. It should be noted that this SG/LA case approximates the results from leveraging the original long-only portfolio. Such leveraging simply sustains the IR of the original long-only as evidenced by the flat line in Exhibit 1.10. With the two sources of active alphas and with a lower TE from the offset effect, it is no surprise that that the AE model (SA/LA) attains much higher IR ratios than the original long-only portfolio or its leveraged SG/LA version.

The comparison of the base AE case with the short active/long generics (SA/LG) case is more complex. The short-only alpha curve is not much different from the reinvested long-only case. However, as shown in Exhibit 1.9, the combination of the short offset and the lack of additional long positions lead to TEs that are actually lower than the original long-only

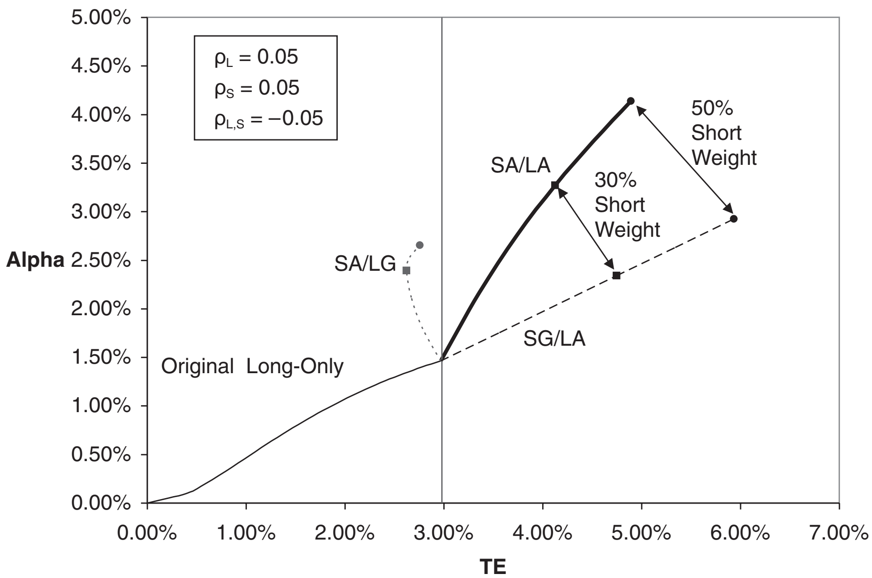

EXHIBIT 1.11 Alpha versus TE: Generics on the Short and/or Long Sides
Source: Morgan Stanley Research

portfolio. The low TEs drive the IR curves for this SA/LG case to levels well above that of the basic AE. In Exhibit 1.10, these higher IRs naturally look quite appealing at first glance.

However, the situation looks quite different when the focus moves from Exhibit 1.10's IR graph to the more fundamental alpha versus TE graph in Exhibit 1.11. Here, the basic AE model (SA/LA) has the same curve as seen earlier, whereas the SG/LA case has the straight line projection expected from a proportional increase (i.e., simple leveraging) of the long-only portfolio.

The long generics case (SA/LG) is quite unusual for a return versus risk graph. Unlike curves where higher alphas are attained with greater TEs, this long generic case curves to the left. This seemingly peculiar shape results from the powerful TE reduction obtained when the offset from the short actives is combined with the lack of new actives on the long side. This result is instructive in that it demonstrates some basic principles about the use of IRs in situations in which additional leverage is limited or simply not available.

The preceding discussions treated generics as providing the basis for either the entire short extension or the entire reinvestment. The basic AE design requires the short extension proceeds and the reinvested funds to be matched in size and in beta values. In practice, there will often be gaps in the availability of viable active opportunities for one side or the other. Generic investments can help fill these gaps and bring the net funding and net beta values into the required balance.

Today's market contains a wide range of liquid generic instruments tied to specific sectors. This range of generic instruments allows for more targeted applications of offset hedging that can address undesired factor exposures in the active positions. When applied on a partial basis to either the short or the long side, sector generics can improve IRs, both by reducing the TE and by facilitating more focused active positions.

POSITION SIZE CONSTRAINTS

The original long-only portfolio consisted of 25 active positions, each with a 2 percent fixed weight. A 50 percent short extension would raise these weights to 4 percent, which may exceed the tolerable position limit. Exhibit 1.12 presents alpha versus TE graphs for two cases in which the reinvestment is limited by these position size considerations. In the first case,

