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August 27, 2007

Portfolio Strategy

Active Return Drivers in 130/30 Extensions

A basic active extension (AE) 130/30 fund that only enlarges the original active long positions improves portfolio alpha but entails a corresponding increase in tracking error (TE). The information ratio (IR) therefore remains essentially unchanged, with higher alphas requiring uncomfortably large extension percentages, excessive position sizes, or high TE's.

To move beyond such "alpha leveraging" and achieve even a minimal IR improvement, the AE must find shorts that can act as fresh sources of positive alpha.

For significant IR improvement, the AE must also develop shorts that can offset unproductive correlations within the long portfolio.

Yet higher IR's alone do not always lead to greater portfolio alphas. It is often suggested that AE extension percentages should be set at IR peak or near-peak levels. However, the benefit from peak IR's can be thwarted by the interaction of limits on position size, TE's and/or extension percentages.

The overall IR pattern becomes an issue when IR's peak sharply at points corresponding to low alphas (and low TE's). One example shows how very high IR's can be obtained from a short extension with limited reinvestment into active longs. These high IR's primarily reflect TE reduction and do not lead to material alpha enhancement.

In a leverageable context, high peak IR's generally provide the most theoretically desirable portfolio. However, such leverage is generally not available in AE funds because of the very constraints that enable them to be situated within standard equity allocations.

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Active Return Drivers in 130/30 Extensions

Introduction

Active 130/30 extensions (AE) are based upon relaxation of the traditional long-only constraint while maintaining some of the basic risk characteristics of benchmark-centric long-only funds. The key requirement is that the percentage sold short is offset by reinvestment in beta-equivalent new longs to preserve both the 100% net long posture and the original beta target. These risk control characteristics enable active extension funds to occupy a position close to active long-only funds while still having the ability to pursue a larger number of alpha opportunities.

A growing body of studies has addressed the potential performance benefits that can be obtained by loosening the standard long-only constraint [1-20]. The early work of Jacobs and Levy [1-5] on risk-controlled long/short equity portfolios created a body of literature that served as a foundation in this area. A further dimension was the analytic framework for active management developed by Grinold and Kahn [6-11]. 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 [12-15], together with further contributions on this specific topic by Jacobs and Levy, Grinold and Kahn, Sorensen, as well as various studies by numerous other authors [16-26]. Two recent articles by Jacobs and Levy provide a comprehensive review of how active extension compares with traditional long-only and market neutral strategies [27-28].

At the outset, it should be noted that there are important pre-conditions 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 tracking error (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, etc [29]. 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 interest in AE strategies has grown significantly as both investment sponsors and asset managers have sought higher levels of positive alpha. The acceptance of these strategies has also been enhanced because they can be viewed as an

“extension” of traditional equity management rather than as a quantum leap into the more limited space allocated to alternative assets [30-31].

Idealized AE Models

The potential benefit from AE is derived from: 1) the opportunity to augment the active positions in the long portfolio, 2) the addition of fresh active short positions with positive alphas, and 3) the use of the short positions to offset unproductive factor risks in the long positions [32]. The purpose of this Note is to analyze the relative contribution from these three effects on portfolio alphas and information ratios (IR's).

To illustrate these differential effects, we use a series of hypothetical AE models. We begin with a long-only portfolio having 25 positions with a 2% active weight, leading to an initial “active weight” of 50%. An exponential alpha ranking curve is assumed, which begins at 5% and then declines to 1.5% by the 25th position. The residual volatility of each active position is 20%. To represent the unintended factor biases, a +0.05 pairwise correlation is assumed among the long positions. The resulting long-only portfolio has an alpha of 1.5% and TE of 3.0%.

This paper begins with studying the effects of short alphas together with different degrees of correlation between the longs and shorts. The following four cases illustrate these effects:

1) Long Reinvestment Only (LRO)

Generic non-alpha producing proceeds from the short sales are deployed to proportionally increase the long-only active positions.

