130/30: *The New Long-Only*

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One of the fastest growing areas in institutional investment management is the so-called active extension or 130/30 class of strategies in which the short-sales constraint of a traditional long-only portfolio is relaxed. Fueled both by the historical success of long-short equity hedge funds and the increasing frustration of portfolio managers at the apparent impact of long-only constraints on performance, 130/30 products have grown to over $75 billion in assets and could reach $2 trillion by 2010 (Tabb and Johnson [2007]).

Despite the increasing popularity of such strategies, considerable confusion still exists among managers and investors regarding the appropriate risks and expected returns of 130/30 products. For example, the typical 130/30 portfolio has a leverage ratio of 1.6 to 1, unlike a long-only portfolio that does not use leverage. Although leverage is typically associated with higher volatility returns, the volatility and market beta of a typical 130/30 portfolio are comparable to those of its long-only counterpart. Nevertheless, the added leverage of a 130/30 product suggests that the expected return should be higher than its long-only counterpart, but by how much? By definition, a 130/30 portfolio holds 130% of its capital in long positions and 30% in short positions. Thus, the 130/30 portfolio may be viewed as a long-only portfolio plus a market-neutral portfolio with long and short exposures that are 30% of the long-only portfolio's market value. The active portion of a 130/30 strategy, however, is typically very different from a market-neutral portfolio so that this decomposition is, in fact, inappropriate.

These unique characteristics suggest that existing indexes such as the S&P 500 and the Russell 1000 are inappropriate benchmarks for leveraged dynamic portfolios such as 130/30 funds. A new benchmark is needed, one that incorporates the same leverage constraints and portfolio construction algorithms as 130/30 funds, but is otherwise transparent, investable, and passive. We provide such a benchmark in this article.

Using ten well-known and commercially available valuation factors from the Credit Suisse Quantitative Equity Research Group from January 1996 to September 2007, we construct a generic 130/30 U.S. equity portfolio using the S&P 500 universe of stocks and a standard portfolio optimizer. The historical simulation of this simple 130/30 strategy—rebalanced on a monthly basis—yields a benchmark time series of returns that can be viewed as a 130/30 index. By using only information available prior to each rebalancing date to formulate the portfolio weights, we create a truly investable index. And by providing both the data and the algorithm for computing the portfolio weights, we render the index passive and transparent.

Of course, our proposal of an algorithm, or dynamic portfolio, as an index is a significant departure from the norm. Existing indexes such as the S&P 500 are defined as baskets of securities that change only occasionally, not dynamic trading strategies requiring monthly rebalancing. Indeed, the very idea of monthly rebalancing seems at odds with the passive buy-and-hold ethos of indexation. The introduction of short sales and leverage into the investment process, however, poses challenges for any buy-and-hold benchmark. Moreover, as the market demand for more sophisticated benchmarks grows, and as trading technology becomes more powerful and increasingly automated, the need for more dynamic indexes—indexes capable of capturing time-varying characteristics—will arise.

One example of the market's growing sophistication is the advent of life-cycle mutual funds. Life-cycle funds target a specific cohort of investors who plan to retire at some fixed date in the future. These funds change their asset allocation over time as each cohort's retirement year draws nearer. In this article, we argue that a dynamic strategy can also be passive if the rebalancing algorithm is sufficiently mechanical and easily implementable. For dynamic strategies such as these, indexes can also be developed, and our 130/30 index is just one example.

A literature review of long-short equity investing indicates that the analytics of 130/30 strategies have only recently been formally developed. These analytics provide the motivation for a 130/30 index. In comparison to groups of heterogeneous 130/30 managers, this index more directly captures the aggregate performance of active-extension strategies. We acknowledge that our proposal of using a strategy as an index is rather unorthodox, so in the third section of the article we provide some historical perspective for this break from tradition. We then present the basic framework for constructing a generic 130/30 strategy as well as a summary of the strategy's empirical properties, before offering our concluding remarks.

LITERATURE REVIEW

Although 130/30 strategies are relatively new, the literature on long-short equity strategies is well developed. Grinold and Kahn [2000] and Ineichen [2002] provide a useful chronology of this literature. Proponents of long-short investing argue that because the vast majority of market action has occurred on the long side, the inefficiencies on the short side of the spectrum have not yet been eliminated. For example, Jacobs and Levy [1993b] and Miller [2001] suggest that overvaluation is more common and of greater magnitude than undervaluation and thus increases the appeal of the short side to alpha hunters. This tendency toward overvaluation can be attributed to the underweighting constraint of long-only portfolios, the limited amount of short selling in the market, and the tendency of brokers to favor buy recommendations. Michaud [1993] counters this argument by suggesting that long-only active portfolio managers can also exploit short-side information by underweighting securities in the benchmark, while Arnott and Leinweber [1994] and Jacobs and Levy [1995b, 2007a] emphasize the constraints on underweighting stocks in long-only portfolios.

Advocates of long-short portfolios also point to the diversification benefits provided by the short side. According to them, a long-short strategy includes a long and a short portfolio; if the two portfolios are uncorrelated, the combined strategy would have a higher information ratio than the two separate portfolios as a result of diversification. This point is summarized by Grinold and Kahn [2000] who explain that it cannot be used as a justification for long-short investing since it also applies to the active portion of long-only portfolios. Jacobs and Levy [1995a] address the diversification argument by observing that long and short alphas are not separately measurable in an integrated long-short optimization framework. They suggest that the correlation between the separate long and short portfolios is not relevant. A theoretical framework and algorithms for integrated optimization with short selling are developed by Jacobs, Levy, and Markowitz [2005, 2006].

Michaud [1993] is among the first to argue that costs related to short sales are an impediment to efficiency. The practical relevance of such costs has been debated by Arnott and Leinweber [1994], Michaud [1994], and Grinold and Kahn [2000]. Jacobs and Levy [1995b] suggest that these costs are not higher than those of long-only investing and that, in fact, the fees per active dollar managed may be much higher in the long-only case.

More recently, the center stage of the long-short debate has focused on whether efficiency gains result from relaxing the long-only constraint. For example, Brush [1997] shows that adding a long-short strategy to a long strategy expands the mean-variance efficient frontier, provided that long-short strategies have positive expected alphas. Grinold and Kahn [2000] show that information ratios decline when one moves from a long-short to a long-only strategy. They stop short of deriving an analytical expression for the loss in efficiency which results from the long-only constraint, and use a computer simulation to estimate the magnitude of the impact. Jacobs, Levy, and Starer [1998, 1999] further elaborate on the loss in efficiency that can occur as a result of the long-only constraint. And Martielli [2005] illustrates empirically how removing the long-only constraint improves the expected information ratio for U.S. large-cap equity funds, even after accounting for the additional costs associated with shorting stocks.

Clarke, de Silva, and Thorley [2002] develop a framework to measure the impact of constraints on the value added by and the performance analysis of constrained portfolios. They provide a generalized version of Grinold's [1989] fundamental law of active management which relates the expected performance of managers and the information coefficient of their forecasting processes, recognizing that various implementation constraints prohibit managers from fully exploiting their ability to forecast returns. To capture the impact of these constraints they introduce a transfer coefficient into the fundamental law as a measure of how effectively manager information is transferred into portfolio weights. Clarke, de Silva, and Thorley [2002] use this framework to provide further support for long-short strategies by showing that the transfer coefficient falls more by imposition of the long-only constraint than by imposition of any other single restriction. Clarke, de Silva, and Sapra [2004] empirically gauge the impact of various constraints and conclude that the long-only constraint is often the most significant in terms of information loss. They show that lifting this constraint is critical for improving the information transferred from stock-selection models to active portfolio weights. Sorensen, Hua, and Qian [2007] use numerical simulations of long-short portfolios to demonstrate the net benefits of shorting and to compute the optimal degree of shorting as a function of alpha, desired tracking error, turnover, leverage, and trading costs. Johnson, Kahn, and Petrich [2007] further emphasize the loss in efficiency from the long-only constraint as well as the importance of the concerted selection of gearing and risk in the execution of long-short portfolios.

With champions of long-short investing increasingly outnumbering its adversaries, the need for a formal model to analyze the factors that determine the size of the short extension in long-short portfolios has become more pressing. Clarke, de Silva, Sapra, and Thorley [2007] have filled this gap. Adopting several simplifying assumptions regarding the security covariance matrix and the concentration profile of the benchmark, they derive an equation that shows how the expected short weight for a security depends on the relative size of the security's benchmark weight and its assigned active weight in the absence of constraints. They argue that to maintain a constant level of active risk, the long-short ratio should be allowed to vary over time to accommodate changes in individual security risk, security correlation, and benchmark weight concentration.

Finally, Martielli [2005] and Jacobs and Levy [2006] provide an excellent practical perspective on the mechanics of enhanced active equity portfolio construction and a number of operational considerations. The advantages of enhanced active equity over equitized long-short strategies are summarized in Jacobs and Levy [2007b].

CAN A STRATEGY BE AN INDEX?

In this section, we illustrate the substantial intellectual history that motivates this article. We depart from standard terminology in one important respect: We are proposing a *strategy* as a passive benchmark for 130/30 products, rather than a static, or buy-and-hold, basket of securities. This departure deserves further discussion and elaboration.

A common reaction to the use of a strategy as an index is to cry foul. How can an active portfolio be used as a benchmark for other active portfolios, particularly if the very purpose of a benchmark is to gauge the value-added by active management? Is it not unfairly raising the bar for active managers by including alpha in the benchmark? If an active strategy is used as an index, how is one particular active strategy chosen over another? By what set of criteria do we select or construct a "strategy index"? To address these legitimate objections, we need to revisit the definition and purpose of a market index, and then explore the possibility that a strategy can satisfy that definition and purpose better than a static portfolio.

The notion of a "normal" portfolio, first proposed by Barr Rosenberg and implemented by BARRA in the 1980s (see, e.g., Kritzman [1987], Divecha and Grinold [1989], and Christopherson [1998]), was an attempt to construct customized indexes for specialized managers in order to provide insight into their unique risk exposures. Christopherson [1998, p. 128] offers the following definition of a normal portfolio:

> A normal portfolio is a set of securities that contains all of the securities from which a manager normally chooses, weighted as the manager would weight them in a portfolio. As such, a normal portfolio is a specialized index.

This definition seems intuitive, but it is vague regarding whether the normal portfolio is dynamic or static; the term "index" suggests a static nature, while the phrase "weighted as the manager would weight them" suggests a dynamic nature. Christopherson [1998, p. 128] writes further that

> [t]he object of using a normal portfolio as a benchmark is to improve one's understanding of a manager's investment activities. This is accomplished by comparing the manager's performance against a passive investment alternative (such as a portfolio of securities from which the manager actually selects) that approximately matches the manager's investment activity.

Christopherson thus appears to adopt a "passive" interpretation, yet requires that the passive portfolio proxy the manager's investment activity. This seemingly contradictory set of characteristics can only be resolved by acknowledging the possibility of a passive benchmark that is also dynamic.

The academic finance literature is replete with studies that employ portfolios with changing weights in order to investigate certain anomalies.[1] From the practitioner's perspective, however, a portfolio that has changing weights is inconsistent with the traditional definition of an index which is a value-weighted basket of a fixed set of securities, such as the S&P 500. The original motivation behind fixing and value-weighting a set of securities was to reduce the amount of trading needed to replicate the index in a cash portfolio. Apart from additions and deletions to the index, a value-weighted portfolio need never be rebalanced because the weights automatically and proportionally adjust as market valuations fluctuate. These buy-and-hold portfolios are attractive not only because they minimize trading costs, but because they are simple to implement from an operational perspective. It is easy to forget the formidable challenges posed by the back-office, accounting, and trade reconciliation processes for even moderate-sized portfolios in the days before personal computers, FIX engines, and electronic trading platforms. A vivid reminder of these early challenges is provided by Bogle [1997] through a fascinating account of the origins of the very first index mutual fund—the Vanguard Index Trust. In the following passage, Bogle describes the intellectual roots of the mutual fund business:

> The basic ideas go back a few years earlier. In 1969–1971, Wells Fargo Bank had worked from academic models to develop the principles and techniques leading to index investing. John A. McQuown and William L. Fouse pioneered the effort, which led to the construction of a $6 million index account for the pension fund of Samsonite Corporation. With a strategy based on an equal-weighted index of New York Stock Exchange equities, its execution was described as "a nightmare." The strategy was abandoned in 1976, replaced with a market-weighted strategy using the Standard & Poor's 500 Composite Stock Price Index. The first such models were accounts run by Wells Fargo for its own pension fund and for Illinois Bell.

The fact that constructing cash portfolios of broad-based indexes was extremely difficult and costly in the 1970s and 1980s is now a distant memory to the technology-savvy managers of today's multi-trillion-dollar index-fund industry. An enduring legacy of that era is the static value-weighted benchmark, which persists today due to its inherent economy of implementation as well as to cultural inertia. Similar to the recent advances in trading technology which have indelibly altered the practice of portfolio management, the concepts of benchmarks, indexes, and passive investing are also evolving as rapid technological advances sweep the financial markets.

One approach to understanding the nature of this evolution is to adopt the functional perspective of Merton [1989, 1995a,b] and Merton and Bodie [2005]. What functions does an index serve? Is it possible that such functions may be better served by an approach other than static value-weighted portfolios? We can identify at least two distinct functions of an index: (1) a passive benchmark against which active managers can be compared and (2) a transparent, investable, and passive portfolio that has a risk-reward profile which appeals to a broad range of investors.

A key concept of both index functions is that they are passive, a trait most investors and managers equate with static low-cost buy-and-hold portfolios. However, a functional definition of passive can be more general: An investment process is deemed passive if it does not require any discretionary human intervention. In the 1970s, this notion of passive investing would have implied a static value-weighted portfolio. But the meaning of passive investing has changed with the many technological innovations that have transformed the financial landscape over the last three decades—for example, automated trading platforms, electronic communications networks, computerized back-office and accounting systems, and straight-through processing.

One recent example is the fundamental index of Arnott, Hsu, and Moore [2005]. A fundamental index is not value-weighted, does not rely on human intervention, and is purely rule-based. Another example is the proliferation of automated trading algorithms provided by many brokerage firms which allow institutional investors to trade entire portfolios of securities with a single mouse-click to achieve the volume-weighted-average-price or time-weighted-average-price benchmark for their portfolios. But perhaps the most compelling illustration of the changing nature of benchmarks and indexes is the proliferation of life-cycle funds which are designed for specific cohorts of investors sorted by their planned retirement dates. For example, the investment policy of the Vanguard Target Retirement 2015 Fund (VTXVX) is summarized by the following passage (www.vanguard.com):

> The fund invests in Vanguard mutual funds using an asset allocation strategy designed for investors planning to retire between 2013 and 2017. The fund's asset allocation will become more conservative over time. Within seven years after 2015, the fund's asset allocation should resemble that of the Target Retirement Income Fund. The underlying funds are: Vanguard Total Bond Market Index Fund, Vanguard Total Stock Market Index Fund,

Vanguard European Stock Index Fund, Vanguard Pacific Stock Index Fund, and Vanguard Emerging Markets Stock Index Fund.

Life-cycle funds are not static, but neither are they actively managed. One of the benefits of technology is the ability to create passive portfolios capable of capturing more complex risk-return profiles, such as those of an aging population preparing for retirement.

In this article, we propose a passive index that involves a mechanical investment process and leads to a plain-vanilla 130/30 portfolio. The concept of a strategy as an index is far more general, however, and we believe a broad array of such indexes would provide useful information for investors. Indeed, the burgeoning literature and industry applications involving hedge-fund beta replication is just one manifestation of this trend toward transparency through mechanical portfolio construction rules (e.g., Hasanhodzic and Lo [2007]). We expect more dynamic strategies to become passive benchmarks as the investor base becomes more sophisticated and demanding.