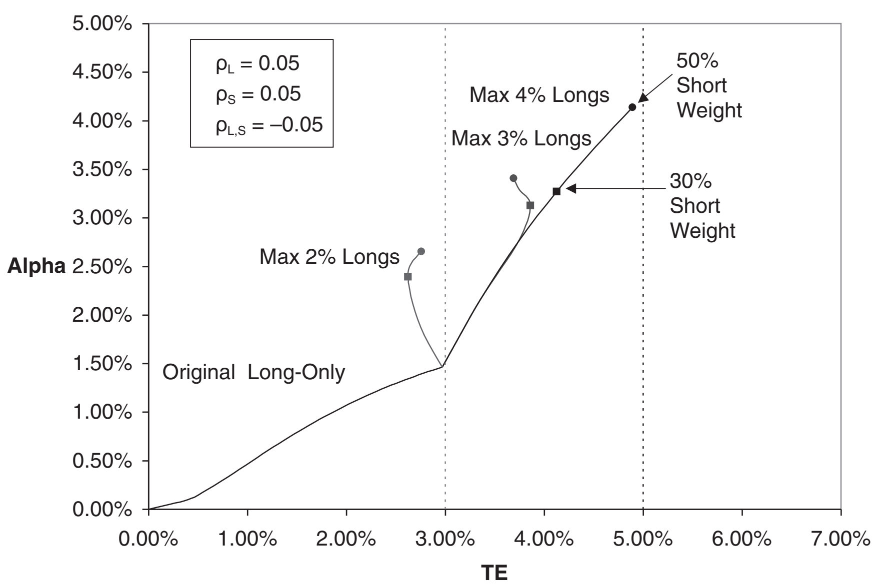

EXHIBIT 1.12 Alpha versus TE with Position Size Limits
Source: Morgan Stanley Research

the active long position size is capped at 2 percent; that is, the active longs are not allowed to grow beyond the 2 percent size in the original long-only portfolio. This case coincides with the short actives/long generics (SA/LG) case discussed earlier in this chapter, where all short proceeds are reinvested in beta-maintaining generic longs. In the second case, the active longs are subject to a 3 percent maximum position limit. With a 50 percent extension, only half of the new proceeds could be reinvested in active positions. The remaining half of the proceeds would then have to be deployed into generic long investments.

For the 2 percent position limit, the original long portfolio has already reached the maximum weight, and all short proceeds have to be reinvested generically. Without active reinvestment on the long side, the new shorts would be the sole alpha source at all extension levels. With the 3 percent long position limit, the reinvestment adds proportionally to the 25 long positions up until a 25 percent short weight. At higher extension percentages, the additional proceeds are reinvested in generic longs that have neither an alpha nor a TE impact. This 3 percent limit does not affect the portfolio alpha prior to a 25 percent extension, but reduces the alpha buildup for higher short weights.

These position limits and the associated reduction in the active weights actually have a beneficial effect on the TE. With the 2 percent limit, the TE declines from outset and then turns up slightly past 30 percent. With a 3 percent position limit, the TE initially coincides with the base SA/LA case, but diverges downward beyond the 25 percent short weight. It is at first surprising to see TEs turn downward as active short positions are added. This downward TE path results from the power of the short offsets that have yet to be overridden by active reinvestment on the long side, or by the accumulating correlating positions on the short side.

As shown in Exhibit 1.12, the highest IRs are attained in the 2 percent limit case in which the greater TE reduction overrides the lower alphas. The net result is an IR that reaches 0.91 at 30 percent; however, this low TE range has alphas that are not very productive. In situations such as AEs, where leverage is not an option, high IRs may not lead to satisfactory alphas. For example, at the 30 percent extension with this 2 percent position limit, the high IR of 0.91 applies to such a low TE that the alpha rises only to 2.4 percent. By comparison, even with its lower IR of 0.79, the base AS/AL case with 4 percent position limits provides an alpha of 3.3 percent. The alpha differential becomes even more dramatic for the 50 percent extension, where in spite of its higher IR, the 2 percent position limit case provides an alpha of only 2.7 percent, far less than the 4.1 percent obtained with the 4 percent limit.

BEYOND THE INFORMATION RATIO

In recent years, the IR has become a standard measure of relative performance. In the AE space, a common approach is to plot the IR as a function of the extension percentage. The peak or near-peak is then taken as the optimal level of extension. However, as illustrated in the preceding discussion of Exhibits 1.10 through 1.12, high IRs may not always be the best guide to the high alphas, especially when there are multiple investment constraints.

Exhibit 1.12 can be used to illustrate a situation in which the acceptable TE tolerance is 5 percent or lower. There may be little problem as long as the TE remains within this 5 percent bound. With a 30 percent or even 50 percent extension, the 4 percent position case could then acceptably move toward an expected alpha in the 3 to 4 percent range. In contrast, the 2 percent position limit case (with the generic long reinvestment) has much higher IRs at all extension weights up to 50 percent, but it can never generate TEs above 3 percent. Without exogenous leverage, this case cannot take full advantage of the allowable 5 percent TE limit, so that its high IR falls well short of providing the higher alphas.