This case does not improve the IR from the original long-only level. Consequently, any alpha enhancement is accompanied by a corresponding TE increase.

2) Short Alphas and Long Reinvestment with Reinforcing Factor Effects (S&L: +.05)

The short positions now have positive alpha expectations derived from the long-only alpha ranking model, less a 0.50% shorting cost. The gross short weight determines the number of 2% positions in the short portfolio while adding proportionally to the size of the 25 long positions. In all of the following, each short position is assumed to also have a +0.05 correlation with the other shorts.

However, the next three cases differ in their treatment of the correlation $\rho_{L,S}$ between the short and long positions.

In this case, $\rho_{L,S} = +0.05$, so that the new short positions reinforce the factor risks present in the long portfolio. The fresh shorts with their higher alphas lead to a slight increase in the IR for low percentage extensions. However, the TE expansion is much more severe due to the continued emphasis on the same factor risks.

3) Short Alphas and Long Reinvestment with Independent Risks (S&L: 0)

The short alphas are accessed as in the preceding case, but the longs and shorts are assumed to be subject to different factor risks.

This case is modeled by having a zero pairwise correlation between the longs and shorts. The independence of the two factor risks materially reduces the TE and improves the IR.

4) Short Alphas and Long Reinvestment With Offsets (S&L: -.05)

This idealized AE model has positive alphas on both the long and short side, together with a - 0.05 offset correlation between the long and short positions.

Rather than “piling on” the factor effects, the short offsets in this case act to significantly lower the TE and greatly improve the IR.

Position Size Models

Shorting generates proceeds that must be used in an AE to maintain the beta one level of market exposure. At some point, the reinvestable proceeds may exceed the maximum size allowed for long active positions. The excess proceeds must then be deployed into generic long investments. The paper next explores two additional cases where the reinvestment is limited by these position size considerations.

5) Short Alphas and Long Reinvestment Subject to 3% Maximum Active Position Size (S&L: 3%)

The original long-only portfolio consisted of 25 active positions, each with a 2% fixed weight. A 50% short extension would raise these weights to 4%, which may exceed the tolerable position limit. By assuming that only half of the new 50% proceeds could be reinvested in active

positions, the active long positions would be reduced to 3%.

Taking this 3% level as a maximum position size reduces the alpha and TE, leading to a surprisingly high IR.

6) Shorts Only (S&L: 2%)

The active long position size is capped at 2%, so that all short proceeds must be reinvested in beta-maintaining generic longs. In this case, the entire incremental alpha comes from the shorts.

As the new shorts begin to exert their factor offsets, the portfolio TE actually declines. The net result is a very high peak IR and a rather curious IR curve that is not very alpha productive.

In the last section, the paper discusses how the realized portfolio alpha depends critically upon various portfolio constraints. In addition to the limit on active position size, there may also be maximum tolerable levels for extension percentages and/or TE's. In such situations, the IR will not always serve as a reliable guide to achieving the most desirable portfolio alpha.

Portfolio Alphas and Tracking Errors

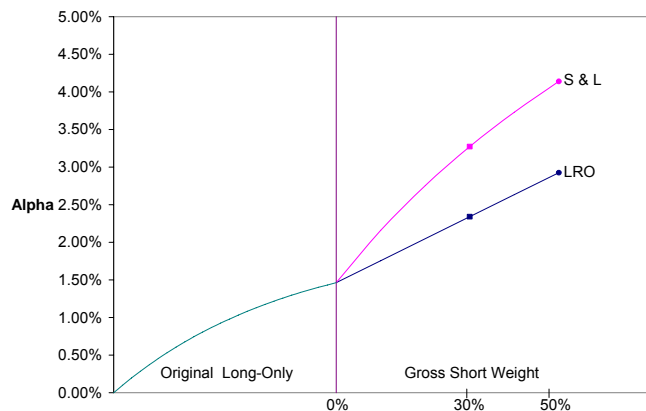
Exhibit 1 compares the portfolio alpha for LRO vs. the S&L scenarios (cases 2-4 produce the same alpha). The LRO curve shows how the portfolio alpha naturally rises with increasing active long weight. At a 30% short weight, the activity level is increased by 60%, from 50% to 80%. As a result, both the position size and the portfolio alpha rise by the same 60% to 3.2% and 2.4%, respectively. With the added boost from the short alphas, the S&L alpha rises to 3.3% for the same 30% extension.