INDEX CONSTRUCTION

A 130/30 strategy has two basic components: forecasts of expected returns, or alphas, for each stock in the portfolio universe, and an estimate of the covariance matrix used to construct an efficient portfolio. In this section we describe a set of ten composite alpha factors developed by the Credit Suisse Quantitative Equity Research Group and distributed regularly to its clients. The factors cover a broad spectrum of valuation models ranging from investment style to technical indicators. We use a simple equal-weighted average of these ten factors as our generic expected-return forecast. The covariance matrix used to construct a mean-variance efficient portfolio is given by the Barra U.S. Equity Long-Term Risk Model.

In this section, we also describe the parameter settings used to determine the portfolio weights of our 130/30 index, and we show how to compute an upper bound on the performance of a 130/30 portfolio by constructing a look-ahead index. In the portfolio optimization process, a look-ahead index uses the realized monthly returns of each security instead of forecasted returns. Although achieving such returns is impossible because no one has perfect foresight, this upper bound serves as a yardstick for measuring the economic significance of the alpha captured by a particular portfolio.

Expected Excess Return Forecasts

The alpha forecasts used in the construction of our 130/30 index (CS 130/30 Investable Index) are obtained from the Credit Suisse Quantitative Equity Research Group and consist of ten distinct composite factors. These can be categorized into five broad investment areas: value, growth, profitability, momentum, and technical. Each strategy was developed using fundamental data from financial statements, consensus earnings forecasts, and market-pricing and volume data. These factors can be used as stand-alone investment strategies (e.g., investors can simply create portfolios of stocks with varying exposure to the alpha factors). The alpha factors can also be used as a bellwether for certain market trends and cycles. For example, if value factors are outperforming in the S&P 500, investors may take this as a signal that a shift to value is underway.[2]

We now describe each of the ten alpha factors and list the financial indicators used in their computation. The methodology for combining these indicators to obtain the composite factors is described later in this section.[3]

1. *Traditional Value.* The traditional-value alpha portfolio buys cheap stocks and shorts expensive stocks. We construct the traditional-value factor using price ratios such as price to earnings, price to book, price to cash flow, and price to sales. We refer to this approach as traditional value because these ratios have long served as the traditional measures of value.
2. *Relative Value.* For relative-value alpha, we measure value using such industry-relative price ratios such as price to earnings, price to book, and price to sales. For example, the industry-relative price-to-earnings ratio of company XYZ is constructed by taking the XYZ price-to-earnings ratio and standardizing it using the median and standard deviation (computed using the median) of that ratio across all companies in XYZ's industry group. In this approach, a stock is considered cheap if its ratio is less than the industry average. We also look at the same measure across time by standardizing the industry-relative ratio of each company with its historical five-year average and standard deviation. We consider a stock cheap if the current spread between its ratio and the industry average is less than the historical five-year average spread.

3. *Historical Growth.* The historical-growth alpha portfolio buys stocks with strong records of growth and shorts stocks with flat or negative growth rates. We measure growth based on earnings growth rates, revenue trends, and changes in cash flows.
4. *Expected Growth.* The expected-growth alpha portfolio buys stocks with high rates of expected earnings growth and shorts those with low or negative expected growth rates.
5. *Profit Trends.* The profit-trends alpha portfolio buys stocks showing strong bottom-line improvement and shorts stocks showing deteriorating profits or increasing losses. We measure profit trends using the following ratios: overhead to sales, earnings to sales, and sales to assets. We also use trends in the following ratios: receivables plus inventories to sales, cash flow to sales, and overhead to sales.
6. *Accelerating Sales.* The accelerating-sales alpha portfolio buys stocks with strong records of sales growth and shorts stocks with flat or negative sales growth.
7. *Earnings Momentum.* We define earnings momentum in terms of earnings estimates, not historical earnings. The earnings-momentum alpha portfolio buys stocks with positive earnings surprises and upward estimate revisions, and shorts stocks with negative earnings surprises and downward estimate revisions.
8. *Price Momentum.* The price-momentum alpha portfolio buys stocks with high returns over the past 6 to 12 months and shorts stocks with low or negative returns over the past 6 to 12 months.
9. *Price Reversal.* Price reversal is the pattern in which short-term winners suffer a price downturn and short-term losers enjoy a price upturn. These reversal patterns are evident for horizons ranging from one day to four weeks.
10. *Small Size.* The small-size alpha portfolio buys the smallest decile stocks in the index and shorts the largest decile stocks in the index. We measure size using the following metrics: market capitalization, assets, sales, and stock price.

Stocks with high exposure to the ten alpha factors are forecast to provide positive alpha and stocks with low exposure to the factors are expected to generate negative alpha. Therefore, we invert all the traditional-value and relative-value ratios, with the exception of the dividend yield, so that a high number indicates positive alpha. For the same reason, all of the price-reversal and small-size individual alpha measurements, as well as two profit-trends individual alpha measurements—1) Industry-Relative Trailing 12-Month Receivables and Inventories to Trailing 12-Month Sales and 2) Trailing 12-Month Overhead to Trailing 12-Month Sales—are multiplied by –1.

As just described, each company in the S&P 1500 universe has ten composite alpha-factor time series associated with it, each of which consists of the factor's constituent alpha measurements. For example, the traditional-value composite alpha factor is composed of the following five constituent factors: price to book value (P/BV), dividend yield, price to trailing cash flow, price to trailing sales, and price to forward earnings. We now describe the algorithm used to combine these individual alpha measurements into composite alpha-factor z-scores. After, say, the P/BV ratio is computed for a particular company on a particular date, the following two-step normalization procedure is used to compute its z-score (beginning with a sample of all companies in the S&P 1500):

1. The P/BV z-score is computed by normalizing the ratio using the ratio's cap-weighted mean across the S&P 500 companies and its standard deviation across the S&P 1500 companies. The standard deviation is computed using the cap-weighted mean, but the squared deviations from the mean are not cap-weighted.
2. The companies with z-scores computed in Step 1 that are greater than 10 in absolute value are dropped from the sample, and the cap-weighted S&P 500 mean and the S&P 1500 standard deviation are re-computed based on this smaller sample. Then, the P/BV of each company (from the original sample) is re-normalized.

Using the same methodology, we compute the z-scores of each of the following ratios: dividend yield, price to trailing cash flow, price to trailing sales, and price to forward earnings. To compute the traditional-value composite alpha-factor z-score, we first take an equal-weighted average of the z-scores of the factor's five constituents. Any constituent z-score that is greater than 10 or less than –10 is set to 10 or –10, respectively. We then normalize that equal-weighted average in two steps as previously described.

The composite alpha-factor z-scores for each of the other nine composite alpha factors are obtained in the same way given the factor's corresponding constituent indicators. Then, for each company in the S&P 500 and for each date, we compute the equal-weighted average of its corresponding ten composite alpha-factor z-scores, and use this score as the excess-return input in the portfolio optimizer as described in the following subsection.

Portfolio Construction Algorithm

We use the MSCI Barra Aegis Portfolio Manager with the Barra U.S. Equity Long-Term Risk Model to construct the 130/30 investable and look-ahead portfolios on a monthly basis for the period January 1996 to September 2007. For each month, we use the S&P 500 as the benchmark and the universe to construct the portfolios. We start with $100 million in cash and rebalance on a monthly basis (i.e., for each month after January 1996, we input the previous month's portfolio as the initial portfolio in the optimization process). The following specifications are used (see the appendix for further details):

Constraints: We constrain the portfolio beta to equal one.

Expected returns: For each company in the S&P 500 and for each date, we use the equal-weighted average of the company's corresponding ten composite alpha-factor z-scores as the excess-return input in the optimizer when constructing the investable portfolio, and we use the one-month forward excess return when constructing the look-ahead portfolio. We set the risk-free rate, the benchmark risk premium, and the expected benchmark surprise all to zero.

Optimization type: We use long-short portfolio optimization for which we set the long- and short-position leverage to 130% and 30%, respectively.

Trading: We do not put any constraints on the holding and trading threshold levels, and we set the active weight to 40 bps. This yields a tracking error, defined as the annualized standard deviation of the difference between the portfolio and the benchmark daily return series, between 1.5% and 3% for each month.

Risk: We use the Barra default setting, which includes the following specifications: mean return of zero, probability level of 5%, risk aversion value of 0.0075, and AS-CF risk aversion ratio of 1.

Transaction costs: We set one-way transaction costs to 0.25% and construct portfolios with three levels of annualized turnover—15%, 100%, and unconstrained—which are intended to span the relevant range of interest for most investors and managers.[4] We also impose a short-sales cost that reflects the spread between the short rebate and the borrowing cost of leverage, which we assume to be 0.75% annually (e.g., Martielli [2005]).[5] Therefore, we deduct $30\% \times 0.75\%/12$ from the monthly returns of our 130/30 portfolio.

Tax costs: We do not assume any model for the tax costs.

Under these parameters, the portfolio optimization process generates for each month the optimal number of shares to be held for each stock in our 130/30 portfolio. Now, for each stock i in our portfolio, we have the following monthly information: the number of shares S_{it-1} at the end of the previous month, the price per share P_{it-1} at the end of the previous month, and the total return for month R_{it}. We use this information to form the net-of-cost monthly 130/30 portfolio total return R_{pt}, as follows:

$$\begin{aligned} R_{pt} &\equiv \sum_{i=1}^{n} \frac{P_{it-1}S_{it-1}}{\sum_{j=1}^{n} P_{jt-1}S_{jt-1}} R_{it} - \text{TCost}_t - \text{SCost}_t \\ \text{TCost}_t &\equiv 0.0025 \times 2 \times 1.6 \times \text{Turnover}_t \\ \text{SCost}_t &\equiv 0.3 \times 0.0075/12 \end{aligned} \tag{1}$$

where TCost_t is the direct transaction costs incurred in month t, Turnover_t is the monthly turnover as calculated by the MSCI Barra Aegis Portfolio Manager, and SCost_t is the cost associated with the short side of the 130/30 portfolio (i.e., the spread between the short rebate and the borrowing cost due to the use of leverage).[6]

The Look-Ahead Index

We create a look-ahead index at month-end using exactly the same portfolio construction process as for the investable index, but we replace the expected excess-return forecast with the realized excess return for that month. Instead of creating a z-score as the proxy for the expected excess return, for each stock we simply use the difference between the one-month forward return of the stock and the S&P 500 index as the expected excess-return input for the MSCI Barra Aegis Portfolio Manager. A portfolio created in this manner obviously has "perfect foresight" because it uses realized returns rather than expected-return forecasts; returns for this portfolio will serve as an upper limit to total available alpha. Because this portfolio is created with the same constraints as the investable index, the return for the portfolio will be the maximum potential return available for the 130/30 strategy. Investors and portfolio managers can use this return to gauge the amount of alpha captured by their own portfolios, which can be a useful measure of alpha decay over time.

EMPIRICAL RESULTS

Using the procedure outlined in the previous section and using data for the period from January 1996 to September 2007, we construct the returns of our 130/30 strategy assuming a one-way transaction cost of 0.25% and an annual short-sales cost of 0.75%, using three levels of annual turnover—15%, 100%, and unconstrained. Given that our universe is the S&P 500, a one-way transaction cost of 0.25% may overestimate transactions costs for most 130/30 portfolios. Transaction costs tend to be higher, however, for portfolios constructed purely from fundamental or discretionary considerations. Hence, we use a more conservative value to accommodate for these as well as the more typical quantitative 130/30 portfolios. Since the S&P 500 has an annual turnover of roughly 2% to 10% (see Exhibit 8), a turnover level of 15% preserves the passive nature of our 130/30 portfolio while allowing it to respond each month to changes in the underlying alpha factors. Therefore, most of our analysis will center on this case. The next two subsections summarize the basic performance characteristics of the 130/30 index and provide the trading statistics for the 130/30 portfolio, respectively.

Historical Risk and Return

Exhibit 1 summarizes the performance of the 130/30 index with 0.25% one-way transaction costs and 0.75% annual short-sales costs, and three levels of annualized turnover constraints—15%, 100%, and unconstrained. For comparison, we also include summary statistics for the 15% turnover case without deducting any transaction or short-sales costs, as well as the look-ahead portfolio and the S&P 500 index. The average return of the 130/30 index is 14.08% with no turnover constraints. The average return becomes 14.25% and 11.76% with turnover constraints of 100% and 15%, respectively. The difference in performance between the unconstrained and highly constrained portfolios is not surprising, given the differences in the amount of trading required for their implementation; the unconstrained portfolio generates approximately 350% turnover per year compared to 15% turnover in the constrained case (see the next subsection and Exhibits 6 and 7). Given the high transaction costs of 0.25%, it is reasonable that the somewhat constrained case of 100% turnover performs better than the unconstrained case, since the latter does not incorporate transaction costs in the optimization process.

Transaction costs have little impact on the volatility of the 130/30 index, which is approximately 15% for the investable index under all three levels of turnover and is similar to the 14.68% standard deviation of the S&P 500. This volatility level implies a Sharpe ratio of 0.44 for the 130/30 index with 0.25% one-way transaction costs, 0.75% annual short-sales costs, and a 15% annualized turnover constraint, assuming a 5% risk-free rate. This compares favorably with the Sharpe ratio of 0.37 for the S&P 500. Of course, some have argued that such a comparison is inappropriate because the 130/30 strategy is leveraged; this argument is the very motivation for our index. By controlling the volatility and beta of our 130/30 strategy, we hope to create a benchmark that is as closely comparable to the S&P 500 as possible, while allowing the unique characteristics of long-short equity investing to emerge.

Exhibit 2 plots the cumulative returns of the CS 130/30 Investable Index (with 0.25% one-way transaction costs, 0.75% annual short-sales costs, and 15% and 100% annualized turnover constraints) and other popular indexes such as the S&P 500, Russell 2000, and CS/Tremont Hedge Fund Index. These plots show that the 130/30 index behaves more like traditional equity indexes than the CS/Tremont Hedge Fund Index, but does exhibit some performance gains over the S&P 500 and Russell 2000.