These results raise a number of questions about the very nature of IRs as a yardstick. The key point is that higher IRs do not always lead to better alphas. For IRs that are leveragable, the highest IR will lead to the highest alpha for a given TE. But the whole motivation behind the AE model is to seek enhanced alpha potential with relatively modest extensions of the traditional long-only model. Consequently, for this problem (as for many other investment situations), direct leverage is simply ruled out. Without the possibility of exogenous leverage, high IRs can be quite misleading as the route toward finding the best alphas.

FUND LEVEL RISK EFFECTS

(For a fuller discussion of this topic, see Chapter 24.) The preceding sections have dealt with how AEs can lead to improvements in the equity portfolio's alpha at the cost of increasing TE. To this point, the discussion has taken place strictly within the confines of the individual equity portfolio. From the point of view of the asset owner or the fund sponsor, the situation is quite different and, in many ways, more compelling. As long as the risk control discipline can assure that a beta of 1 is being maintained and that exogenous sources of risks are excluded, the increased TE from the AE will be the only additional source of volatility risk at the fund level. In such a situation, the extension's alpha adds, on a weighted basis, to the overall

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fund return, while the higher TE can be shown to be largely submerged within the beta risk that dominates the volatility of the overall fund.

The policy allocations of a wide range of institutional funds have surprisingly similar risk characteristics. Exhibit 1.8 shows two examples—a traditional 60/40 portfolio B and a modern portfolio C that is diversified into a wide range of asset classes.

The funds' risk characteristics in Exhibit 1.13 are derived from a standard return/covariance matrix that provides an estimation of the volatility of each asset class and the correlations between any two-asset classes. In particular, it specifies the correlation of each asset class with a U.S. equity benchmark. This correlation can be combined with the ratio of the asset's volatility to the equity volatility to develop an implicit beta. This implicit beta represents a correlation-based estimate of the asset's mean response to changing equity returns.

The correlation-based implicit betas for each asset class are shown in Exhibit 1.13. A total beta for a given fund can then be found by weighting the implicit betas by their respective percentage allocations. Thus, portfolio B has a total beta of 0.65, consisting of its 60 percent explicit equity allocation and 0.05 from the 40 percent bonds that have an implicit beta of 0.14. In the highly diversified portfolio C, the total beta value of 0.57, consisting

EXHIBIT 1.13 Typical Diversification Does Not Materially Change Fund Volatility: 90 Percent-Plus Comes from Equity

	Correlation-Based Implicit Beta	B	C
U.S. Equity	1.00	60%	20%
U.S. Bonds	0.14	40%	20%
International Equity	0.77		15%
Emerging Mkt Equity	0.76		5%
Absolute Return	0.28		10%
Venture Capital	0.59		10%
Private Equity	0.98		10%
Real Estate	0.07		10%
Total		100%	100%
Total Volatility		11.17	10.45
Correlation with U.S. Equity		96.7%	90.4%
Total Beta		0.65	0.57

Source: Morgan Stanley Research

of 0.20 from the 20 percent direct equity and a further 0.37 from all the correlation-based betas of the nonequity asset classes.

Three Volatility Surprises

In comparing the fund-level risk characteristics of portfolios B and C at the bottom of Exhibit 1.13, three surprises immediately present themselves. The first surprise is that, despite the vastly different levels of diversification, portfolios B and C have total volatilities that are nearly the same.

The second surprise is that the total betas for these two very different funds again are quite close, 0.65 and 0.57, respectively, for portfolios B and C. If you were to look at a wide spectrum of asset allocations across U.S. pension funds, foundations, and endowments, you will find that both total betas and total volatilities fall within quite narrow ranges: 0.55 to 0.65 for the total betas, and 10 percent to 11.5 percent for the volatilities.

The third surprise is found by taking the total beta value and multiplying by the 16.50 percent volatility that the covariance model assigns to U.S. equities. When this product is divided by the fund volatility, the result is the percentage of the total volatility that can be ascribed to the fund's equity exposure. For portfolios B and C, these percentages are $(0.65 \times 16.50\%)/11.17\% = 97\%$ and $(0.57 \times 16.50\%)/10.45\% = 90\%$, respectively. Thus, an overwhelming percentage of the volatility risk in these two funds is derived from their comovement relationship with equities. This dominating beta role can be seen across a wide swath of institutional (and individual) portfolios.

This percentage of equity-based volatility can also be interpreted as the correlation of the fund with movements in the equity market. This powerful and pervasive beta dominance at the fund level has major implications for the potential role of AEs and other benchmark-centric strategies that are tightly targeted to a well-defined equity benchmark.