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Exhibit 1

Alpha vs. Short Weight

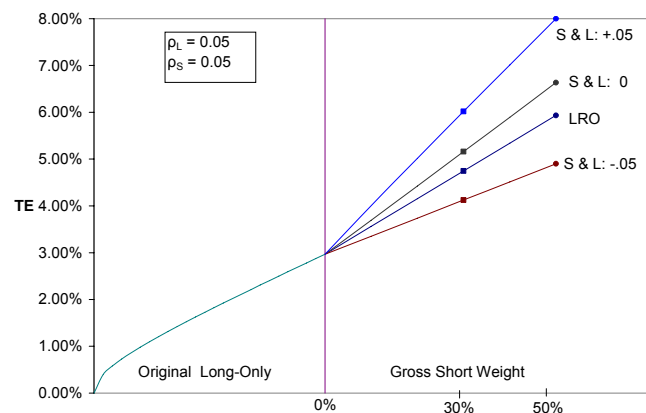


Source: Morgan Stanley Research

Exhibit 2 compares the associated TE for each of the first four cases. In the LRO scenario, the TE rises from 3% in the original portfolio to 4.7% at the 30% short weight. This 60% TE increase coincides with the 60% percentage increase in position size and portfolio alpha.

Exhibit 2

TE vs. Short Weight



Source: Morgan Stanley Research

One of the key motivations in moving from a long only to an AE is being able to use the shorts as a way to reduce certain factor risks in the long portfolio. This benefit is clearly shown when comparing the TE pattern at varying degrees of correlation between the longs and shorts.

With a positive correlation between the longs and shorts (S&L: +.05), the portfolio is essentially reinforcing its risk exposures, which leads to significant increases in TE. At 30% extension, the S&L: +.05 TE rises to 6% as more correlated positions are added to the portfolio. With a zero pairwise correlation between the longs and shorts S&L: 0, the TE is slightly lower at 5.2% for the 30% extension.

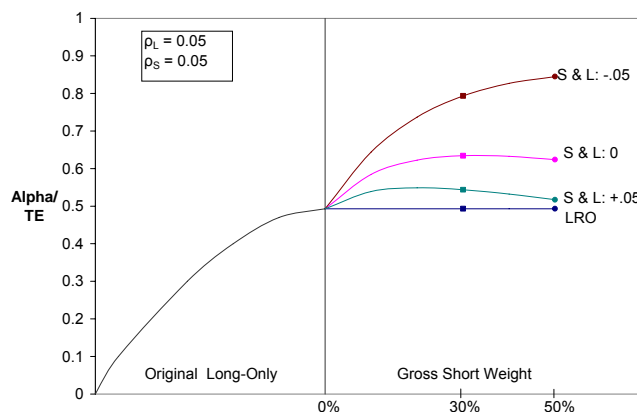
However, to achieve the lowest possible TE curve, one needs short positions that can act as offsets to the longs (S&L: -.05). Exhibit 2 illustrates the TE-reducing power of such offsets, where the TE's even fall below the LRO case, in spite of the larger total number of active positions.

Information Ratios

Exhibit 3 combines the alphas and TE's from Exhibits 1 and 2 to form alpha/TE (IR) curves for each scenario. With LRO, the IR stays fixed at the same 0.49 level achieved with the long-only portfolio. With this constant IR, higher alphas are obtained only with a comparable increase in TE.

Exhibit 3

Alpha/TE vs. Short Weight



Source: Morgan Stanley Research

With S&L: +.05 and S&L: 0, the TE increases at a slower rate than the corresponding alphas, leading to higher IR's, which peak at 0.54 and 0.63, respectively, and then decline slightly with further extension.