These performance gains are more readily captured by Exhibit 3, in which the geometrically compounded annual returns of the 130/30 strategy with 0.25% one-way transaction costs, 0.75% annual short-sales costs, and a 15% annualized turnover constraint are plotted, as well as the strategy's long-side and short-side returns and the comparable S&P 500 returns, where the long-side (short-side) returns are defined as the returns of the strategy's long (short) positions. With the exception of 2002, Exhibit 3 shows that the short positions of the 130/30 portfolio hurt performance; hence it is tempting to conclude that the short side adds little value. However, this interpretation ignores the diversification benefits that the short positions yield, as well as the flexibility to take more active risk on

EXHIBIT 1

Summary Statistics for the Monthly Returns of the CS 130/30 Investable and Look-Ahead Indexes and the S&P 500 Index, January 1996 to September 2007

Statistic	Sample Period				Sample Period			
	1996-2007	2002-2007	2004-2007	2007	1996-2007	2002-2007	2004-2007	2007
	130/30 Index, TC=0.25%, SC=0.75%, T/O≈15%				130/30 Index, TC=0%, SC=0%, T/O≈15%			
Annualized Mean (%)	11.76	7.85	11.07	15.59	12.07	8.14	11.36	15.88
Annualized SD (%)	15.22	12.20	7.32	8.60	15.22	12.19	7.32	8.60
Annualized Sharpe*	0.44	0.23	0.83	1.23	0.46	0.26	0.87	1.26
Skewness	-0.50	-0.61	-0.25	-0.27	-0.50	-0.61	-0.25	-0.27
Kurtosis	3.61	4.35	2.16	1.86	3.61	4.35	2.16	1.86
ρ_1	-3.8	5.2	-7.9	17.7	-3.8	5.2	-7.9	17.7
ρ_2	-2.1	8.8	-12.8	-69.2	-2.1	8.8	-12.9	-69.3
ρ_3	5.1	3.6	-17.6	-42.7	5.1	3.6	-17.6	-42.7
MaxDD (%)	-44.9	-29.6	-4.3	-3.6	-44.5	-29.5	-4.2	-3.5
DD Begin	20000831	20020328	20050228	20070531	20000831	20020328	20050228	20070531
DD End	20020930	20020930	20050429	20070731	20020930	20020930	20050429	20070731
	130/30 Index, TC=0.25%, SC=0.75%, T/O≈100%				Look-Ahead 130/30, TC=0%, SC=0%, T/O=NC†			
Annualized Mean (%)	14.25	9.34	11.43	11.78	127.98	106.59	99.31	98.53
Annualized SD (%)	15.15	11.34	7.42	8.85	18.01	13.57	7.99	9.59
Annualized Sharpe*	0.61	0.38	0.87	0.77	6.83	7.48	11.80	9.75
Skewness	-0.49	-0.62	-0.28	-0.45	0.51	1.10	-0.02	-0.01
Kurtosis	3.87	3.99	2.42	1.67	3.26	6.01	1.86	1.50
ρ_1	-3.4	0.2	-5.3	13.6	6.2	-1.9	-6.8	12.2
ρ_2	-7.7	1.1	-21.1	-64.6	2.3	-11.2	-12.1	-73.4
ρ_3	5.7	3.6	-17.5	-40.0	18.7	-2.5	-21.5	-34.6
MaxDD (%)	-36.5	-23.1	-5.0	-5.0	-2.9	-0.2	0.0	0.0
DD Begin	20000831	20020328	20070531	20070531	19980731	20020830	—	—
DD End	20020930	20020930	20070731	20070731	19980831	20020930	—	—
	130/30 Index, TC=0.25%, SC=0.75%, T/O=NC†				S&P 500 Index			
Annualized Mean (%)	14.08	8.70	10.78	10.80	10.50	7.49	10.58	12.09
Annualized SD (%)	15.10	11.39	7.64	9.42	14.68	12.00	7.35	9.38
Annualized Sharpe*	0.60	0.32	0.76	0.61	0.37	0.21	0.76	0.76
Skewness	-0.36	-0.59	-0.19	-0.34	-0.56	-0.61	-0.32	-0.26
Kurtosis	3.71	4.07	2.40	1.63	3.65	4.36	2.12	1.69
ρ_1	-1.3	-1.3	-6.4	16.7	-0.9	5.2	-1.3	18.3
ρ_2	-8.6	0.4	-21.9	-69.2	-5.0	5.5	-16.6	-71.1
ρ_3	3.1	3.7	-18.7	-42.7	4.0	3.9	-24.8	-44.4
MaxDD (%)	-35.4	-23.9	-5.6	-5.6	-44.7	-28.3	-4.7	-4.7
DD Begin	20000831	20020328	20070531	20070531	20000831	20020328	20070531	20070531
DD End	20020930	20020930	20070731	20070731	20020930	20020930	20070731	20070731

**A risk-free rate of 5% is assumed.*

†NC = No Constraint.

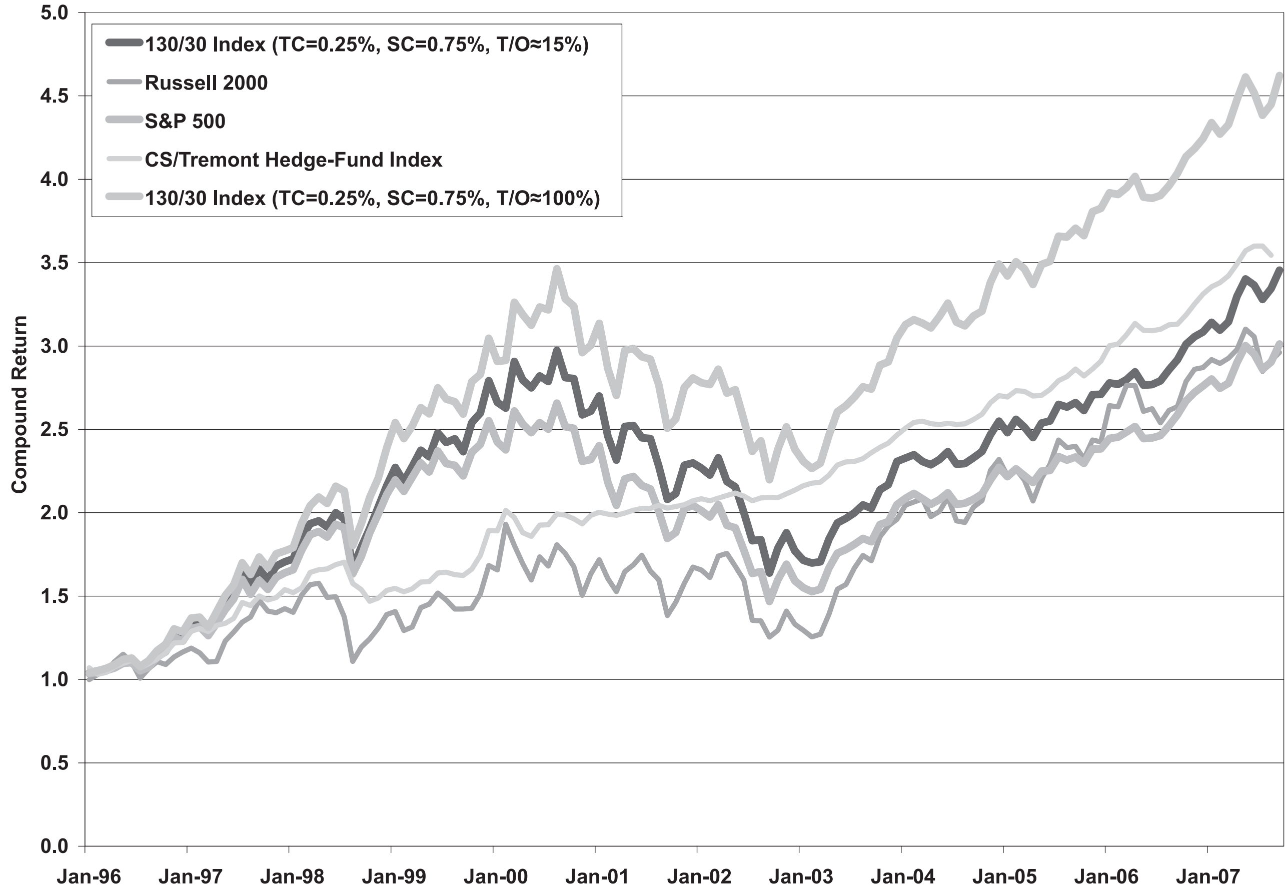
Note: The annualized mean returns are arithmetic averages of monthly returns multiplied by 12, not compounded geometric averages.

the long side while maintaining a unit beta and a 100% dollar exposure for the portfolio.

A year-by-year comparison of the 130/30 strategy with the S&P 500 suggests that the increased flexibility of the 130/30 portfolio does seem to yield benefits over and above the S&P 500. However, there are periods such as 1998, 2002, and 2006 where the 130/30 strategy can underperform the S&P 500. Exhibit 4 contains the monthly and annual returns of the various 130/30 investable and look-ahead indexes and the S&P 500 index, and a direct comparison shows that the annualized tracking error of the 130/30 index with 0.25% one-way transaction costs, 0.75% annual short-sales costs, and a 15% annualized turnover constraint is 1.83% and the average excess return associated with this 130/30 index 1.26%, implying an information ratio (IR) of 0.69.[7] However, given the passive and transparent nature of the 130/30 strategy we have proposed, this impressive IR should not be interpreted as

EXHIBIT 2

Comparison of the Cumulative Returns of the CS 130/30 Investable Index and Other Indexes, January 1996 to September 2007



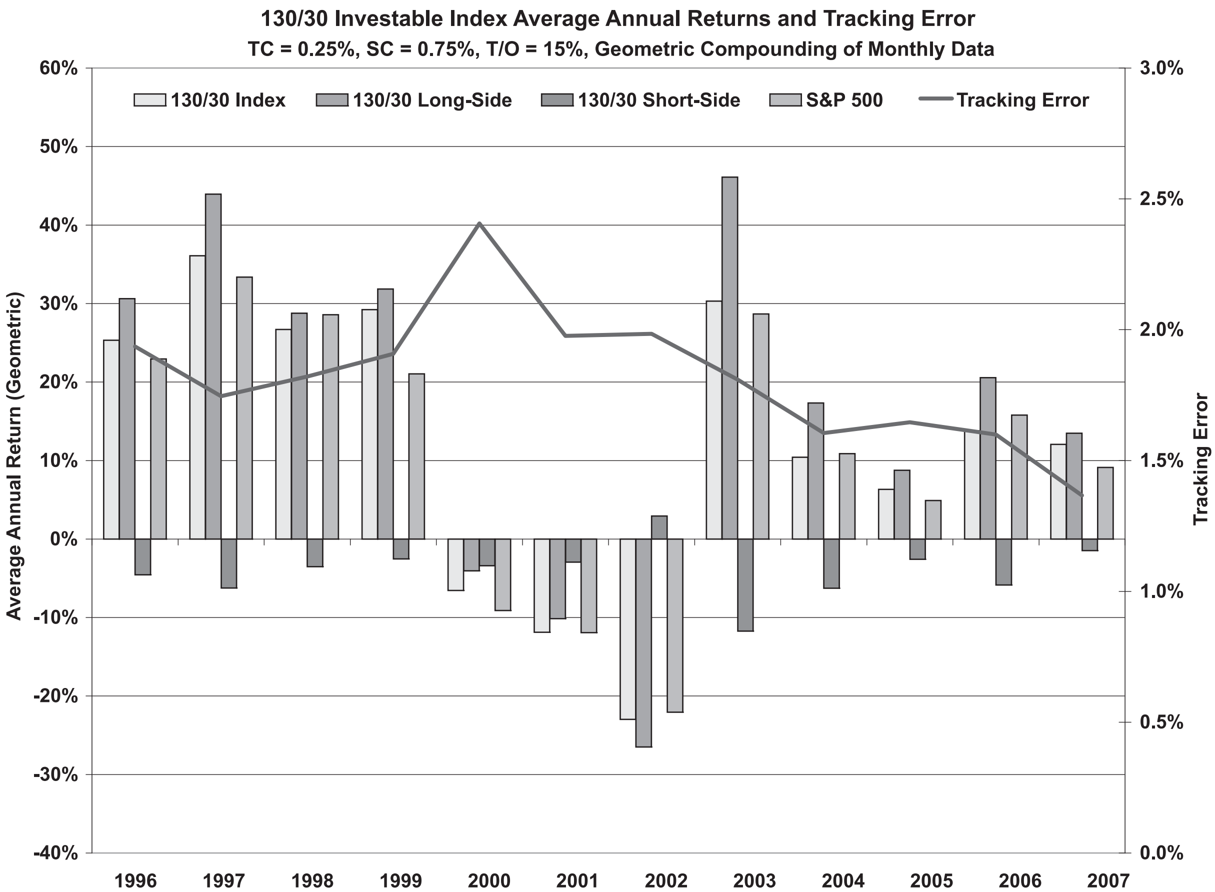
a sign of "alpha,"[8] but rather as the benefits of increased flexibility provided by the 130/30 format.

It is well-known that a long-only portfolio with no alpha will not benefit from the flexibility of leverage and short sales. Consider the trivial example of leveraging all the positions of the S&P 500 by an additional 30%, and then shorting every stock by 30%. The outcome of this 130/30 portfolio is simply the S&P 500. For a 130/30 portfolio to yield positive excess return above and beyond its long-only counterpart, the factors used to construct expected-return forecasts must add value. In the appendix subsection A.3, we report the performance summary statistics of the long-only version of the 130/30 investable index. Exhibit A2 shows that the CS factors do add value above and beyond the S&P 500 benchmark. However, we argue that this value-added should not be interpreted as "alpha" in the sense of proprietary investment acumen, but may be due to other sources of risk premia that a 130/30 portfolio can exploit more effectively than the long-only format.

Apart from these performance differences, Exhibit 1 shows that the remaining statistical properties of 130/30 index returns are virtually indistinguishable from those of the S&P 500. In Exhibit 5, we report the correlations of the 130/30 index with 0.25% one-way transaction costs, 0.75% annual short-sales costs, and 15%, 100%, and unconstrained annual turnover to various market indexes, key financial assets, and hedge-fund indexes. For comparison, we report the same correlations for the S&P 500. Not surprisingly, the 130/30 index is highly correlated with all of the equity indexes, and the correlation coefficients are nearly identical to those of the S&P 500. The second two sub-panels of Exhibit 5 show the same patterns—the 130/30 index and the S&P 500 have almost

EXHIBIT 3

Annual Geometrically Compounded Returns of the CS 130/30 Investable Index and S&P 500 Index, January 1996 to September 2007



Note: Transaction costs (TC) are 0.25% one way, short-sales costs (SC) are 0.75% annually, and the annualized turnover constraint (T/O) is 15%. Tracking error is relative to the S&P 500. The annual returns for 2007 are year-to-date returns.

identical correlations to stock, bond, currency, commodity, and hedge-fund indexes.

Trading Statistics

To develop a sense for the implementation issues surrounding the 130/30 index, Exhibits 6 and 7 report the monthly and annual turnover and yearly averages of the annualized tracking errors (obtained from the MSCI Barra Aegis Portfolio Manager each month) of the 130/30 portfolio assuming 0.25% one-way transaction costs and 0.75% annual short-sales costs with annualized turnover constrained to either 15% or 100%, or left unconstrained.[9] The turnover of the 130/30 index ranges from a high of 16.2% in 2000 to a low of 6.2% in 2003, and is typically 1% per month. For comparison, Exhibit 8 contains the turnover of several S&P indexes.