PASSIVE IMPLICIT ALPHAS

Exhibit 1.14 shows how fund B's expected return of 5.85 percent and fund C's 7.08 percent is derived from the weighted expected return of the component assets. The return components can also be broken down into a risk-free base rate of 1.50 percent, and return premiums of 4.35 percent for fund B, and a significantly higher 5.85 percent for fund C. The return premiums can then be further parsed into one component associated with the asset's implicit beta component, and a second component consisting of the remaining expected return specified in the return/covariance model. The beta-based

EXHIBIT 1.14 Diversification Raises Fund Return through Implicit Alphas

	Expected Return	Correlation-Based Implicit Alpha	B	C
U.S. Equity	7.25		60%	20%
U.S. Bonds	3.75	1.47	40%	20%
International Equity	7.25	1.33		15%
Emerging Mkt Equity	9.25	3.36		5%
Absolute Return	5.25	2.14		10%
Venture Capital	12.25	7.37		10%
Private Equity	10.25	3.14		10%
Real Estate	5.50	3.58		10%
Total			100%	100%
Total Expected Return			5.85	7.08
Total Beta ×			0.65	0.57
Equity Premium			×5.75	×5.75
Beta Return			3.76	3.29
Risk-Free Rate			1.50	1.50
Implicit Alpha			0.59	2.29

Source: Morgan Stanley Research

return component is simply the multiple of the implicit beta and the equity return premium. The second component has the form of an implicit alpha; that is, the remaining return that can be accessed by *passively* investing in the given asset class.

As seen in Exhibit 1.14, the weighted sum of these implicit alphas adds to only 0.59 percent in portfolio B. On the other hand, the implicit alphas for portfolio C accumulate to a sizable 2.29 percent, accounting for a large part of portfolio C's higher return relative to portfolio B.

The actual numerical values will, of course, vary with the selected return/covariance model. The covariance results tend to be relatively robust across the various models used in practice, although there may be more variability in the return assumptions. In this regard, the implicit alpha values will depend on the risk parameters assumed for equities, with lower equity risk premiums leading to higher implicit alphas.

It should be emphasized that these implicit alphas are quite different from active alphas. Implicit alphas are derived from a passive investment in an asset class that captures the expected return embedded in the return/covariance model. These passive alpha returns are obtainable without any unique skills or structural advantages. They represent a nonzero-sum

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reward for moving the portfolio from its current allocation into a less constrained and more diversified posture that provides higher expected returns.

It should also be noted that Exhibits 1.13 and 1.14 have the somewhat startling implication that diversification as typically practiced by institutional funds does not really reduce total volatility, but rather serves to enhance expected returns.

BEYOND-MODEL DRAGON RISKS

The preceding discussion suggests that, at the fund level, asset classes with positive implicit alpha can provide a higher expected return with little impact on total volatility. This raises the question as to why this apparently free lunch should not be pursued more vigorously. A related question is why allocations are not more concentrated on the single highest alpha source, rather than having the weight to alternatives fragmented over multiple alpha assets. This same issue arises from an unconstrained optimization process that invariably produces initial allocations with overtly unacceptable concentrations in one or more alternative assets.

In practice, pension funds, endowments, and foundations often use a process that could be described as tortured optimization, based on the mean/variance approach first suggested by Harry Markowitz in the 1950s (Markowitz, 1959). The resulting allocations are naturally highly dependent on both the assumptions in the covariance matrix and on the constraints established for each asset class. Torturing refers to the common practice of sequentially manipulating these constraints to achieve portfolios that are theoretically optimal, but that also satisfy the more ephemeral criterion of being palatable. Whether determined in advance or as part of the process, constraints play a key role in determining the ultimate allocation.

The allocation into any alternative asset is always subject to a variety of constraints, some well founded and well articulated, and others that may be more subtle and/or simply convention based. Some considerations that are frequently put forward for setting these position limits include:

- Underdeveloped financial markets,
- Liquidity concerns,
- Limited access to acceptable investment vehicles or first-class managers,
- Problematic fee structures,
- Regulatory or organizational strictures,
- Peer-based standards,
- Headline risk,
- Insufficient or unreliable historical data.

The term dragon risks aptly captures the cornucopia of concerns that lead to these constraints. This expression is taken from a paper by Cliff Asness (2002), referring to the medieval mapmaker's characterization of uncharted territories as places where dragons may dwell. The basic issue here is the critical divide between modelable probabilities and the more fundamental uncertainty about the validity of any model. This distinction has been discussed at some length in the work of Peter Bernstein (1996) and Frank Knight (1964).

As funds diversify into alternative assets, they incur three forms of risk:

- Implicit betas,
- Modeled alpha volatility,
- Beyond-model dragon risks.

The implicit beta at the fund level is often preserved through the purchase of a mid-beta alternative asset using a mid-beta combination of bonds and equity. Indeed, this is why the typical diversification creates only minimal changes in the fund's total beta or overall volatility risk.