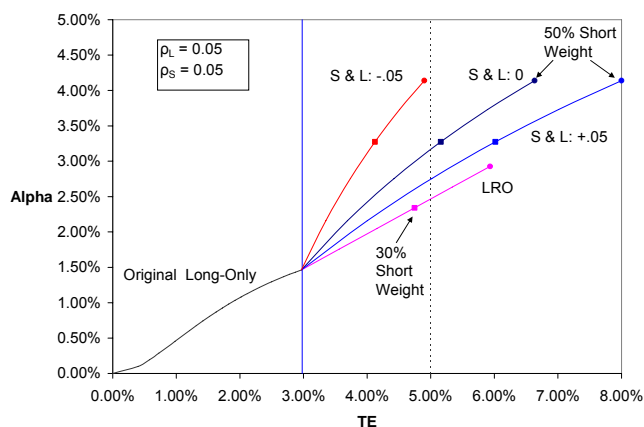
In the S&L: -.05 case, the TE drops significantly due to the offsetting correlation. The IR for 30% short weight rises to 0.79 and increases to 0.85 with larger extensions.

The View from Alpha vs. TE Space

Exhibit 4 plots these four cases in alpha vs. TE space. The 30% and 50% extension points on each curve are marked by the small squares and dots, respectively. All S&L cases have the same 3.3% alpha at 30% and a 4.1% alpha at 50%. However, the TE's are quite different, with the S&L: +.05 and S&L: 0 both exceeding a TE of 5%, even before reaching the 30% extension level. In contrast, the S&L: -.05 maintains a TE below 5% even for a 50% extension.

Exhibit 4

Alpha vs. TE



Source: Morgan Stanley Research

Thus, for those situations that allow extensions up to 50% but require TE's below 5%, the S&L: -.05 provides a much higher alpha of 4.1% than the other three cases.

Position Size Effects

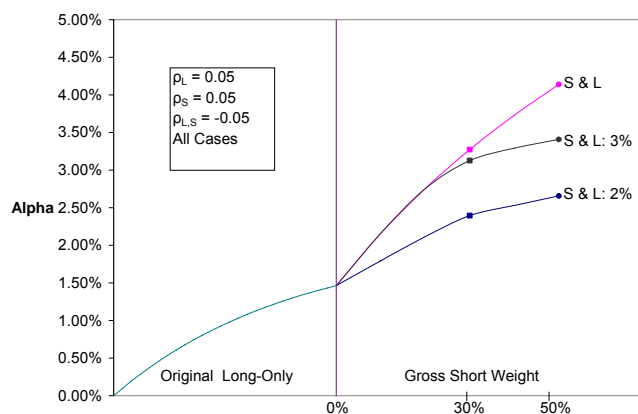
In the last three cases, the short proceeds were fully reinvested to augment existing positions in the original long-only portfolio. This led to increases in active position size that ultimately reached 4% for a 50% extension. However, there may be exogenous limits on the amount that can be reinvested in any single position. The next two cases look at maximum long position limits of 2% and 3%. The short position size is fixed at 2% in all cases, so the extension percentage continues to determine the number of short positions.

For the 3% limit (S&L: 3%), reinvestment adds proportionally to the 25 long positions up until a 25% short weight. At higher extension percentages, the additional proceeds are reinvested in generic longs that have neither an alpha nor a TE impact. For the case (S&L: 2%), with a 2% position limit, the original long portfolio has already reached the maximum weight, and all short proceeds have to be reinvested generically.

Exhibit 5 displays the effect of these position limits on the portfolio alpha. Imposing a 3% limit on the long positions does not affect the portfolio alpha prior to a 25% extension, but reduces the alpha buildup for higher short weights. With a 2% maximum size limit, none of the short proceeds can be actively reinvested, leaving the new shorts as the sole alpha source at all extension levels.