In contrast to the 130/30 index which is intended to be a dynamic basket of securities, the S&P indexes are static, changing only occasionally as certain stocks are included or excluded due to changes in their characteristics. Therefore, as a buy-and-hold index, the turnover of the S&P 500 is typically much lower than that of the 130/30 index. Exhibit 8 shows, however, that even for the S&P 500, there are years when this static portfolio exhibits turnover levels approaching the levels of the 130/30 index, such as in 1998 when the turnover in the S&P 500 index is 9.5%. Moreover, for other static S&P indexes such as the Mid Cap 400, the turnover levels exceed those of the 130/30 index. As a result, the

EXHIBIT 4

Monthly Returns of the CS 130/30 Investable and Look-Ahead Indexes and S&P 500 Index (in Percent), January 1996 to September 2007

	130/30 Index Monthly Returns (TC=0.25%, SC=0.75%, T/O≈15%)												Annual
Year	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**(Geom)**
1996	4.0	1.2	1.1	2.0	1.9	0.6	-4.3	3.0	5.6	2.6	8.4	-2.7	25.3
1997	7.6	1.0	-4.5	6.8	6.7	4.0	8.1	-5.3	5.3	-3.7	5.0	1.5	36.1
1998	1.0	7.5	4.5	0.8	-1.8	4.5	-1.9	-14.9	7.3	6.3	6.7	6.2	26.7
1999	5.1	-3.7	4.1	4.3	-1.6	6.1	-2.3	0.9	-3.1	7.4	2.2	7.5	29.2
2000	-4.7	-1.3	10.7	-3.9	-1.7	2.6	-1.2	6.7	-5.5	-0.2	-7.7	0.8	-6.6
2001	3.5	-8.9	-5.9	8.7	0.2	-2.9	-0.2	-6.8	-8.7	1.6	8.1	0.6	-11.9
2002	-1.3	-1.9	4.6	-6.1	-1.5	-7.2	-8.4	0.3	-10.9	9.1	5.2	-5.8	-23.0
2003	-3.2	-0.9	0.4	8.0	5.3	1.4	1.7	2.3	-1.0	5.6	1.4	6.4	30.3
2004	0.9	0.8	-1.7	-0.9	1.4	2.0	-3.1	0.2	1.5	1.6	4.2	3.3	10.4
2005	-2.7	3.2	-1.8	-2.5	3.5	0.5	3.9	-0.6	1.0	-1.8	3.7	0.0	6.3
2006	2.6	-0.3	1.1	1.7	-2.8	0.1	0.8	2.4	2.0	3.2	1.5	0.9	13.8
2007	1.9	-1.5	1.6	4.9	3.1	-1.1	-2.5	2.0	3.3				12.0
Mean	1.2	-0.4	1.2	2.0	1.1	0.9	-0.8	-0.8	-0.3	2.9	3.5	1.7	
SD	3.6	3.9	4.5	4.7	3.1	3.5	4.2	5.7	5.8	3.9	4.4	4.0	

	130/30 Index Monthly Returns (TC=0%, SC=0%, T/O≈15%)												Annual
Year	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**(Geom)**
1996	4.0	1.2	1.1	2.0	2.0	0.7	-4.3	3.0	5.6	2.6	8.4	-2.7	25.7
1997	7.6	1.0	-4.5	6.9	6.7	4.0	8.1	-5.3	5.4	-3.7	5.1	1.5	36.5
1998	1.0	7.6	4.5	0.9	-1.8	4.5	-1.9	-14.8	7.4	6.3	6.8	6.2	27.1
1999	5.1	-3.7	4.2	4.3	-1.6	6.1	-2.3	0.9	-3.1	7.4	2.3	7.5	29.7
2000	-4.6	-1.2	10.7	-3.8	-1.6	2.6	-1.1	6.7	-5.5	-0.2	-7.7	0.9	-6.2
2001	3.5	-8.9	-5.8	8.7	0.3	-2.9	-0.2	-6.7	-8.7	1.7	8.1	0.6	-11.6
2002	-1.3	-1.8	4.6	-6.0	-1.4	-7.2	-8.4	0.3	-10.8	9.1	5.2	-5.8	-22.7
2003	-3.2	-0.9	0.4	8.0	5.3	1.4	1.7	2.4	-1.0	5.6	1.4	6.5	30.7
2004	0.9	0.9	-1.7	-0.8	1.4	2.0	-3.1	0.2	1.5	1.7	4.3	3.3	10.7
2005	-2.7	3.2	-1.8	-2.5	3.6	0.5	3.9	-0.6	1.1	-1.8	3.7	0.1	6.6
2006	2.6	-0.3	1.1	1.7	-2.8	0.1	0.8	2.4	2.1	3.2	1.5	0.9	14.1
2007	1.9	-1.5	1.6	4.9	3.2	-1.1	-2.5	2.0	3.3				12.3
Mean	1.2	-0.4	1.2	2.0	1.1	0.9	-0.8	-0.8	-0.2	2.9	3.5	1.7	
SD	3.6	3.9	4.5	4.7	3.1	3.5	4.2	5.7	5.8	3.9	4.4	4.0	

	130/30 Index Monthly Returns (TC=0.25%, SC=0.75%, T/O≈100%)												Annual
Year	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**(Geom)**
1996	4.0	1.2	1.3	2.1	2.9	0.6	-4.4	3.2	5.4	3.3	7.6	-1.4	28.5
1997	6.5	0.3	-4.4	7.1	6.9	4.2	8.6	-4.1	6.4	-3.8	5.1	1.0	37.8
1998	1.1	8.3	5.3	2.5	-1.8	5.0	-1.4	-15.3	7.3	8.1	5.5	8.2	34.8
1999	6.4	-3.8	3.1	4.4	-1.4	6.0	-2.5	-0.6	-2.8	7.5	1.6	7.6	27.6
2000	-4.6	0.2	11.9	-2.2	-2.0	3.5	-0.5	7.7	-5.2	-1.4	-8.6	1.5	-1.4
2001	4.4	-8.6	-5.6	10.0	0.3	-1.6	-0.5	-5.3	-9.3	2.2	7.4	2.0	-6.5
2002	-1.0	-0.4	3.3	-5.0	0.8	-6.7	-7.4	2.7	-9.6	8.2	5.7	-5.3	-15.2
2003	-3.1	-1.8	1.4	7.3	5.7	1.4	1.9	2.3	-0.5	5.2	0.7	4.9	28.0
2004	2.7	1.0	-0.7	-0.9	2.2	2.5	-3.5	-0.7	1.9	0.9	5.4	3.3	14.6
2005	-2.0	2.5	-1.2	-2.7	3.5	0.5	4.3	-0.2	1.5	-1.2	3.9	0.5	9.5
2006	2.4	-0.2	1.0	1.7	-3.1	-0.2	0.4	1.5	1.8	2.5	1.1	1.5	11.0
2007	2.2	-1.6	1.4	3.4	3.0	-2.0	-3.0	1.5	3.9				8.9
Mean	1.6	-0.2	1.4	2.3	1.4	1.1	-0.7	-0.6	0.1	2.9	3.2	2.2	
SD	3.6	3.9	4.5	4.5	3.2	3.5	4.2	5.7	5.7	4.1	4.6	3.9	

	130/30 Look-Ahead Index Monthly Returns (TC=0%, SC=0%, T/O=NC*)												Annual
Year	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**(Geom)**
1996	12.8	9.7	9.8	10.3	9.2	7.8	3.9	9.3	13.9	12.8	15.6	5.7	214.5
1997	16.0	8.9	4.4	16.3	14.7	14.1	18.5	2.8	14.8	7.0	13.8	11.3	280.3
1998	10.8	16.1	14.5	10.4	5.9	14.8	10.6	-2.9	24.1	20.8	16.9	17.4	337.2
1999	18.3	8.3	18.7	19.1	8.0	16.9	5.7	10.9	9.7	21.1	14.0	21.6	393.7
2000	8.1	14.4	26.5	9.7	11.4	16.2	12.7	19.1	9.9	14.1	5.6	16.9	361.3
2001	19.4	1.4	5.0	21.3	10.4	10.3	11.1	3.0	4.7	15.9	18.8	10.0	240.4
2002	9.7	9.0	14.3	4.1	8.8	3.7	5.4	11.6	-0.2	24.4	19.0	1.5	183.6
2003	6.0	7.3	10.5	18.6	14.5	9.3	11.9	9.0	6.2	15.5	7.6	12.6	238.2
2004	11.6	8.4	5.4	6.1	7.6	8.7	4.7	7.0	8.4	10.6	11.7	10.1	161.4
2005	4.9	9.5	5.7	6.0	10.7	6.8	11.3	6.3	8.9	7.0	11.3	6.1	147.7
2006	12.2	7.1	8.6	9.3	4.1	7.0	9.9	9.7	9.0	11.1	8.4	7.4	169.8
2007	9.0	4.8	7.2	11.8	10.5	4.9	5.4	8.8	11.5				102.9
Mean	11.6	8.8	10.9	11.9	9.6	10.0	9.3	7.9	10.1	14.6	13.0	11.0	
SD	4.5	3.8	6.6	5.6	3.1	4.4	4.3	5.5	6.0	5.7	4.5	5.9	

	130/30 Index Monthly Returns (TC=0.25%, SC=0.75%, T/O=NC*)												Annual
Year	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**(Geom)**
1996	3.7	1.4	1.2	1.5	3.2	0.2	-4.3	3.0	5.3	3.4	7.6	-1.8	26.7
1997	6.7	0.3	-4.5	6.8	7.0	4.4	9.5	-4.2	5.8	-4.2	5.0	1.4	37.9
1998	1.5	8.4	5.5	2.3	-1.8	4.3	-2.1	-14.4	7.1	8.4	6.0	9.0	36.9
1999	4.9	-3.3	3.3	4.8	-2.1	5.6	-2.2	-0.1	-3.1	7.0	2.7	6.1	25.3
2000	-4.0	-0.1	12.3	-1.5	-2.4	3.2	-0.4	7.5	-4.5	-2.0	-8.2	1.5	-0.2
2001	4.5	-8.3	-6.1	11.7	1.0	-1.1	-1.2	-5.6	-8.9	3.5	6.2	2.1	-4.3
2002	-0.8	-1.2	3.7	-4.9	0.2	-7.2	-6.9	2.6	-10.0	8.4	5.7	-4.7	-15.6
2003	-3.0	-1.1	0.9	7.2	5.5	1.3	2.0	2.0	-0.4	5.2	0.6	4.6	27.0
2004	2.3	0.8	-0.7	-0.7	1.9	2.8	-3.2	-0.1	2.1	0.1	5.4	3.0	14.1
2005	-2.0	2.2	-1.9	-3.0	4.0	0.6	4.5	0.0	1.2	-1.7	4.0	0.4	8.4
2006	2.6	0.2	0.8	1.3	-3.1	-0.3	0.6	1.8	2.1	1.7	1.1	1.5	10.7
2007	1.6	-1.6	1.1	3.7	3.3	-2.7	-3.0	1.6	4.1				8.1
Mean	1.5	-0.2	1.3	2.4	1.4	0.9	-0.6	-0.5	0.1	2.7	3.3	2.1	
SD	3.3	3.9	4.8	4.7	3.3	3.6	4.3	5.5	5.6	4.3	4.4	3.7	

	S&P 500 Index Monthly Returns												Annual
Year	**Jan**	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**(Geom)**
1996	3.4	0.9	1.0	1.5	2.6	0.4	-4.4	2.1	5.6	2.8	7.6	-2.0	23.0
1997	6.2	0.8	-4.1	6.0	6.1	4.5	8.0	-5.6	5.5	-3.3	4.6	1.7	33.4
1998	1.1	7.2	5.1	1.0	-1.7	4.1	-1.1	-14.5	6.4	8.1	6.1	5.8	28.6
1999	4.2	-3.1	4.0	3.9	-2.4	5.6	-3.1	-0.5	-2.7	6.3	2.0	5.9	21.0
2000	-5.0	-1.9	9.8	-3.0	-2.1	2.5	-1.6	6.2	-5.3	-0.4	-7.9	0.5	-9.1
2001	3.5	-9.1	-6.3	7.8	0.7	-2.4	-1.0	-6.3	-8.1	1.9	7.6	0.9	-11.9
2002	-1.5	-1.9	3.8	-6.1	-0.7	-7.1	-7.8	0.7	-10.9	8.8	5.9	-5.9	-22.1
2003	-2.6	-1.5	1.0	8.2	5.3	1.3	1.8	2.0	-1.1	5.7	0.9	5.2	28.7
2004	1.8	1.4	-1.5	-1.6	1.4	1.9	-3.3	0.4	1.1	1.5	4.0	3.4	10.9
2005	-2.4	2.1	-1.8	-1.9	3.2	0.1	3.7	-0.9	0.8	-1.7	3.8	0.0	4.9
2006	2.6	0.3	1.2	1.3	-2.9	0.1	0.6	2.4	2.6	3.3	1.9	1.4	15.8
2007	1.5	-2.0	1.1	4.4	3.5	-1.7	-3.1	1.5	3.7				9.1
Mean	1.1	-0.6	1.1	1.8	1.1	0.8	-0.9	-1.0	-0.2	3.0	3.3	1.5	
SD	3.3	3.8	4.3	4.4	3.1	3.4	4.1	5.4	5.6	3.9	4.3	3.5	

**NC = No Constraint*

Note: The monthly returns of the CS 130/30 Investable Index are presented with and without transaction costs (TC) and short-sales costs (SC) under various turnover constraints (T/O). The monthly returns of the CS 130/30 Look-Ahead Index are presented with no transaction costs, short-sales costs, or turnover constraints. The annual returns for 2007 are year-to-date returns.

practical challenges of implementing the 130/30 index are no greater than those posed by many other popular buy-and-hold indexes.

Exhibit 9 contains the number of securities held on the long and short sides of the 130/30 index with 0.25% one-way transaction costs, 0.75% annual short-sales costs, and with turnover constraints set at 15%, 100%, and unconstrained. On average, the 130/30 index with 15% turnover is long 270 names and short 150 names, yielding a fairly well-diversified portfolio. In this respect, the 130/30 portfolio resembles a typical U.S. large-cap core enhanced-index strategy for which the active weights are more variable over time and across stocks, thanks to the loosening of the long-only constraint.

CONCLUSION

For a portfolio to be considered a true index, it must be transparent, investable, and passive. Transparency requires that the rules for constructing the index must be systematic, clear, and easily implementable. Investability requires that the components of the portfolio consist of liquid exchange-traded instruments. Passivity requires that the implementation of the index is purely mechanical,

EXHIBIT 5

Correlations of the CS 130/30 Investable, Look-Ahead, and Long-Only Indexes to Various Market and Hedge-Fund Indexes (in Psercent), January 1996 to September 2007

Statistic	130/30 Index (TC=0.25%, SC=0.75%, T/O≈15%)	130/30 Index (TC=0.25%, SC=0.75%, T/O≈100%)	130/30 Index (TC=0.25%, SC=0.75%, T/O=NC*)	130/30 Index (TC=0%, SC=0%, T/O≈15%)	Long-Only Strategy (TC=0.25%, T/O≈9%)	Look-Ahead 130/30 Index	S&P 500 Index
Correlations (based on monthly returns to September 2007):							
Russell 1000	99	99	98	99	99	85	100
Russell 1000 Growth	94	94	94	94	94	81	94
Russell 1000 Value	89	88	88	89	89	75	90
Russell 2000	71	73	73	71	73	61	72
Russell 2000 Growth	71	73	72	71	72	61	71
Russell 2000 Value	66	68	68	66	69	55	67
Russell 3000	98	98	98	98	99	84	99
Russell 3000 Growth	93	94	93	93	93	80	94
Russell 3000 Value	89	88	88	89	89	75	90
S&P 500 (Large Cap)	99	99	98	99	100	85	100
S&P 500 Growth	95	95	94	95	95	81	96
S&P 500 Value	93	92	92	93	94	80	94
S&P 400 (Mid Cap)	85	87	88	85	86	75	85
S&P 400 Growth	82	85	85	82	82	73	82
S&P 400 Value	78	79	80	78	79	68	78
S&P 600 (Small Cap)	72	74	74	72	73	61	72
S&P 600 Growth	69	71	70	69	69	57	68
S&P 600 Value	72	73	73	72	73	60	72
Correlations To Other Market Indexes (based on monthly returns to August 2007):							
MSCI World Index	94	93	93	94	95	78	95
NASDAQ 100 Stock Index	82	82	82	82	82	74	81
BBA LIBOR USD 3-Month	1	-1	-3	1	0	-19	0
DJ Lehman Bond Comp GLBL	-6	-5	-4	-6	-6	1	-6
U.S. Treasury N/B (GT10)	18	17	16	18	18	9	18
U.S. Treasury N/B (GT2)	26	25	24	26	26	8	25
U.S. Treasury N/B (GT30)	11	11	9	11	11	6	11
Gold (Spot $/oz)	-4	-2	-3	-4	-3	-8	-4
U.S. Dollar Spot Index	7	5	6	7	6	10	6
NYMEX Crude Future Implied Call Volatility	-15	-18	-19	-15	-17	-13	-16
Correlations To CS/Tremont Indexes (based on monthly returns to August 2007):							
All Funds	52	52	50	52	51	39	50
Convertible Arbitrage	14	15	16	14	14	17	13
Dedicated Short Bias	-76	-78	-78	-76	-77	-65	-76
Emerging Markets	55	54	53	55	56	43	55
Equity Market Neutral	43	44	45	43	43	44	42
Event Driven	55	55	54	55	56	38	55
Fixed Income Arbitrage	2	2	2	2	2	-6	0
Global Macro	25	25	23	25	24	17	23
Long/Short Equity Hedge	60	62	60	60	59	51	59
Managed Futures	-9	-10	-10	-9	-8	-6	-8
Multi-Strategy	16	16	16	16	16	8	15

**NC = No Constraint.*

requiring little or no manual intervention and discretion. With these criteria in mind, we have proposed a simple dynamic portfolio as an index for the many 130/30 products that are now being offered.