If the passive investments are coincident with the benchmark used for gauging the allocation's performance, the alpha volatility should not engender any TE relative to the policy portfolio. Moreover, the modeled alpha volatility should be uncorrelated with the dominant beta exposure. With the alternative assets having such fragmented allocations, the fund's dominant beta risk will overwhelm the volatility effect from modeled TEs (as long as they remain uncorrelated with each other). The beyond-model risks are more problematic because they are harder to formally assess and control. The standard approach is to set what seems to be reasonable constraints on each alternative asset, and trust that the resulting fragmented allocation represents an acceptable balance of risk and return.

Thus, regardless of any optimization results based upon a given return/covariance matrix, it tends to be these beyond-model dragon risks that determine the percentage weight ultimately assigned to the nontraditional asset classes.

ACTIVE ALPHAS

To this point, I have not focused on any return/risk characteristics other than those associated with passive investments in the various asset classes. The implicit alphas are fundamentally different from the various forms of active alphas derived from superior security selection, better portfolio construction, uncovering high-performing managers, unique access to desirable investment vehicles, and so on. Active alphas are intrinsically skill-based and theoretically zero-sum in nature. Benchmark-centric and AE strategies depend upon skilled active management to generate their anticipated positive alphas.

A benchmark-centric strategy has a TE that is intended to be independent of the targeted beta volatility, and hopefully has few sources of beyond-model risk. This situation is quite different from the beyond-model concerns associated with nontraditional asset classes, where the standard covariance model will almost surely be viewed as only partially describing all the potential dimensions of risk. For example, any simple covariance assumptions for real estate or commodities can hardly be interpreted as capturing the entire constellation of risks associated with such investments. However, a benchmark-centric process should theoretically be able to provide risks that can be segregated into a targeted beta risk, an orthogonal TE component, and relatively few beyond-model concerns.

The first column in Exhibit 1.15 summarizes the return and risk characteristics for portfolio C with only passive investments. The third column, labeled C^{**}, shows the case in which the 20 percent passive equity is transferred to four 5 percent active 130/30 mandates, each having the 3.3 percent alpha and 4.1 percent TE described in the earlier base case example. The active equity increases the returns by $20\% \times 3.3\% = 0.66\%$, or from 7.08 percent to 7.74 percent. The beta remains the same at 0.57 because one of the requirements for benchmark-centric active management is that the equity portfolio's beta retains the original target value of 1. If the four managers' 3 percent TE are uncorrelated (an admittedly ideal case), the total fund TE becomes $\sqrt{4}^{*}5\%{}^{*}4.1\% = .41\%$

Even if the active 130/30 strategies have some level of correlation, the net effect on the total fund risk would still be negligible. At the same time, it should be pointed out that the 0.41 percent TE could be a source of departure from the short-term returns of the policy portfolio.

With equity beta being the overwhelming short-term risk factor for most U.S. institutional funds (Leibowitz, 2004; Leibowitz and Bova, 2005b), it can be seen that positive alpha sources that are uncorrelated with beta are particularly valuable. The key is to find active sources of positive alphas that are highly risk-controlled relative to a specific benchmark, with a benchmark that has a stable equity beta, and where the active TE around this benchmark is reliably uncorrelated with equity beta.

However, whereas the total volatility is the standard measure of fund risk, there are other risk concerns that deserve mention. In addition to the beyond-model dragon risks described earlier, there are other risks associated with the fund's ultimate ability to fulfill its (possibly complex) set of liabilities. This issue of surplus risk is a critically important factor in many

EXHIBIT 1.15 Long-Only Active Equity Adds Active Alpha with Minimal Volatility Impact

			C	C**
	Alpha	TE	Passive	130/30
Passive U.S. Equity	0%	0%	20%	–
Active 130/30 Extension	3.3%	4.1%	–	20%
Passive U.S. Bonds	0%	0%	20%	20%
Passive Alpha Core	0%	0%	60%	60%
Expected Return			7.08	7.74
Active Alphas [1.5% Alpha on 20% Long-Only]			–	0.30
AE Incremental Alpha [1.8% Alpha on 20% AE-30%]			–	0.36
Total Volatility			10.45	10.46
Passive Long-Term Volatility			10.45	10.45
Added TE: Four 5% 130/30 AEs with 4.1% Independent TE			–	0.41
Added Total Volatility			–	0.01

Source: Morgan Stanley Research

settings, but one that would take the discussion far afield from the asset-only focus of this paper.

RISK AS RISK TO THE POLICY PORTFOLIO

One question raised by this analysis is why most funds have total fund volatilities that fall within the same 10 to 11 percent range.