Exhibit 5

Alpha vs. Short Weight



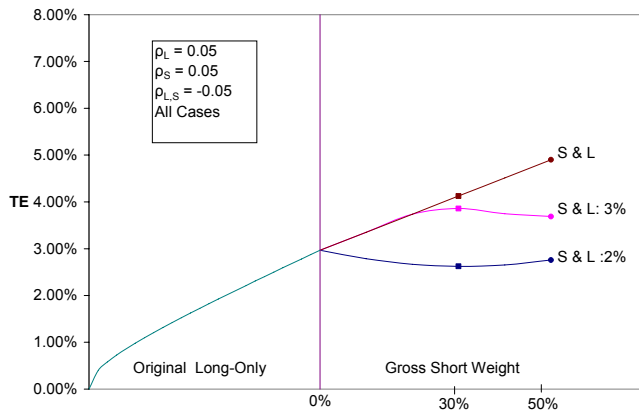
Source: Morgan Stanley Research

As shown in Exhibit 6, these position limits and the associated reduction in the active weights actually have a beneficial effect on the TE. With a 3% position limit, the TE initially coincides with the S&L case but begins to diverge downward beyond a 25% short weight. With the 2% limit, the TE declines from outset and then turns up slightly past 30%. It is at first surprising to see TE's 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.

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Exhibit 6

TE vs. Short Weight



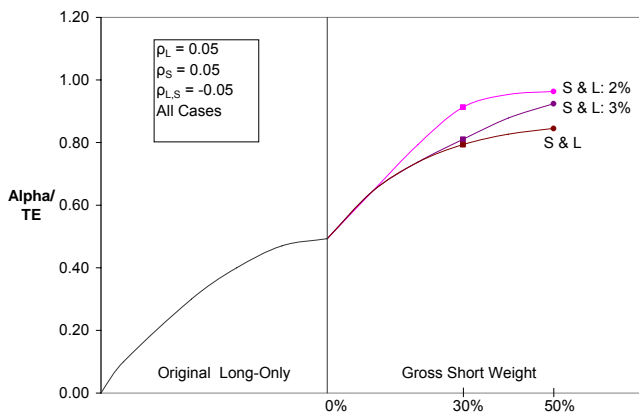
Source: Morgan Stanley Research

Position Size and Information Ratios

As seen in Exhibit 7, the highest IR's are for shorts only case (S&L: 2%). The limit on the long positions reduces the TE more than the alpha because the long/short balance allows for a more effective offset. The net result is an IR that reaches 0.91 at 30% and then continues to rise with further extension.

Exhibit 7

Alpha/TE vs. Short Weight



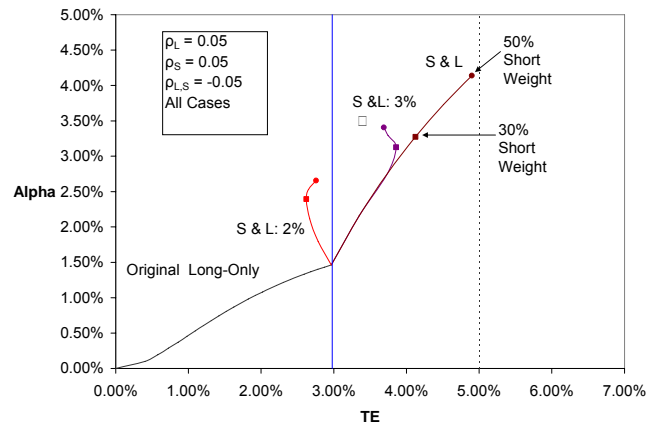
Source: Morgan Stanley Research

Exhibit 8 plots these position-limit cases in alpha vs. TE space. In all cases, the TE remains below 5% even for 50% extensions. At first, one might think that these high IR's and low TE's would be desirable outcomes. However, even with extensions up to 50%, these two alpha "orbits" fall within a low TE range and are not very fruitful in terms of alpha production.