Proposing a dynamic strategy as an index is a significant departure from tradition. However, the growing complexity of financial products coupled with corresponding advances in trading technology and portfolio construction tools provide compelling motivation for this next generation of benchmarks. Although the interpretation and implementation of such dynamic portfolios will require more effort than the standard buy-and-hold indexes, this is the price of innovation as institutional investors become more engaged in alternative investments. And as trading

EXHIBIT 6

Monthly Turnover and Annualized Tracking Error for the CS 130/30 Investable Index (in Percent), January 1996 to September 2007

130/30 Index (TC=0.25%, SC=0.75%, T/O≈15%): Total Turnover

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual*
1996	130.0	2.0	1.4	1.4	1.0	0.9	1.0	1.1	0.6	0.8	1.5	0.8	13.5
1997	0.5	1.4	0.6	0.5	1.3	0.4	0.9	1.3	1.0	1.1	1.6	1.9	12.4
1998	0.8	0.8	0.5	0.5	1.0	0.6	1.6	1.4	1.3	1.6	0.9	1.0	11.9
1999	1.6	2.4	0.5	1.5	1.3	0.4	0.9	0.5	1.3	0.9	2.0	1.7	14.9
2000	2.3	1.6	2.9	0.9	0.9	0.9	1.4	1.0	1.3	1.1	0.6	1.4	16.2
2001	1.2	0.6	1.9	1.0	1.4	0.7	0.6	0.7	0.7	1.8	0.6	0.5	11.6
2002	0.6	0.4	0.7	0.4	1.0	0.7	1.3	2.0	0.7	1.4	1.3	1.3	11.9
2003	0.3	0.3	0.8	0.4	0.7	0.9	0.5	0.6	0.5	0.3	0.6	0.4	6.2
2004	0.7	0.6	0.4	0.7	0.8	0.2	0.7	0.9	0.4	0.4	0.6	0.8	7.1
2005	0.4	0.6	1.0	0.7	0.8	0.3	0.6	0.6	0.8	1.3	0.7	0.3	8.0
2006	0.5	0.9	0.6	0.8	1.2	0.5	0.5	0.9	0.3	0.3	0.3	0.8	7.7
2007	0.4	0.6	0.4	0.8	0.7	0.5	0.5	1.1	0.8				7.7
Mean	11.6	1.0	1.0	0.8	1.0	0.6	0.9	1.0	0.8	1.0	1.0	1.0	
SD	37.3	0.7	0.7	0.4	0.2	0.3	0.4	0.4	0.4	0.5	0.5	0.5	

130/30 Index (TC=0.25%, SC=0.75%, T/O≈100%): Total Turnover

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual*
1996	130.0	10.4	8.0	7.3	11.4	6.8	4.9	12.1	6.2	6.8	10.8	5.4	98.4
1997	6.2	8.9	5.4	6.8	9.0	8.0	6.6	10.7	6.2	6.9	9.3	6.8	90.8
1998	6.1	10.1	8.0	7.4	10.5	7.4	4.7	11.4	7.8	7.7	11.4	5.0	97.5
1999	5.3	11.4	6.5	7.0	11.6	8.1	7.3	8.9	6.4	6.8	9.6	6.5	95.5
2000	7.2	9.1	5.6	6.1	8.7	7.8	8.0	8.9	6.8	6.9	12.1	7.5	94.7
2001	7.2	9.6	7.2	6.6	9.2	5.9	5.9	12.1	7.9	6.8	9.6	8.7	96.8
2002	6.6	10.4	7.8	6.7	8.6	7.4	7.2	9.6	6.8	6.8	9.1	9.3	96.4
2003	6.2	9.2	6.5	5.8	10.1	7.6	7.6	8.8	6.4	8.8	9.7	5.5	92.1
2004	6.9	9.1	6.3	6.5	7.6	8.7	6.4	6.4	5.7	5.3	8.2	6.3	83.5
2005	6.4	5.8	6.5	7.3	8.7	6.4	4.6	7.3	6.4	5.8	7.4	7.3	79.8
2006	6.1	6.1	6.0	6.1	7.2	6.9	6.4	7.7	5.6	7.3	6.2	7.0	78.6
2007	5.7	5.8	7.6	7.3	6.2	8.8	5.8	6.6	7.5				81.7
Mean	16.7	8.8	6.8	6.7	9.1	7.5	6.3	9.2	6.7	6.9	9.4	6.8	
SD	35.7	1.9	0.9	0.5	1.6	0.9	1.1	2.0	0.8	0.9	1.7	1.3	

130/30 Index (TC=0.25%, SC=0.75%, T/O≈15%): Long-Side Turnover

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual*
1996	115.0	1.2	1.0	1.1	0.6	0.6	0.6	0.6	0.5	0.5	0.8	0.4	8.7
1997	0.3	0.8	0.4	0.3	0.7	0.2	0.6	0.9	0.5	0.8	0.9	1.0	7.5
1998	0.5	0.6	0.4	0.4	0.7	0.4	0.9	0.9	0.9	1.0	0.6	0.6	7.6
1999	0.9	1.3	0.3	0.9	0.7	0.3	0.5	0.2	0.8	0.5	1.1	1.0	8.5
2000	1.4	0.9	1.6	0.5	0.5	0.6	0.8	0.5	0.7	0.7	0.4	0.7	9.2
2001	0.8	0.4	0.9	0.5	0.8	0.3	0.3	0.4	0.4	1.0	0.5	0.3	6.7
2002	0.3	0.3	0.4	0.1	0.5	0.4	0.8	1.5	0.5	0.9	0.7	0.7	7.0
2003	0.1	0.2	0.3	0.2	0.4	0.5	0.1	0.3	0.3	0.2	0.3	0.2	3.2
2004	0.5	0.2	0.2	0.6	0.5	0.1	0.5	0.5	0.2	0.2	0.3	0.4	4.1
2005	0.3	0.3	0.6	0.5	0.4	0.2	0.4	0.4	0.5	0.8	0.5	0.2	5.0
2006	0.3	0.6	0.3	0.5	0.7	0.3	0.4	0.6	0.2	0.2	0.2	0.4	4.6
2007	0.3	0.4	0.3	0.6	0.5	0.3	0.3	0.7	0.4				5.1
Mean	10.0	0.6	0.6	0.5	0.6	0.3	0.5	0.6	0.5	0.6	0.6	0.5	
SD	33.1	0.4	0.4	0.3	0.1	0.2	0.2	0.3	0.2	0.3	0.3	0.3	

130/30 Index (TC=0.25%, SC=0.75%, T/O≈100%): Long-Side Turnover

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual*
1996	115.0	7.1	6.0	5.4	7.8	4.4	4.0	9.0	4.5	5.0	7.7	3.5	70.2
1997	4.4	6.3	3.8	4.6	5.9	5.8	4.5	7.1	3.8	5.5	7.1	4.8	63.6
1998	4.5	7.2	5.5	5.0	8.1	4.9	3.1	8.3	5.6	5.4	7.7	3.3	68.5
1999	3.9	8.5	4.4	4.8	7.7	5.8	5.2	6.4	4.9	4.8	6.5	4.8	67.6
2000	4.6	6.5	4.2	4.4	6.5	5.6	6.3	6.3	5.1	4.9	8.3	5.1	67.8
2001	5.2	6.7	5.4	4.5	6.7	4.2	3.7	8.8	5.2	4.6	7.0	6.2	68.2
2002	5.1	7.3	5.5	4.5	5.4	4.8	5.4	7.2	4.7	4.4	6.5	6.1	66.8
2003	4.1	6.2	4.7	4.3	7.1	5.1	4.6	6.3	4.7	6.6	6.3	3.9	63.8
2004	4.6	6.8	4.8	4.7	5.3	5.7	4.4	4.0	3.7	3.8	6.1	4.3	58.2
2005	4.6	4.5	4.1	5.2	5.8	4.0	3.1	4.7	4.4	4.4	5.1	4.7	54.5
2006	4.5	4.6	4.0	4.4	5.5	4.6	4.4	5.6	4.2	5.3	5.1	4.7	57.1
2007	3.8	4.3	4.9	5.0	4.2	6.2	3.9	4.9	5.5				57.0
Mean	13.7	6.3	4.8	4.7	6.3	5.1	4.4	6.6	4.7	5.0	6.7	4.7	
SD	31.9	1.3	0.7	0.4	1.2	0.7	0.9	1.6	0.6	0.7	1.0	0.9	

130/30 Index (TC=0.25%, SC=0.75%, T/O≈15%): Short-Side Turnover

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual*
1996	15.0	0.8	0.4	0.3	0.4	0.3	0.4	0.4	0.1	0.3	0.6	0.4	4.8
1997	0.2	0.6	0.2	0.2	0.5	0.1	0.3	0.3	0.5	0.4	0.7	0.8	4.9
1998	0.3	0.3	0.1	0.1	0.3	0.2	0.7	0.5	0.5	0.6	0.3	0.4	4.4
1999	0.6	1.1	0.2	0.6	0.6	0.1	0.4	0.2	0.6	0.4	0.9	0.7	6.4
2000	0.9	0.7	1.3	0.4	0.5	0.3	0.5	0.5	0.6	0.4	0.2	0.7	7.0
2001	0.5	0.2	0.9	0.4	0.6	0.3	0.2	0.3	0.3	0.8	0.1	0.2	4.9
2002	0.3	0.2	0.4	0.2	0.5	0.3	0.5	0.6	0.2	0.5	0.7	0.6	4.9
2003	0.1	0.2	0.4	0.2	0.3	0.5	0.4	0.2	0.2	0.1	0.3	0.2	3.1
2004	0.2	0.4	0.2	0.2	0.3	0.1	0.2	0.4	0.2	0.2	0.3	0.4	3.0
2005	0.1	0.3	0.4	0.2	0.4	0.2	0.2	0.2	0.3	0.5	0.2	0.1	3.0
2006	0.2	0.4	0.3	0.3	0.6	0.2	0.1	0.3	0.1	0.1	0.1	0.4	3.1
2007	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.4	0.4				2.6
Mean	1.6	0.4	0.4	0.3	0.4	0.2	0.3	0.4	0.3	0.4	0.4	0.4	
SD	4.2	0.3	0.3	0.1	0.1	0.1	0.2	0.1	0.2	0.2	0.3	0.2	

130/30 Index (TC=0.25%, SC=0.75%, T/O≈100%): Short-Side Turnover

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual*
1996	15.0	3.3	2.0	1.8	3.7	2.4	0.9	3.1	1.7	1.8	3.2	1.9	28.2
1997	1.7	2.6	1.6	2.3	3.1	2.2	2.2	3.7	2.3	1.5	2.2	2.0	27.2
1998	1.5	2.9	2.5	2.4	2.5	2.5	1.6	3.1	2.3	2.3	3.7	1.7	29.0
1999	1.4	2.9	2.1	2.3	4.0	2.4	2.1	2.4	1.6	2.1	3.1	1.7	27.9
2000	2.6	2.6	1.4	1.7	2.2	2.2	1.7	2.6	1.8	2.0	3.8	2.4	26.9
2001	2.1	2.9	1.9	2.2	2.5	1.6	2.2	3.3	2.7	2.1	2.6	2.4	28.6
2002	1.5	3.1	2.3	2.3	3.2	2.6	1.9	2.5	2.1	2.4	2.6	3.2	29.6
2003	2.1	3.0	1.8	1.5	2.9	2.6	3.1	2.5	1.7	2.2	3.3	1.6	28.3
2004	2.3	2.3	1.5	1.8	2.3	3.0	2.1	2.4	2.0	1.5	2.2	2.0	25.3
2005	1.8	1.4	2.4	2.1	2.9	2.5	1.6	2.6	2.0	1.4	2.2	2.5	25.3
2006	1.7	1.5	1.9	1.7	1.7	2.3	1.9	2.0	1.4	1.9	1.1	2.4	21.5
2007	1.9	1.5	2.6	2.3	2.0	2.6	1.9	1.7	2.0				24.7
Mean	3.0	2.5	2.0	2.0	2.7	2.4	1.9	2.6	2.0	1.9	2.7	2.1	
SD	3.8	0.7	0.4	0.3	0.7	0.3	0.5	0.6	0.4	0.3	0.8	0.5	

130/30 Index (TC=0.25%, SC=0.75%, T/O≈15%): Annualized Tracking Error

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1996	2.0	2.0	2.0	2.1	2.0	1.9	1.9	1.9	1.8	1.8	1.9	1.8	1.9
1997	1.9	1.9	1.8	1.7	1.7	1.6	1.8	1.7	1.7	1.7	1.8	1.6	1.7
1998	1.7	1.7	1.6	1.7	1.7	1.7	1.7	1.9	2.0	2.1	2.0	2.0	1.8
1999	1.9	2.0	1.9	2.1	1.9	1.9	1.8	1.7	1.8	1.8	2.1	2.1	1.9
2000	2.6	2.5	2.8	2.8	2.6	2.2	2.2	2.2	2.2	2.4	2.3	2.2	2.4
2001	2.1	2.2	2.2	2.1	1.9	1.8	1.9	1.9	1.8	1.9	1.9	1.8	2.0
2002	1.9	2.0	1.8	1.8	1.9	1.8	2.0	2.2	2.0	2.1	2.1	2.1	2.0
2003	2.1	1.9	1.7	1.7	1.7	1.8	1.8	1.9	1.8	1.8	1.7	1.7	1.8
2004	1.6	1.6	1.6	1.6	1.7	1.6	1.6	1.7	1.5	1.6	1.6	1.6	1.6
2005	1.6	1.7	1.6	1.7	1.7	1.6	1.6	1.6	1.6	1.7	1.8	1.6	1.6
2006	1.6	1.8	1.7	1.7	1.6	1.6	1.6	1.6	1.6	1.5	1.5	1.4	1.6
2007	1.4	1.4	1.4	1.3	1.3	1.3	1.4	1.5	1.5				1.4
Mean	1.9	1.9	1.9	1.9	1.8	1.7	1.8	1.8	1.8	1.8	1.9	1.8	
SD	0.3	0.3	0.4	0.4	0.3	0.2	0.2	0.2	0.2	0.3	0.2	0.3	

130/30 Index (TC=0.25%, SC=0.75%, T/O≈100%): Annualized Tracking Error

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1996	2.0	2.0	2.0	2.0	2.0	1.8	1.8	2.1	1.9	1.9	2.0	1.9	2.0
1997	2.1	2.0	2.0	1.9	2.0	1.9	2.1	1.9	2.0	1.9	2.1	2.0	2.0
1998	2.1	2.1	1.9	2.0	2.1	2.0	2.1	2.3	2.4	2.5	2.5	2.4	2.2
1999	2.2	2.3	2.3	2.4	2.4	2.3	2.2	2.1	2.2	2.1	2.4	2.4	2.3
2000	2.9	2.8	3.1	3.0	2.9	2.7	2.8	2.7	2.7	2.9	2.9	2.9	2.9
2001	2.7	2.8	2.8	2.6	2.3	2.3	2.5	2.4	2.3	2.5	2.6	2.5	2.5
2002	2.5	2.6	2.6	2.5	2.6	2.5	2.6	2.9	2.6	2.7	2.7	2.6	2.6
2003	2.6	2.4	2.3	2.2	2.2	2.3	2.4	2.6	2.3	2.2	2.3	2.1	2.3
2004	2.1	2.1	2.1	2.2	2.3	2.1	2.1	2.2	2.1	2.0	2.1	2.1	2.1
2005	2.1	2.1	2.0	2.2	2.3	2.1	2.0	2.0	2.1	2.1	2.2	2.1	2.1
2006	2.0	2.1	2.0	2.0	2.0	2.1	2.0	2.0	2.1	2.0	1.8	1.7	2.0
2007	1.6	1.7	1.7	1.6	1.6	1.6	1.7	1.8	1.8				1.7
Mean	2.2	2.3	2.2	2.2	2.2	2.2	2.2	2.2	2.2	2.3	2.3	2.3	
SD	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	

**Annual turnover values for 1996 exclude the month of January.*

Note: Results are based on calculations with 0.25% one-way transaction costs (TC), 0.75% annual short-sales costs (SC), and 15% and 100% annualized turnover constraints (T/O).