Following significant market movements, the common practice among institutional funds is to automatically rebalance back to the set policy portfolio. The standard rationale for such behavior typically takes the form of either an appeal to efficient markets theory or some version of buy low/sell high. In fact, it can be argued that both these rationales are fundamentally flawed (Leibowitz and Hammond, 2004). Nevertheless, the policy portfolio exerts a strong gravitational pull that results in a virtually uniform acceptance of automatic rebalancing.

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This strong reluctance to being forced to shift away from its policy portfolio may play an underappreciated role in setting the fund's risk tolerance and in shaping its policy portfolio in the first place. When an institution shifts to a lower-risk allocation, it departs from the policy portfolio that was previously considered to represent an optimal allocation. Institutional funds are understandably reluctant to move away from these pre-established policy portfolios. Indeed, their rebalancing behavior is specifically geared toward sustaining this portfolio structure. Most institutional managers would view it as most unfortunate if the fund were to be forced by an extreme market movement—or by the fund's investment committee—to abandon its presumably optimal approach and shift into a lower-risk strategy.

Potential trigger points for such mandated shifts lurk in the background of every investor's mind and can act (possibly subconsciously) as fence posts that define the outer limits of tolerable risk. These fence posts may also play a feedback role in setting the policy portfolio's overall risk level in the first place. For example, suppose adverse movements of 15 to 20 percent are considered to be the tolerable outer limit of the risk envelope. A fund may then reasonably want to control the prospect of any such triggering event by reducing this probability to a minimal level. It can be shown that a combination of reasonable shortfall constraints leads total betas in the 0.55 to 0.65 range and portfolio volatilities of 10 to 11 percent, that is, exactly where risk levels are located in practice (Leibowitz and Bova, 2005a).

Under the banner of diversification, funds adopt different mixes of active alpha hunting and/or implied alpha gathering that they find suitable as a way of enhancing their expected return. However, there seems to be a surprising commonality in their determination to avoid roughly the same level of catastrophic risk. With the equity beta serving as the dominating risk factor for virtually all institutional funds, it is likely that any such catastrophic event would be the result of—or at least associated with—a major equity downturn. Consequently, it may not really be too surprising that total fund betas have been generally found to lie in the narrow range of 0.55 to 0.65.

CORRELATION TIGHTENING AND STRESS BETAS

The standard covariance data that project these 10 to 11 percent volatilities is based on a performance history that necessarily has a concentration on normal times. A fund's true risk tolerance tends to be more determined by this perceived need to alter the strategic allocation—even when further market deterioration is assessed to have a relatively low probability. Another related facet of extreme downside risk may be the prospect of a decline in asset (or surplus) value so severe and so persistent as to erode a fund's capability to fulfill its liabilities without extraordinary sponsor contributions (Leibowitz and Bova, 2007a). It is at precisely these juncture points of maximum stress that standard asset relationships break down and the original risk estimates become invalid.

To be realistic, any risk reduction strategy must address these potential tail events. With equity being the dominant factor even under normal times, it is almost sure to play a crucial role at the points of maximum duress. There are many challenges in trying to estimate equity movements under such tail events and the interasset correlations that may then prevail. In discussions of these prospective events, one often hears the comment that, under such adverse conditions, "all correlations go to one." However, there is rarely any serious analysis of the covariance and volatility effects implied by such extreme extrapolations.

The concept of correlation tightening provides a more measured way to gain some insight into these effects. By assuming varying forms of correlation tightening across asset classes, one can explore how stress conditions might affect different allocations. Any such study would, of course, be plagued by myriad degrees of freedom. However, with equities as the dominant risk factor, the problem can become more manageable by focusing only on tightening correlations between equities and other asset classes. This approach leads to what may be called stress betas for each asset class. For a given allocation, these values will then build to a stress beta for the fund as a whole. Exhibit 1.16 shows the stress betas for portfolios B and C under a 25 percent correlation tightening, where the residual volatilities are assumed to be kept constant.

With normal-times covariance data and the associated normal beta values, most U.S. funds tend to have roughly the same 10 to 11 percent projected level of volatilities. However, unlike this common range for normal times volatility, stress betas can affect different allocations very differently. As shown in Exhibit 1.16, it is the more diversified funds that tend to be severely strained by stress betas that far exceed their normal betas. Naturally, when stress betas come into play, the underlying equity volatility also tends to increase markedly.