In situations such as AE's where leverage is not an option, high IR's may not lead to satisfactory alphas. For example, in the shorts only case, the high 0.91 IR applies to such a low TE that the alpha only rises to 2.4%. By comparison, even with its lower 0.79 IR, the S&L case without position limits provided an alpha of 3.3%.

Exhibit 8

Alpha vs. TE



Source: Morgan Stanley Research

Beyond the Information Ratio

Thus, it can be seen that reasonable position limits can play a material role in determining the portfolio characteristics of active extensions. In general, such limits may raise IR's but they will generally lower both the alphas and the TE's.

These high IR curves raise a number of interesting questions about the very nature of the IR as a yardstick. Optimal extensions are often analyzed in terms of which short percentage yields the highest IR. However, the key point from the preceding discussion is that higher peak IR's do not always lead to better alphas.

Exhibit 9 drives this point home by presenting the portfolio alphas and TE's for each case at the peak IR points. It can be seen that the highest IR and highest alpha rarely go together. The peak IR of 0.96 is obtained by the shorts only case at a 50% extension. However, this peak is reached at such a low TE that the corresponding alpha is only 2.7%, the lowest of the six cases.

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Exhibit 9

Alphas at Peak IR's

	Peak IR	Alpha at Peak IR
LRO	0.49	2.9%
S & L: 0	0.63	3.3%
S & L: + .05	0.55	2.8%
S & L: - .05	0.85	4.1%
S & L: 3%	0.92	3.4%
S & L: 2%	0.96	2.7%

Source: Morgan Stanley Research

If the peak IR were itself leveragable, then of course, the highest peak IR would lead to the highest alpha for any given TE. However, for this problem (and for many other investment situations), direct leverage is simply ruled out.

The preceding examples show that the best alphas are not necessarily derived from those AE strategies that produce the highest peak IR's. Even within the same case, because AE's cannot make use of further leverage, the highest alphas will generally lie either well before or well after the peak IR. For example, in Exhibit 10, the S&L: 0 and S&L: +.05 peak-IR alphas are 3.3% and 2.8% at extensions of 30% and 20%. However, in both cases, the maximum alpha of 4.1% is reached for extensions of 50% that are well beyond the peak IR's.

Exhibit 10

Maximum Alphas vs. Alphas at Peak IR's

	Unrestricted Maximum Alpha	Alpha at Peak IR
LRO	2.9%	2.9%
S & L: 0	4.1%	3.3%
S & L: + .05	4.1%	2.8%
S & L: - .05	4.1%	4.1%
S & L: 3%	3.4%	3.4%
S & L: 2%	2.7%	2.7%

Source: Morgan Stanley Research

When exogenous constraints are present, the greatest alphas will often be found at boundary points. Exhibit 11 illustrates how investment constraints interact with the alpha/TE orbit.

The first column presents the highest alpha when having a TE below 5% is combined with the additional constraint of having an extension of 30% or lower. The second column again presents, for purposes of comparison, the alphas at the peak IR point. It can be seen that under the dual constraints, all the alphas fall below their respective peak IR alphas.

Exhibit 11

Maximum Alpha under Dual Constraints

	TE < 5% and Short Weight < 30%	Alpha at Peak IR
LRO	2.3%	2.9%
S & L: 0	3.2%	3.3%
S & L: + .05	2.7%	2.8%
S & L: - .05	3.3%	4.1%
S & L: 3%	3.1%	3.4%
S & L: 2%	2.4%	2.7%

Source: Morgan Stanley Research

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 (as in Exhibits 3 and 7). The peak or near-peak IRs are then often taken as the optimal level of extension. However, as illustrated in the preceding discussion, high IR's may not always be the best guide to the highest alphas, especially when there are multiple investment constraints.