EXHIBIT 7

Monthly Turnover and Annualized Tracking Error for the CS 130/30 Investable Index (in Percent), January 1996 to September 2007

130/30 Index (TC=0.25%, SC=0.75%, T/O=NC†): Total Turnover

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual*
1996	130.0	32.4	26.9	24.7	31.1	27.1	25.1	35.4	26.6	26.4	32.4	25.6	342.2
1997	23.3	31.9	24.6	25.7	32.6	27.4	30.0	33.9	28.1	24.6	31.4	25.6	339.0
1998	25.8	31.8	28.0	26.0	33.4	26.7	23.6	29.5	29.9	27.5	33.6	25.2	340.9
1999	26.7	31.7	26.5	25.5	32.8	28.5	27.8	32.7	25.8	24.8	34.3	27.4	344.6
2000	25.4	35.2	24.2	26.3	31.5	25.3	27.0	30.9	25.9	27.0	32.6	26.9	338.1
2001	26.6	34.0	27.9	23.8	34.5	29.1	27.2	36.3	30.3	25.0	38.0	25.8	358.4
2002	26.4	32.6	28.7	29.4	32.0	26.6	28.9	36.3	27.5	28.1	33.6	28.7	358.8
2003	29.1	31.7	24.9	24.4	32.3	28.2	29.8	32.9	25.8	32.5	36.1	24.7	352.5
2004	31.6	29.1	32.9	30.5	31.7	30.8	27.8	27.7	29.4	27.6	28.7	29.2	356.9
2005	26.4	27.4	27.7	27.0	27.5	28.7	25.0	27.9	25.8	23.4	29.4	27.4	323.7
2006	22.8	28.0	28.4	26.7	28.4	30.5	25.9	28.8	29.6	28.5	26.6	29.2	333.4
2007	26.4	28.3	26.7	25.8	26.8	27.5	22.6	26.8	30.2				321.4
Mean	35.0	31.2	27.3	26.3	31.2	28.0	26.7	31.6	27.9	26.8	32.4	26.9	
SD	30.0	2.4	2.3	1.9	2.4	1.6	2.3	3.5	1.9	2.5	3.3	1.6	

130/30 Index (TC=0.25%, SC=0.75%, T/O=NC†): Long-Side Turnover

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual*
1996	115.0	22.5	20.2	18.1	22.5	19.8	18.2	26.0	18.7	18.3	21.7	18.5	245.0
1997	16.3	22.3	17.7	18.5	24.7	20.5	23.3	24.2	20.7	17.7	22.6	18.4	246.8
1998	18.2	22.9	20.4	19.4	25.8	19.2	16.6	20.9	22.1	18.9	23.5	17.6	245.5
1999	20.0	22.1	19.0	17.6	23.4	20.3	20.0	23.7	18.2	17.2	23.5	18.4	243.6
2000	16.9	26.1	16.9	18.7	21.9	17.8	18.3	20.7	18.7	19.5	21.9	19.0	236.4
2001	19.0	24.2	19.0	15.3	24.3	20.8	19.9	26.5	22.4	17.2	27.9	18.2	254.6
2002	19.5	23.9	21.1	21.1	21.9	18.9	20.9	27.0	20.3	21.1	24.6	19.7	260.1
2003	20.3	23.1	17.6	17.7	22.6	20.3	21.4	24.5	18.6	23.7	25.8	18.0	253.7
2004	23.5	21.5	23.6	21.7	23.4	22.0	21.2	19.8	21.7	21.1	21.2	20.6	261.2
2005	19.9	19.4	20.5	19.6	18.7	20.0	17.9	20.6	18.0	16.4	21.9	19.6	232.6
2006	16.9	20.9	21.3	19.2	19.9	22.5	18.7	20.6	21.6	20.3	18.5	19.6	239.9
2007	20.1	19.7	17.7	18.1	19.1	19.3	15.3	18.7	22.5				227.6
Mean	27.1	22.4	19.6	18.8	22.4	20.1	19.3	22.8	20.3	19.2	23.0	18.9	
SD	27.7	1.9	2.0	1.7	2.2	1.3	2.2	2.9	1.7	2.2	2.5	0.9	

130/30 Index (TC=0.25%, SC=0.75%, T/O=NC†): Annualized Tracking Error

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1996	2.1	2.1	2.0	2.0	2.0	2.0	2.0	2.1	1.8	2.0	2.0	1.9	2.0
1997	2.1	2.0	2.1	1.9	2.0	1.9	2.1	1.9	1.9	1.9	2.2	2.0	2.0
1998	2.1	2.2	2.0	2.1	2.2	2.0	2.1	2.3	2.4	2.5	2.5	2.4	2.2
1999	2.2	2.4	2.4	2.5	2.4	2.3	2.4	2.2	2.2	2.2	2.6	2.6	2.4
2000	2.9	3.0	3.1	3.1	3.1	2.9	3.1	2.9	2.9	3.1	3.1	3.1	3.0
2001	2.8	2.8	2.9	2.8	2.5	2.4	2.6	2.6	2.4	2.7	2.8	2.6	2.7
2002	2.5	2.7	2.6	2.6	2.6	2.6	2.8	3.0	2.6	2.8	2.8	2.6	2.7
2003	2.7	2.5	2.4	2.3	2.3	2.2	2.5	2.6	2.3	2.2	2.4	2.2	2.4
2004	2.1	2.2	2.1	2.1	2.4	2.2	2.1	2.3	2.3	2.1	2.3	2.1	2.2
2005	2.3	2.2	2.0	2.3	2.5	2.2	2.0	2.1	2.1	2.2	2.4	2.1	2.2
2006	2.0	2.1	2.2	2.0	1.9	2.1	1.9	2.0	2.2	2.1	1.8	1.7	2.0
2007	1.7	1.6	1.7	1.7	1.6	1.7	1.8	1.8	1.8				1.7
Mean	2.3	2.3	2.3	2.3	2.3	2.2	2.3	2.3	2.3	2.3	2.4	2.3	
SD	0.4	0.4	0.4	0.4	0.4	0.3	0.4	0.4	0.3	0.4	0.4	0.4	

130/30 Index (TC=0.25%, SC=0.75%, T/O=NC†): Short-Side Turnover

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual*
1996	15.0	9.8	6.6	6.6	8.6	7.2	6.9	9.5	7.9	8.2	10.7	7.1	97.2
1997	7.0	9.6	6.9	7.2	7.9	6.9	6.7	9.7	7.5	6.9	8.8	7.2	92.2
1998	7.6	8.9	7.6	6.5	7.6	7.5	7.0	8.6	7.8	8.6	10.2	7.6	95.5
1999	6.7	9.6	7.5	7.9	9.4	8.3	7.7	9.0	7.6	7.6	10.8	9.0	101.0
2000	8.5	9.0	7.3	7.6	9.6	7.5	8.7	10.2	7.2	7.5	10.7	7.8	101.7
2001	7.7	9.8	8.9	8.5	10.2	8.3	7.3	9.8	7.9	7.8	10.1	7.6	103.9
2002	6.9	8.7	7.6	8.3	10.0	7.7	8.0	9.3	7.2	6.9	8.9	9.1	98.7
2003	8.8	8.6	7.3	6.7	9.7	7.9	8.3	8.4	7.2	8.8	10.3	6.7	98.8
2004	8.1	7.7	9.2	8.8	8.4	8.8	6.7	7.9	7.7	6.4	7.5	8.6	95.7
2005	6.5	8.0	7.2	7.4	8.8	8.7	7.1	7.3	7.8	7.0	7.5	7.8	91.1
2006	5.9	7.1	7.1	7.5	8.5	8.0	7.3	8.2	8.0	8.3	8.1	9.6	93.5
2007	6.2	8.6	8.9	7.7	7.6	8.1	7.3	8.1	7.7				93.8
Mean	7.9	8.8	7.7	7.6	8.9	7.9	7.4	8.8	7.6	7.6	9.4	8.0	
SD	2.4	0.9	0.9	0.7	0.9	0.6	0.7	0.9	0.3	0.8	1.3	0.9	

**Annual turnover values for 1996 exclude the month of January.*

†NC = No Constraint.

Note: Results are based on calculations with 0.25% one-way transaction costs (TC), 0.75% annual short-sales costs (SC), and no turnover constraint (T/O).

EXHIBIT 8

Turnover of Various S&P Indexes (in Percent)

Year	S&P 500	S&P MidCap 400	S&P SmallCap 600
1993	2.6	10.3	
1994	3.8	9.9	
1995	5.0	15.6	13.7
1996	4.6	14.4	16.4
1997	4.9	17.9	21.8
1998	9.5	31.4	24.4
1999	6.2	28.9	24.4
2000	8.9	37.1	36.4
2001	4.4	17.0	15.6
2002	3.8	10.7	11.0
2003	1.5	8.6	11.0
2004	3.1	13.1	13.0
2005	5.7	14.5	13.8
2006	4.5	12.2	12.9

Source: Credit Suisse Equity Derivatives Group.

technology becomes more sophisticated, we anticipate the creation of many more benchmarks from dynamic trading strategies, and we hope that the 130/30 index will pave the way for that future.

APPENDIX

In this appendix, we provide additional details for constructing the 130/30 index. In subsection A.1 of the appendix, we summarize the individual factors used in the ten Credit Suisse composite alpha factors. In subsection A.2, we outline a step-by-step procedure for using the MSCI Barra Optimizer to construct the 130/30 investable portfolio, and in subsection A.3, we provide summary statistics for the long-only version of the 130/30 investable index.

A.1 Credit Suisse Alpha Factors

The inputs for each of the ten composite alpha factors are described below. For more details, see Patel, Yao, and Carlson [2007a].

EXHIBIT 9

Number of Securities Held Long and Short Each Month in the CS 130/30 Investable Index, January 1996 to September 2007

130/30 Index (TC=0.25%, SC=0.75%, T/O≈15%): Number of Securities (Long)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
1996	238	243	245	246	249	252	254	256	257	260	263	264	252
1997	263	266	265	266	268	267	268	271	265	267	271	271	267
1998	270	270	269	271	271	272	272	274	276	277	273	272	272
1999	274	279	278	278	274	275	273	272	271	268	272	271	274
2000	270	270	276	278	277	280	278	280	282	282	281	275	277
2001	273	271	268	269	272	270	269	272	271	273	274	274	271
2002	273	274	271	269	269	269	273	278	278	282	285	281	275
2003	280	278	279	278	275	272	272	273	273	274	274	273	275
2004	275	273	270	270	268	268	266	268	266	267	267	265	269
2005	267	266	267	269	269	269	269	270	270	273	274	273	270
2006	270	269	271	268	270	271	269	271	270	270	270	265	270
2007	265	264	262	262	264	263	265	267	268				264
Mean	268	269	268	269	269	269	269	271	271	272	273	271	
SD	11	9	9	9	7	7	6	6	7	7	6	5	

130/30 Index (TC=0.25%, SC=0.75%, T/O≈15%): Number of Securities (Short)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
1996	115	121	123	123	124	125	126	129	130	130	132	132	126
1997	131	134	135	134	138	137	137	139	132	133	136	142	136
1998	143	142	142	141	141	141	142	148	147	145	144	145	143
1999	148	149	149	150	146	147	147	148	153	154	160	162	151
2000	168	170	174	177	174	175	180	178	179	178	177	172	175
2001	167	166	159	160	161	156	153	154	150	154	154	154	157
2002	152	150	149	148	146	146	148	149	150	152	160	158	151
2003	159	158	161	160	160	154	155	156	155	157	158	158	158
2004	158	159	157	157	158	158	156	158	159	157	158	156	158
2005	156	157	159	158	159	159	159	157	157	157	158	156	158
2006	155	155	156	154	154	156	156	157	156	155	154	150	155
2007	152	152	152	152	151	150	149	152	155				152
Mean	150	151	151	151	151	150	151	152	152	152	154	153	
SD	15	14	13	14	13	13	13	12	13	13	12	11	

130/30 Index (TC=0.25%, SC=0.75%, T/O≈100%): Number of Securities (Long)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
1996	238	244	246	251	256	258	255	254	252	256	258	251	252
1997	249	247	246	247	249	243	245	246	245	244	248	248	246
1998	245	248	250	251	252	248	247	253	259	259	261	255	252
1999	256	260	256	260	257	251	254	254	255	249	259	258	256
2000	258	270	277	275	275	268	269	274	275	277	273	270	272
2001	269	266	266	262	269	267	265	268	265	265	264	265	266
2002	268	264	266	266	272	273	273	285	279	278	272	264	272
2003	259	262	263	260	253	251	254	257	254	253	259	256	257
2004	258	256	245	246	253	259	257	256	254	254	253	254	254
2005	261	259	261	260	249	254	255	252	253	249	249	249	254
2006	245	247	251	249	252	254	255	257	252	248	249	240	250
2007	240	243	237	242	244	246	250	257	265				247
Mean	254	256	255	256	257	256	257	259	259	257	259	255	
SD	10	9	11	10	10	9	8	11	10	11	9	9	

130/30 Index (TC=0.25%, SC=0.75%, T/O≈100%): Number of Securities (Short)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
1996	115	119	120	120	124	122	123	126	126	128	128	126	123
1997	126	129	123	120	127	122	126	124	126	126	126	121	125
1998	124	127	123	123	122	125	125	125	127	129	132	136	127
1999	136	137	125	128	124	122	124	127	127	131	135	136	129
2000	139	144	155	156	154	150	158	155	148	148	154	146	151
2001	141	134	135	135	139	130	128	128	127	130	125	126	132
2002	127	128	130	128	126	130	132	135	135	140	135	132	132
2003	132	131	129	132	120	116	119	112	114	118	115	115	121
2004	115	120	120	123	121	120	119	118	116	115	118	121	119
2005	116	117	118	122	124	119	121	119	118	123	127	118	120
2006	119	117	119	116	121	119	119	121	119	122	119	114	119
2007	116	114	116	115	119	117	119	122	123				118
Mean	126	126	126	127	127	124	126	126	126	128	129	126	
SD	10	9	11	11	10	9	11	11	9	9	11	10	

130/30 Index (TC=0.25%, SC=0.75%, T/O=NC*): Number of Securities (Long)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
1996	236	246	245	246	241	249	249	245	236	239	240	239	243
1997	241	242	227	240	245	232	232	241	235	237	241	237	238
1998	242	244	237	244	249	248	230	240	250	244	244	250	244
1999	234	235	236	244	235	234	251	233	238	238	235	239	238
2000	242	265	267	275	257	249	248	244	249	252	248	255	254
2001	251	244	260	256	245	243	243	243	240	248	253	246	248
2002	243	245	244	245	243	242	243	268	248	248	252	241	247
2003	252	241	246	239	234	240	241	255	236	237	248	246	243
2004	243	235	242	243	248	237	236	250	237	239	241	237	241
2005	241	244	240	248	251	245	243	243	241	243	254	241	245
2006	235	247	250	242	241	241	236	250	234	240	237	234	241
2007	229	229	219	234	237	240	245	239	240				235
Mean	241	243	243	246	244	242	241	246	240	242	245	242	
SD	7	9	13	10	7	6	7	9	6	5	7	6	

130/30 Index (TC=0.25%, SC=0.75%, T/O=NC*): Number of Securities (Short)