The traditional 60/40 funds have stress betas that essentially match their normal betas. In a more diversified fund, the lower correlations across the assets tend to moderate volatility under normal times. However, under market duress, these correlations tighten, resulting in a higher percentage of an asset's volatility being transmitted to the overall fund level. Thus, it is ironic that, in comparison with the traditional 60/40, diversified allocations

EXHIBIT 1.16 Effect on Beta of 25 Percent Increase in Correlations—Residual Volatility Constant

			Allocation Percentages	
	Original Beta	Stress Beta	B	C
U.S. Equity	1.00	1.00	60%	20%
U.S. Bonds	0.14	0.18	40%	20%
International Equity	0.77	1.25		15%
Emerging Mkt Equity	0.76	1.03		5%
Venture Capital	0.59	0.77		10%
Private Equity	0.98	1.80		10%
Absolute Return	0.28	0.39		10%
Real Estate	0.07	0.09		10%
Initial Beta			0.65	0.57
Stress Beta			0.67	0.78
% Beta Increase			2%	36%
Stress Volatility			11.42	13.61
Stress Correlation with U.S. Equity			96.8%	94.4%

Source: Morgan Stanley Research

may actually experience a much larger gap between the losses under stress times as opposed to the estimated losses under normal times.

SHORT-TERM RISK AND LONG-TERM RETURNS

The prospect of such stress events—and the impact of the stress betas that they may induce—clearly deserves serious consideration in any comprehensive risk plan (Leibowitz and Bova, 2008).

At the same time, these short-term beta-driven risks must be balanced against the prospect of longer-term returns from diversification. The initial correlations embedded in the covariance matrix are based primarily on short-term price changes. Over longer periods, the correlations may be quite different. For example, the relationship between developed and emerging market equities may be quite tight under a sudden down move. However, over the long term, regional decoupling could lead these two markets to behave more independently, and an emerging market allocation may, therefore, serve as a powerful diversifier over the long term.

It should be noted that, theoretically, pension funds and certain other institutional funds are ideal vehicles for pursuing long-term investment returns. Diversified portfolios have the potential to provide both passive and active expected returns above and beyond the returns derived from the beta relationship. The most desirable assets for this purpose would be those that combine the prospect of incremental passive returns and/or positive active returns that are relatively uncorrelated with equities (or where the equity component can be reliably stripped out). Over time, the accumulation of these incremental returns can provide a sizable cushion against beta-based risks.

The incremental risk from AE should, theoretically, remain uncorrelated with equity movements, both in normal times as well as in periods of market turmoil. In this regard, it may enjoy certain advantages relative to other forms of active management that are embedded in more stress-vulnerable asset classes.

THE ALPHA/BETA MATRIX

The alpha/beta matrix in Exhibit 1.17 attempts to classify the various forms of portfolio management styles using an alpha/beta template.

In an earlier work (Leibowitz, 2005), a rather anthropomorphic classification was used to describe different categories of alpha-seeking behavior:

- The beta grazers are the index funds that passively feed off the return premiums that are broadly available to all.
- The gatherers are funds that expand their allocation by diversifying, but passively, into a wider range of asset classes with the intention of accessing the implicit alphas.
- The alpha hunters are the active managers that aggressively seek excess returns from the exercise of superior investment skill. In contrast to gathering, such hunting is an intrinsically zero-sum activity.
- The foragers venture forth and seek returns wherever these can be found.

All of these return-seeking pursuits can prove valuable if successfully pursued, but they differ materially in the character of the risks entailed—and nature of their fund-level effects.

Benchmark-centric alpha hunting should ideally have risks that take the form of a moderate level of uncorrelated TE. These modest TE additions should have little impact at the fund level volatility.

The gathering of implicit alphas in new asset classes may entail a substantial degree of uncorrelated TE. However, the more significant risk in expanded diversification arises from the beyond-model dragon risks.

EXHIBIT 1.17 Fund Level Alpha/Beta Structures

Metaphor	Betas	Management Styles	Nature of Alphas	Fund Volatility	Model Risk	TE vs. Policy	Stress Betas
Beta Grazing	Stapled	Passive Investing in Broad Equity/Fixed Income Markets	Risk Premium	Fundamental Source	Very Low	Zero	Zero
Alpha Hunting	Beta-Targeted	Risk-Controlled Active Equity Market Neutral Market Neutral Some Hedge Funds	Active Management	Low	Low	Moderate	Very Low
Alpha Gathering	Correlation-Based	Diversification into New Asset Classes	Implicit Correlation-Based Passive Alphas	Low	High	Low	High
Alpha/Beta Foraging	"Free Range" Betas	Beta-Agnostic Opportunistic Investment Some Hedge Funds Macro Funds	Intense to Hyper Active	High	High	High	High

Source: Morgan Stanley Research

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These risk factors may not be formalized, but they reveal themselves at the fund level through the de facto limits imposed on nontraditional asset classes.

Free-range foraging can incur any and all these forms of risk. However, the fund-level impact depends on the intensity of the risks and percentage of the overall allocation deployed in each form of active management.

Clearly, these activities can be mixed and matched. For example, an alpha-gatherer fund may well elect—at the outset or subsequently—to become a hunter and pursue active alphas within the new asset classes.