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Appendix

The alpha function α_i depicts the i^{th} long position's expected return relative to the specified benchmark. This function is assumed to have an exponential form with an initial alpha α_0 and a position-by-position decay rate μ ,

$$\alpha_i = \alpha_0 e^{-\mu(i-1)} \quad i = 1, N_L$$

In this paper, the long alpha function has the values $\alpha_0 = 5\%$, $\mu = .05$ and $N_L = 25$

In general, for active weights ω_i , the expected alpha return for a long portfolio will be

$$\begin{aligned} \alpha_L &= \sum_1^N \omega_i \alpha_i \\ &= \alpha_0 \sum_1^N \omega_i e^{-\mu(i-1)} \end{aligned}$$

In this paper, the active weight ω_i , in the long portfolio will be treated as uniform value ω_L across all 25 positions, so that

$$\alpha_L = \alpha_0 \omega_L \left[\frac{1 - e^{-\mu N}}{1 - e^{-\mu}} \right]$$

At the outset, the original long-only portfolio has 25 active positions with 2% weights. In the case of an active extension, the new shorts create proceeds S that are reinvested proportionally across the 25 long positions. When there is no cap on the maximum active weight, the long weight grows to

$$\omega_L(S) = 2\% + S / 25$$

Thus, for $S = 50\%$, we would have $\omega_L = 4\%$.

When there is a cap ω_{MAX} on the active weight,

$$\omega_L(S) = \min(2\% + S / 25, \omega_{MAX})$$

Turning to the short positions, these are assumed for simplicity to always have a fixed 2% weight. The magnitude of the extension S then determines on the number N_S of short positions,

$$N_S = (S / 2\%)$$

In the cases where the short positions are assumed to be alpha generating, the alpha ranking function is identical to the long alpha function, less a 0.50% charge for the differential cost involved in shorting. Thus, the cumulative alpha $\alpha_S(S)$ contributed by the short side in these cases becomes,

$$\begin{aligned}\alpha_S(S) &= (5\%) \sum_1^{N_S} (2\%) e^{-\mu(i-1)} - N_S (.50\%)(2\%) \\ &= (.1\%) \left[\frac{1 - e^{-.05N_S}}{1 - e^{-.05}} \right] - N_S (.01\%)\end{aligned}$$

With the tracking error (TE), we once again opt for simplicity. For the initial long-only portfolio, the TE is given by,

$$TE_L(0) = \omega_L \sigma \sqrt{N_L + N_L(N_L - 1)\rho_L}$$

with $\omega_L = 2\%$, $\sigma = 20\%$, $N_L = 25$, and $\rho_L = .05$.

As short proceeds S are generated and reinvested, the total long fund's TE becomes,

$$TE_L(S) = \omega_L(S) \sigma \sqrt{N_L + N_L(N_L - 1)\rho_L}$$

The short side's TE contribution is similar, although here the weight ω_S is fixed while the number of positions depends on S ,

$$TE_S(S) = \omega_S \sigma \sqrt{N_S(S) + N_S(S)[N_S(S) - 1]\rho_S}$$

where ω_S , σ , and ρ_S are all constant at 2%, 20% and .05, respectively.

The TE for the combined portfolio TE_p is the standard sum of squares combined with a measure ρ_{LS} for the pairwise correlation between long and short positions,

$$TE_p(S) = \sqrt{TE_L^2(S) + TE_S^2(S) + 2\rho_{LS} N_L [N_S(S)] [\omega_L(S)] \omega_S \sigma^2}$$

The following table identifies the different values for ρ_{LS} , ω_{MAX} , and ω_S that distinguish the 6 cases presented in the paper

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	ρ_{Ls}	ω_{max}	ω_s
LRO	—	4	0
S & L: + .05	0.05	4	2
S & L: 0	0	4	2
S & L: - .05	-0.05	4	2
S & L: 3%	-0.05	3	2
S & L: 2%	-0.05	2	2

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Overweight/Buy	908	40%	332	44%	37%
Equal-weight/Hold	1021	45%	327	44%	32%
Underweight/Sell	358	16%	90	12%	25%
Total	2,287		749		

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