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
1996	115	114	115	116	114	112	117	120	120	117	121	114	116
1997	111	115	114	113	110	110	110	109	113	117	117	112	113
1998	111	115	112	113	113	108	106	113	122	123	112	118	114
1999	110	110	107	109	117	110	107	108	110	112	120	117	111
2000	112	127	145	127	126	115	122	122	117	124	127	123	124
2001	116	118	119	118	118	112	117	116	110	121	115	114	116
2002	117	120	110	115	122	108	120	123	116	112	110	111	115
2003	122	111	105	117	106	108	105	107	108	110	109	107	110
2004	111	110	113	107	108	100	107	116	103	108	108	107	108
2005	109	113	109	110	114	111	113	111	109	111	115	111	111
2006	109	111	109	116	115	107	114	114	110	114	110	113	112
2007	116	111	108	108	108	106	109	113	109				110
Mean	113	115	114	114	114	109	112	114	112	115	115	113	
SD	4	5	11	5	6	4	6	5	5	5	6	5	

*Note: Turnover constraint (T/O) is set at 15%, 100%, and unconstrained. *No Constraint (NC)*

1. Traditional Value
   - *Price/12-Month Forward Earnings Consensus Estimate.* Twelve-month forward earnings is calculated as the time-weighted average of FY1 and FY2 (the upcoming and the following fiscal year-end earnings forecasts). The weight for FY1 is the ratio of the number of days left in the year to the total number of days in a year, and the weight for FY2 is one minus the weight for FY1.
   - *Price/Trailing 12-Month Sales.* Trailing sales is computed as the sum of the quarterly sales over the last 4 quarters.
   - *Price/Trailing 12-Month Cash Flows.* The trailing cash flow is computed as the sum of the quarterly cash flow over the last 4 quarters.
   - *Dividend Yield.* This is computed as the total DPS paid over the last year, divided by the current price.
   - *Price/Book Value.* For the book value we use the last quarterly value.
2. Relative Value
   - *Industry-Relative Price/Trailing 12-Month Sales*
   - *Industry-Relative Price/Trailing 12-Month Earnings*
   - *Industry-Relative Price/Trailing 12-Month Cash Flows*
   - *Industry-Relative Price/Trailing 12-Month Sales (Current Spread vs. 5-Year Average)*
   - *Industry-Relative Price/Trailing 12-Month Earnings (Current Spread vs. 5-Year Average)*
   - *Industry-Relative Price/Trailing 12-Month Cash Flows (Current Spread vs. 5-Year Average)*
3. Historical Growth
   - *Number of Consecutive Quarters of Positive Changes in Trailing 12-Month Cash Flows (counted over the last 24*

EXHIBIT A1

Summary Statistics for Monthly Returns of the CS 130/30 Investable Index (Long-only Version) and S&P 500 Index, January 1996 to September 2007

Statistic	Sample Period				Sample Period			
	1996-2007	2002-2007	2004-2007	2007	1996-2007	2002-2007	2004-2007	2007
	Long-Only Strategy, TC=0.25%, T/O≈9%				S&P 500 Index			
Annualized Mean (%)	11.56	8.34	11.14	13.07	10.50	7.49	10.58	12.09
Annualized SD (%)	14.91	12.26	7.38	8.92	14.68	12.00	7.35	9.38
Annualized Sharpe*	0.44	0.27	0.83	0.90	0.37	0.21	0.76	0.76
Skewness	-0.55	-0.70	-0.24	-0.22	-0.56	-0.61	-0.32	-0.26
Kurtosis	3.61	4.52	2.07	1.76	3.65	4.36	2.12	1.69
ρ_1	-2.3	7.7	-0.9	20.3	-0.9	5.2	-1.3	18.3
ρ_2	-3.3	7.5	-16.2	-69.4	-5.0	5.5	-16.6	-71.1
ρ_3	3.9	5.1	-23.4	-45.9	4.0	3.9	-24.8	-44.4
MaxDD (%)	-43.3	-29.3	-4.3	-4.3	-44.7	-28.3	-4.7	-4.7
DD Begin	20000831	20020328	20070531	20070531	20000831	20020328	20070531	20070531
DD End	20020930	20020930	20070731	20070731	20020930	20020930	20070731	20070731

**A risk free rate of 5% is assumed. Note: The returns for the 130/30 index are based on calculations with 0.25% one-way transaction costs (TC) and 9% annual turnover (T/O). The annualized mean returns are arithmetic averages of monthly returns multiplied by 12, not compounded geometric averages.*

quarters). For each of the last 24 quarters we compute the trailing 12-month cash flow, and then count the number of times the consecutive changes in those trailing cash flows are of the same sign from quarter to quarter, starting with the most recent quarter and going back. If the consecutive quarter-to-quarter changes are negative, we count each change as −1, and if they are positive we count each change as +1.

- *Number of Consecutive Quarters of Positive Change in Trailing 12-Month Quarterly Earnings (counted over the last 24 quarters).* We calculate the trailing 12-month quarterly earnings by summing up the quarterly earnings for the last 4 quarters, and compute the number of consecutive quarters in the same way as in the item above.
- *12-Month Change in Quarterly Cash Flows.* This is the difference between the trailing 12-month cash flow for the most recent quarter and the trailing 12-month cash flow for the quarter exactly one year back from the most recent quarter.
- *3-Year Average Annual Sales Growth.* For each of the last 3 years we compute the 1-year percentage change in sales, and then compute the 3-year average of those 1-year percentage changes.
- *3-Year Average Annual Earnings Growth.* The same calculation as in the item above is done, but for earnings.
- *12-Quarter Trendline in Trailing 12-Month Earnings.* For each of the last 12 quarters we take the trailing 12-month earnings and calculate the slope of the linear trendline fitted to those 12 points, and then divide that slope by the average 12-month trailing earnings across all 12 quarters.
- *12-Quarter Trendline in Trailing 12-Month Cash Flows.* This is calculated in the same way as described in the item above, but using cash flows instead of earnings.

4. Expected Growth

- *5-Year Expected Earnings Growth (I/B/E/S Consensus)*
- *Expected Earnings Growth: Fiscal Year 2/Fiscal Year 1 (I/B/E/S)*

5. Profit Trends

- *Number of Consecutive Quarters of Declines in (Receivables + Inventories)/Trailing 12-Month Sales (counted over the last 24 quarters).* We start with the most recent quarter and count back. If the consecutive quarter-to-quarter changes are negative, we count each change as +1, and if they are positive we count each change as −1. Receivables is calculated as the average of the receivables for this quarter and the quarter one year ago, and the inventories number is calculated similarly.
- *Number of Consecutive Quarters of Positive Change in Trailing 12-Month Cash Flows/Trailing 12-Month Sales (counted over the last 24 quarters).* We start with the most recent quarter and count back. If the consecutive quarter-to-quarter changes are positive, we count each change as +1, and if they are negative we count each change as −1.
- *Consecutive Quarters of Declines in Trailing 12-Month Overhead/Trailing 12-Month Sales (counted over the last*

24 quarters). We start with the most recent quarter and count back. If the consecutive quarter-to-quarter changes are negative, we count each change as +1, and if they are positive we count each change as –1. The trailing 12-month overhead equals trailing 12-month sales minus trailing 12-month COGS minus trailing 12-month EBEX, where the trailing 12-month values are obtained by summing the quarterly values for the last 4 quarters.

- *Industry-Relative Trailing 12-Month (Receivables + Inventories)/Trailing 12-Month Sales.* The industry-relative ratio is obtained by standardizing the underlying ratio using the mean and standard deviation of that ratio across all companies in that industry group.
- *Industry-Relative Trailing 12-Month Sales/Assets.* The assets value is the average of the assets for this quarter and the assets for the quarter one year ago. The industry-relative ratio is obtained by standardizing the underlying ratio using the mean and standard deviation of that ratio across all companies in that industry group.
- *Trailing 12-Month Overhead/Trailing 12-Month Sales.* Trailing 12-month overhead equals trailing 12-month sales minus trailing 12-month COGS minus trailing 12-month EBEX, where the trailing 12-month values are obtained by summing the quarterly values for the last 4 quarters.
- *Trailing 12-Month Earnings/Trailing 12-Month Sales*

6. Accelerating Sales

- *3-Month Momentum in Trailing 12-Month Sales.* To compute this measurement, we first take the difference between the current trailing 12-month sales and the trailing 12-month sales one year ago, and then divide that difference by the absolute value of the trailing 12-month sales one year ago. We then take the difference between this ratio today and this ratio 3 months ago.
- *6-Month Momentum in Trailing 12-Month Sales.* This is computed in the same way as described above.
- *Change in Slope of 4-Quarter Trendline through Quarterly Sales.* To obtain this number we first calculate the trailing 12-month sales for every quarter for the past 4 quarters, and compute the average of those trailing 12-month sales over the last 4 quarters. We then compute the slope of the linear trendline through the trailing 12-month quarterly sales, and divide it by the average quarterly sales. Finally, we compute the same ratio using the data one year ago, and subtract that value from the current ratio to obtain the change in slope.

7. Earnings Momentum

- *4-Week Change in 12-Month Forward Earnings Consensus Estimate/Price.* The 12-month forward earnings estimate is calculated as the time-weighted average of FY1 and FY2 (the upcoming and the following fiscal year-end earnings forecasts). The weight for FY1 is the ratio of the number of days left in the year to the total number of days in a year, and the weight for FY2 is 1 minus the weight for FY1.
- *8-Week Change in 12-Month Forward Earnings Consensus Estimate/Price.* This is calculated in the same way as described above.
- *Last Earnings Surprise/Current Price.* The last earnings surprise is the difference between the reported and the expected earnings, both of which are reported by I/B/E/S.
- *Last Earnings Surprise/Standard Deviation of Quarterly Estimates for the Last Quarter (SUE).* As reported by I/B/E/S.

8. Price Momentum

- *Slope of 52-Week Trendline (calculated with 20-day lag)*
- *Percent Above 260-Day Low (calculated with 20-day lag)*
- *4/52-Week Price Oscillator (calculated with 20-day lag).* This is computed as the ratio of the average weekly price over the past 4 weeks to the average weekly price over the past 52 weeks, minus 1.
- *39-Week Return (calculated with 20-day lag)*
- *52-Week Volume Price Trend (calculated with 20-day lag).* This is computed in the standard way. Please refer to Colby and Meyers [1988, p. 544].

9. Price Reversal

- *5-Day Industry-Relative Return.* This is calculated as the 5-day return minus the cap-weighted average 5-day return within that industry.
- *5-Day Money Flow/Volume.* To obtain the numerator of this ratio, for each of the past 5 days we compute the closing price times the volume (shares traded) for that day, multiply that by –1 if that day's return is negative, and sum those daily values. To obtain the denominator, we simply sum the closing price times the daily volume across the past 5 days (without multiplying those daily products further by –1 if the corresponding daily return is negative).
- *12–26 Day MACD—10-Day Signal Line.* The MACD and the Signal Line are computed in the standard way. Please refer to Colby and Meyers [1988, p. 281].
- *14-Day RSI (Relative-Strength Index).* This is computed in the standard way. Please refer to Colby and Meyers [1988, p. 433].
- *20-Day Lane's Stochastic Indicator.* Please refer to Colby and Meyers [1988, p. 473].
- *4-Week Industry-Relative Return.* This is calculated as the 4-week return minus the cap-weighted average 4-week return within that industry.

10. Small Size

- *Log of Market Capitalization*
- *Log of Market Capitalization Cubed*
- *Log of Stock Price*
- *Log of Total Last Quarter Assets*
- *Log of Trailing 12-Month Sales*

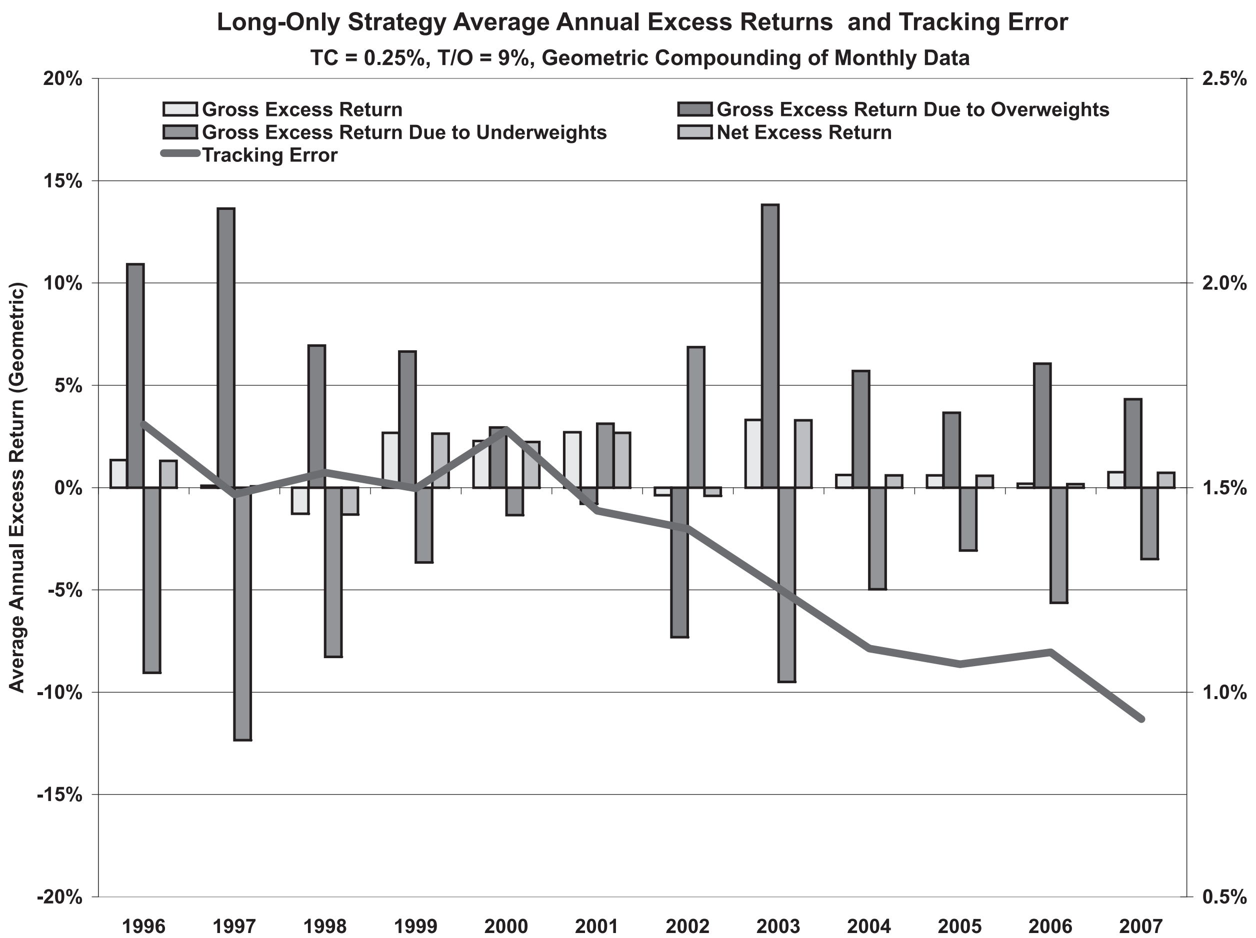
A.2 MSCI Barra Optimization

The following procedure was used to construct the CS 130/30 Investable Index (where specific MSCI Barra keywords are typeset in boldface):[10]

- Open the Barra Aegis System Portfolio Manager.
- On the drop-down menu, select **Data** → **Select Model and Dates**. Select the file containing the data for a particular date for which optimization is to be run, and hit **OK**.
- On the drop-down menu, select **Data** → **Benchmarks, Markets, and Composites**, and hit the button **Remove All**. Now hit the button **Add File**, and go to the Barra data folder corresponding to your date of interest to add the appropriate index (**SAP500.por**). Press **Process** and then **OK**.
- On the drop-down menu, select **Data** → **Import User Data**. First press **Clear All**. Then go to the file containing the composite alpha-factor z-scores for the

EXHIBIT A2

Annual Geometrically Compounded Excess Returns of the CS 130/30 Investable Index (Long-only Version), January 1996 to September 2007



Note: Excess return is defined as in excess of the S&P 500 Index. The returns for the 130/30 index are based on calculations with 0.25% one-way transaction costs (TC) and 9% annualized turnover (T/O). The corresponding gross annual excess returns are decomposed by overweight and underweight positions, where overweights and underweights are defined with respect to the S&P 500. The tracking error relative to the S&P 500 is also included.