The basic message is that benchmark-centric active management will have only a minimal impact on fund level volatility if:

- Its beta is tightly stapled to the targeted value.
- The TE is uncorrelated with the fund's dominant beta exposure.
- The TE-associated relative return deviations over the short term are manageable.
- No other significant sources of volatility risk correlate with the TE.
- Few, if any, sources of other nonmodeled risks exist.

If a reliably positive alpha can be accessed with such minimal impact on total volatility risk, it would seem to be desirable to accept the additional TE (which should be quite modest at the fund level) in exchange for alpha enhancement.

CONCLUSION

The basic message is that when its design goals are realized, active 130/30 extension falls into the realm of benchmark-centric alpha hunting. The discussion in this chapter illustrates the key drivers that enable an AE to be productive:

- Fresh active underweights from the ability to short,
- Enhanced opportunities for active long positions that are more sizable and/or broader in range,
- Reduction in TE from potential offset of unintended factor exposures,
- More sharply focused (and possible more sizable) active positions afforded by the offset potential,
- Ability to use generics, especially sector-based generics, to help fill gaps in active opportunities.

These features play a role in both fundamental and quantitative management strategies, but their relative importance can obviously vary (Leibowitz and Bova, 2007e). For example, the greater breadth of active opportunities may play a greater role in a highly diversified quantitative approach, whereas the ability to shape the exposures in a concentrated portfolio may be more significant for a bottom-up fundamental manager.

Of course, the benefits from AE, as with all active management, are dependent on the ability to generate reliably positive alphas on a risk-adjusted basis and to do so at reasonable costs (especially including shorting costs). The corresponding downside is that AE generally leads to some modest increase in TE and would exacerbate the adverse effects of any negative alphas.

One key driver for the growth of AE has been the desire from U.S. institutional funds to seek incremental alphas that can significantly affect their overall returns. United States equity is an asset class that will always have a sizable allocation, even in diversified portfolios. In addition, as an asset class, equities have a number of advantages for active alpha hunting. The techniques for shorting and for extending long-only risk control to AE formats are relatively straightforward. There is the advantage of a large cadre of both quantitative and fundamental managers that have significant performance records, reliable operational procedures, credibility in terms of their risk control, and well established institutional relationships. Indeed, most AE 130/30 assignments to date have been literal extensions of preexisting relationships with a long-only manager.

From another point of view, for many institutional investors, AE strategies enable access to the benefits of shorting and return enhancement, given only a modest expansion of the traditional risk control framework. Moreover, AE strategies are indexed to well-defined equity benchmarks so that the alpha performance is clearly delineated. Although yet to be seen in practice, this alpha clarity, together with the availability of highly liquid derivatives and overlay vehicles, suggests that AE strategies may well be used as a portable alpha source in the future (Leibowitz and Bova, 2007c).

Within the framework of institutional funds, the fact that equity is such a dominating risk factor has special implications for AE as an intensive benchmark-centric form of active investment within the equity asset class.

The volatility risk of U.S. institutional funds is 90 percent or more dominated by their explicit—and implicit—equity exposure. AEs are designed to maintain the targeted beta relative to the original long-only benchmark, with the primary source of additional risk being increased TE from the larger number of active positions. In a properly risk controlled setting, such TE should be uncorrelated with equities. Because total equity exposure is overwhelmingly dominant at the fund level, the additional TE from AEs will be swamped in the standard sum-of-squares calculation. The net result is that the positive alphas derived from an AE will add to the fund's expected return, with only a minimal impact on the fund's overall volatility. Moreover, because it relates to the basic equity asset class, AE strategies should, theoretically, be able to avoid stress beta effects.

In other diversifying asset classes (i.e., non-U.S. equity), active management is typically measured relative to the corresponding passive benchmark. The resulting alphas and TEs are then determined with reference to this asset class benchmark, and performance evaluation usually occurs within these confines of the specific asset class. Consequently, the TEs from even well-controlled active management in nonequity assets may be statistically independent of their primary benchmark, but may still correlate with U.S. equities, that is, credit-tilted strategies in fixed income or export-tilted approaches within emerging markets. With equity being the overwhelmingly dominant risk factor at the fund level, such equity-correlated TEs could significantly add to the fund level volatility risk. Moreover, under conditions of market stress, short-term tightening of the covariance structure across diversifying asset classes could further exacerbate this adverse fund-level effect.

In contrast, the alpha component of AE strategies is specifically designed to be orthogonal to U.S. equity risk, and so the associated TEs should be relatively free from the beta correlation and stress effects that could complicate risk control at the fund level.

Equity-based AE has the benefits of being resident in an efficient asset class that also happens to be the dominant risk factor in virtually all institutional (and many individual) portfolios. At the same time, it should be pointed out that the alphas that can be hunted in a highly efficient, but intensely competitive, asset class can be distinctly different from alphas that may be hidden in a less-efficient asset class.

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