S&P 500 companies on the date of interest. Highlight the file and select **Add**. Press **Process** and then **OK**. For the purposes of further directions, we assume that the z-scores variable in the user input file is labeled as "Value."

- Now we construct the portfolio. On the drop-down menu, select **File** → **New Portfolio**. Make sure the date is correct and hit **OK**. On the drop-down menu, select **Portfolio** → **Settings**. Within the **Settings** window, select the following:

General Tab

1. For the **Benchmark** field, hit **Select** and choose the index you just added (**SAP500**).
2. Set the **Market** field to **Cash** by pressing the **Cash** button.
3. If you are *not* doing this process for the first time in a series, set the **Initial Portfolio** field to the previous month's optimized portfolio by pressing the **Browse** button. Otherwise set the **Initial Portfolio** field to a portfolio containing $100 million in cash and no other assets.
4. To populate the **Universe** field, hit the button **Use benchmark as universe**.
5. **Base Value** option should be set to **Net Value**, which is the default.

Tax Costs Tab

Everything in this tab should be disabled by default.

Optimize Tab

1. Under the **Optimization Type** heading, set the **Portfolio** option to **Long-Short**.
2. Under the **Cash** heading, leave the **Cash Contribution** at 0.00.
3. Under the **Transactions** heading, select **Allow All**.
4. Under the **Leverage** heading, enter the following parameters:

   a. **Max. Long Position** = 130.00
   b. **Min. Long Position** = 130.00
   c. **Min. Short Position** = 30.00
   d. **Max. Short Position** = 30.00

Risk Tab

Under the **Return Distribution Parameters** heading, set:

1. **Mean Return = Zero**
2. **Show Function Type = Probability Density**
3. **Number of Bins** = 24
4. **Probability Level** (%) = 5
5. Leave the box **Truncate Total Return at –100%** unchecked.

   Under the **Risk Aversion** heading, set:

6. **Value** = 0.0075
7. **AS-CF Risk Aversion Ratio** = 1.0000

Constraints Tab

1. **Constraint Priority = Default**
2. **Constraint Type = Beta**
3. **Constraints on = Net**
4. Set the **Factor** field to **Beta** and the corresponding **Min** and **Max** fields both to 1, and leave the **Soft** box unchecked.

Expected Returns Tab

Under the **Expected Asset Returns** heading, select the following:

1. For the **Return Source** field, select **User Data** → "Value".
2. Leave the **Description** and **Formula** fields blank.
3. Set the **Return Type** to **Excess** for these directions since we are dealing with z-scores (in general this setting depends on the return type in your input file).
4. Set the **Return Multiplier** to 0.0100 (in general, this will depend on the scale of the input z-scores), and do not define anything for the **Expected Factor Return**.

Under the **Return Refinement Parameters** heading, select the following:

5. **Risk Free = 0.00%**
6. **Benchmark Risk Premium = 0.00%**
7. **Expected Benchmark Surprise = 0.00%**
8. **Market Risk Premium = 0.00%**
9. **Expected Market Surprise = 0.00%**

Transaction Costs Tab

1. **Barra Market Impact Model = Off**
2. **Analysis Mode = One Way**, and **Holding Period (years)** = 1.00
3. **Overall Transaction Costs** (**Buy Costs**, **Sell Costs**, and **Short Sell Costs**) should all be set to the desired transaction cost level (0.00% for the unconstrained-

turnover optimization and 0.25% for the constrained-turnover optimization) **Plus** 0.0000 **Per Share**.

4. **Asset Specific Transaction Costs** (**Buy Costs**, **Sell Costs**, and **Short Sell Costs**) should all be set to **< none > Plus < none > Per Share**.
5. **Transaction Cost Multiplier** is set to 1.0000 for the unconstrained-turnover optimization, and to 0.7500 or 12.0000 for the constrained-turnover simulations. One-way transaction costs of 0.25% and a transaction-cost multiplier of 0.75 yields turnover of approximately 100% per year, and when we increase the transaction-cost multiplier to 12, the annualized turnover drops to 15%.

Penalties Tab

Leave the default setting (blank).

Formulas Tab

Leave the default setting (blank).

Advanced Constraints Tab

Leave it disabled (default).

Trading Tab

All of the **General Constraints** boxes should be left unchecked, except for the **Allow Crossovers** box, which should be checked. All of the **Turnover** boxes and all of the **Trade Limits** boxes should be left unchecked.

Holdings Tab

Under the **Asset Level Bounds**, set:

1. **Upper Bound % = < none >**
2. **Lower Bound % = < none >**

Under the **Grandfather Rule** heading, leave everything unchecked.

Under the **General Holding Bounds** heading, set:

3. **Upper Bound** % = b + 0.40
4. **Lower Bound** % = b – 0.40

Under the **Conditional Rule** heading, the **Apply Conditional Rule** box should be left unchecked.

E X H I B I T A 3

Monthly Returns, Turnover, Number of Securities, and Annualized Tracking Error for the CS 130/30 Investable Index (Long-only Version), January 1996 to September 2007

Long-Only Strategy Monthly Returns (TC=0.25%, T/O≈9%)													Annual
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	(Geom)
1996	3.7	1.4	1.3	2.2	2.1	0.0	-4.9	3.0	5.4	2.5	8.4	-2.4	24.4
1997	6.9	1.0	-4.1	6.1	6.8	3.4	8.2	-5.2	5.3	-3.9	4.5	1.3	33.4
1998	1.3	7.4	4.5	0.9	-2.1	3.9	-1.3	-14.4	7.2	6.9	6.4	5.4	27.0
1999	4.5	-3.7	4.1	4.5	-2.4	5.7	-2.7	0.3	-3.2	6.3	2.3	7.0	24.1
2000	-4.9	-1.3	10.3	-2.4	-2.5	2.7	-0.7	6.0	-6.1	-0.3	-7.2	0.4	-7.1
2001	3.6	-8.5	-5.8	8.0	1.0	-2.4	-0.6	-6.0	-8.6	2.4	8.1	0.6	-9.6
2002	-0.8	-1.4	4.0	-6.0	-0.9	-7.0	-8.5	0.5	-11.3	8.1	6.2	-6.1	-22.4
2003	-2.7	-1.5	1.0	8.5	5.6	1.6	2.3	1.9	-0.5	6.1	1.3	5.9	32.8
2004	1.5	1.3	-2.1	-1.9	1.7	2.2	-3.0	0.3	1.2	2.0	4.8	3.1	11.5
2005	-2.4	2.5	-1.6	-2.1	3.5	0.2	3.6	-0.9	1.1	-1.8	3.6	0.1	5.5
2006	2.5	0.0	1.5	1.2	-2.4	0.0	0.6	2.8	2.1	3.4	1.9	1.4	16.0
2007	1.6	-1.7	1.4	4.6	3.5	-1.5	-2.8	1.4	3.2				9.9
Mean	1.2	-0.4	1.2	2.0	1.2	0.8	-0.8	-0.8	-0.4	2.9	3.7	1.5	
SD	3.4	3.8	4.3	4.5	3.3	3.4	4.3	5.4	5.8	3.8	4.3	3.8	

Long-Only Strategy (TC=0.25%, T/O≈9%): Annualized Tracking Error													
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
1996	1.8	1.7	1.7	1.8	1.7	1.7	1.6	1.7	1.6	1.5	1.6	1.5	1.7
1997	1.6	1.5	1.5	1.5	1.5	1.4	1.5	1.4	1.5	1.4	1.5	1.4	1.5
1998	1.5	1.5	1.4	1.5	1.6	1.5	1.5	1.6	1.6	1.6	1.6	1.6	1.5
1999	1.5	1.6	1.6	1.6	1.6	1.5	1.5	1.4	1.4	1.4	1.4	1.5	1.5
2000	1.7	1.6	1.8	1.9	1.8	1.5	1.6	1.5	1.5	1.6	1.6	1.5	1.6
2001	1.5	1.6	1.6	1.6	1.4	1.3	1.4	1.4	1.3	1.4	1.4	1.3	1.4
2002	1.3	1.4	1.3	1.3	1.4	1.3	1.4	1.6	1.5	1.5	1.5	1.4	1.4
2003	1.5	1.3	1.3	1.2	1.2	1.2	1.2	1.3	1.2	1.2	1.2	1.2	1.3
2004	1.2	1.2	1.2	1.2	1.1	1.1	1.1	1.1	1.0	1.0	1.1	1.1	1.1
2005	1.0	1.1	1.0	1.1	1.1	1.0	1.0	1.0	1.0	1.1	1.1	1.1	1.1
2006	1.1	1.2	1.1	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.0	1.0	1.1
2007	0.9	0.9	0.9	0.9	0.9	0.9	1.0	1.0	1.0				0.9
Mean	1.4	1.4	1.4	1.4	1.4	1.3	1.3	1.3	1.3	1.4	1.4	1.3	
SD	0.3	0.3	0.3	0.3	0.3	0.2	0.2	0.2	0.2	0.2	0.2	0.2	

Long-Only Strategy (TC=0.25%, T/O≈9%): Total Turnover													
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual*
1996	100.0	1.1	1.0	1.2	0.8	0.7	0.3	0.4	0.3	0.7	0.7	0.4	8.3
1997	0.8	0.6	0.4	0.2	0.5	0.4	0.8	0.8	0.6	0.7	0.5	0.5	6.8
1998	0.5	0.4	0.3	0.4	0.8	0.4	0.6	0.7	0.6	1.3	0.8	0.8	7.5
1999	1.3	0.9	0.4	0.5	0.5	0.2	0.5	0.3	0.4	0.6	1.2	0.8	7.7
2000	1.3	0.6	1.1	0.3	0.5	0.6	1.2	1.0	0.6	0.8	0.3	0.8	9.1
2001	0.8	0.3	0.6	0.4	0.7	0.1	0.2	0.4	0.6	0.7	0.6	0.2	5.5
2002	0.4	0.2	0.4	0.2	0.6	0.4	0.6	1.5	0.5	0.9	0.3	0.3	6.2
2003	0.1	0.2	0.2	0.2	0.3	0.4	0.2	0.2	0.3	0.1	0.3	0.2	2.7
2004	0.4	0.2	0.2	0.6	0.2	0.2	0.5	0.3	0.1	0.2	0.2	0.4	3.4
2005	0.2	0.1	0.3	0.5	0.2	0.3	0.2	0.1	0.3	0.8	0.3	0.2	3.6
2006	0.4	0.5	0.2	0.4	0.5	0.3	0.3	0.4	0.3	0.3	0.1	0.6	4.3
2007	0.2	0.6	0.3	0.5	0.3	0.7	0.6	0.5	0.4				5.5
Mean	8.9	0.5	0.4	0.4	0.5	0.4	0.5	0.5	0.4	0.6	0.5	0.5	
SD	28.7	0.3	0.3	0.3	0.2	0.2	0.3	0.4	0.2	0.3	0.3	0.2	

Long-Only Strategy (TC=0.25%, T/O≈9%): Number of Securities													
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
1996	194	196	196	198	200	200	201	203	204	205	208	210	201
1997	211	211	211	213	211	211	210	211	208	210	211	211	211
1998	210	212	211	212	211	213	213	214	215	214	209	207	212
1999	203	207	207	209	209	210	206	204	206	204	201	199	205
2000	205	208	212	213	212	210	204	203	204	207	206	205	207
2001	205	205	203	205	207	207	206	208	207	206	206	205	206
2002	204	206	206	207	208	207	209	214	213	212	214	215	210
2003	214	215	216	217	216	214	213	215	215	216	217	216	215
2004	214	215	213	213	211	212	212	213	212	211	211	207	212
2005	208	208	209	212	213	212	212	212	213	214	215	214	212
2006	213	213	214	213	214	216	215	216	216	216	215	213	215
2007	214	213	214	214	216	215	217	217	216				215
Mean	208	209	209	211	211	211	210	211	211	210	210	209	
SD	6	5	6	5	4	4	5	5	5	4	5	5	

**Annual turnover values for 1996 exclude the month of January.*
Note: The results for the 130/30 index are based on calculations with 0.25% one-way transaction costs (TC) and 9% annualized turnover (T/O).

- At the bottom right of the **Settings** window press the **Apply** button, then at the top right of the same window press **OK**.
- From the drop-down menu, select **Actions** → **Optimize**.
- Save the resulting output.

A.3 LONG-ONLY PORTFOLIO CHARACTERISTICS

In this subsection, we report summary statistics for the long-only version of the 130/30 investable index to provide intuition for the contribution of the CS alpha factors to overall performance. With the exception of the long-only constraint, the parameters used to construct this portfolio are identical to those used to construct the 130/30 investable index with 15% turnover and 0.25% one-way transaction costs.[11] Exhibit A1 presents summary statistics for this long-only portfolio, Exhibit A2 contains its annual performance and tracking error relative to the S&P 500, and Exhibit A3 provides its monthly returns, turnover, and other trading statistics. Correlations between the long-only portfolio and other indexes are given in Exhibit 5.

ENDNOTES

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[1]Examples of these types of anomalies include the size effect (Banz [1981]), January effect (Rozeff and Kinney [1976] and Keim [1983]), and book-to-market factor (Fama and French [1992]).

[2]The ten composite factors are available for approximately 3,500 U.S. companies which span the combined universe of the S&P 1500, the top 3,000 companies by market cap, the top 100 ADRs, and the Credit Suisse Analyst Coverage. Approximately 5,000 international companies are also covered.

[3]Please see the appendix and Patel, Yao, and Carlson [2007a, pp. 26–27] for further details on the constituents of each composite factor.

[4]The turnover of approximately 15% and 100% per year is achieved by coupling the one-way transaction costs of 0.25% with a transaction-cost multiplier of 12 and 0.75, respectively, in the MSCI Barra Aegis Portfolio Manager. The unconstrained-turnover case is produced by setting transaction costs to zero.

[5]This cost was deducted outside of the MSCI Barra portfolio optimizer in order not to affect the optimization algorithm.

[6]Because the MSCI Barra Aegis Portfolio Manager calculates turnover as the one-way turnover versus the total absolute value of the initial portfolio positions, we multiply turnover by a factor of 2 and by the leverage ratio. The transaction cost, $TCost_t$, is set to zero for the first month in the study (January 1996) and is assumed to be zero for all months for the look-ahead index.

[7]Note that the annualized tracking error of 1.83% is computed directly from the monthly excess returns (after fees) of the 130/30 strategy, whereas the tracking errors in Exhibits 3, 6, 7, A2, and A3 are based on the monthly annualized tracking-error estimates produced by the MSCI Barra Aegis Portfolio Manager.

[8]Recall that the factors used in constructing the 130/30 portfolio are based on well-known accounting variables and have been available to CS clients for several years.

[9]The total, long-side, and short-side turnover in Exhibits 6, 7, and A3 are all computed as one-way turnover against the total absolute value of the initial portfolio positions, whereas in the MSCI Barra Aegis Portfolio Manager, the long-side (short-side) turnover is computed against the value of the long (short) positions of the initial portfolio. Also, each time a portfolio is constructed, the MSCI Barra Aegis Portfolio Manager provides an annualized tracking-error forecast based on the Barra multiple-factor risk model.

[10]The look-ahead portfolio is constructed in the same way, but instead of using the equal-weighted average of the alpha-factor z-scores as the excess-return input in the optimizer, we use the one-month forward excess return (hence, the look-ahead bias). The long-only version of the 130/30 index discussed in appendix subsection A.3 is constructed in the same way as its 130/30 counterpart, but with the long- and short-position leverage set at 100% and 0%, respectively.

[11]Those same parameters now yield an annual turnover of at most 9%.

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