The Index Investor

Why Pay More for Less?

Global Asset Class Returns

YTD 30Jan04	In USD	In AUD	In CAD	In EURO	In JPY	In GBP
US Bonds	0.80%	-0.66%	2.99%	1.63%	-0.71%	-1.40%
US Prop.	4.30%	2.84%	6.49%	5.13%	2.79%	2.10%
US Equity	2.20%	0.74%	4.39%	3.03%	0.69%	0.00%
AUS Bonds	-0.78%	-2.24%	1.41%	0.05%	-2.29%	-2.98%
AUS Prop.	1.49%	0.03%	3.68%	2.32%	-0.03%	-0.71%
AUS Equity	-0.70%	-2.16%	1.49%	0.13%	-2.21%	-2.90%
CAN Bonds	-1.77%	-3.23%	0.42%	-0.94%	-3.28%	-3.97%
CAN Prop.	1.86%	0.40%	4.05%	2.68%	0.34%	-0.34%
CAN Equity	0.40%	-1.06%	2.59%	1.23%	-1.11%	-1.80%
Euro Bonds	-0.94%	-2.40%	1.25%	-0.11%	-2.45%	-3.14%
Euro Prop.	2.48%	1.02%	4.68%	3.31%	0.97%	0.29%
Euro Equity	2.00%	0.54%	4.19%	2.83%	0.49%	-0.20%
Japan Bonds	1.65%	0.19%	3.84%	2.48%	0.14%	-0.55%
Japan Prop.	14.53%	13.07%	16.72%	15.36%	13.02%	12.33%
Japan Equity	0.20%	-1.26%	2.39%	1.03%	-1.31%	-2.00%
UK Bonds	1.71%	0.25%	3.90%	2.54%	0.20%	-0.49%
UK Prop.	5.05%	3.59%	7.24%	5.87%	3.53%	2.85%
UK Equity	-0.50%	-1.96%	1.69%	0.33%	-2.01%	-2.70%
World Bonds	0.45%	-1.01%	2.64%	1.28%	-1.06%	-1.75%
World Prop.	6.20%	4.74%	8.39%	7.03%	4.69%	4.00%
World Equity	1.90%	0.44%	4.09%	2.73%	0.39%	-0.30%
Commodities	0.60%	-0.86%	2.79%	1.43%	-0.91%	-1.60%
A$	-1.46%	0.00%	-3.65%	-2.29%	0.06%	0.74%
C$	2.19%	3.65%	0.00%	1.37%	3.71%	4.39%
Euro	0.83%	2.29%	-1.37%	0.00%	2.34%	3.02%
Yen	-1.51%	-0.06%	-3.71%	-2.34%	0.00%	0.68%
UK£	-2.20%	-0.74%	-4.39%	-3.02%	-0.68%	0.00%
US$	0.00%	1.46%	-2.19%	-0.83%	1.51%	2.20%

As you can see, we are making some major changes to our global asset class return summary this year. We are providing more detail about currencies, and have added the commercial property asset class. The latter change reflects the growing number of listed commercial property index vehicles (that track the performance of real estate investment trusts and/or real estate operating companies) that are now, or soon will be available in markets around the world. However, the total market capitalization of listed commercial property company shares is still only a fraction (estimated to be around 12% to 15%) of the total market value of the underlying real estate. Moreover, this fraction also varies by region, with the highest rates of securitization in Australia, middle tier rates in Canada, the U.S. and the U.K., and the lowest rates in Japan, Southeast Asia, and continental Europe. The following table shows a rough estimate of different region's share of total real estate market capitalization, and the total value of available property company securities.

Region	Approximate Share of Total Property Market Capitalization	Approximate Share of Listed Property Securities Market
Australia	1%	4%
Continental Europe	27%	6%
Japan and Southeast Asia	30%	27%
North America	34%	52%
United Kingdom	8%	11%

Model Portfolio Update

The objective of our first set of model portfolios is to deliver higher returns than their respective benchmarks, while taking on no more risk. The benchmark for the first portfolio in this group is an aggressive mix of 80% domestic equities, and 20% domestic bonds. Through the end of January, this benchmark had returned 1.9%, while our model portfolio had returned 2.2%. We have also compared our model portfolios to a set of global benchmarks. In this

case, the global benchmark is a mix of 80% global equities, and 20% global bonds. Through the end of last month, it had returned 1.6%.

The benchmark for the second portfolio in this group is a mix of 60% domestic equities and 40% domestic bonds. Through the end of last month, it had returned 1.6%, while our model portfolio had returned 2.0%, and the global benchmark had returned 1.3%.

The benchmark for the third portfolio in this group is a conservative mix of 20% domestic equities and 80% domestic bonds. Through the end of last month, it had returned 1.1%, while our model portfolio had returned 1.4% and the global benchmark 0.7%.

The objective of our second set of model portfolios is to deliver less risk than their respective benchmarks, while delivering at least as much return. The benchmark for the first portfolio in this group is an aggressive mix of 80% domestic equities, and 20% domestic bonds. Through the end of last month, this benchmark had returned 1.9%, while our model portfolio had returned 2.3%. We have also compared our model portfolios to a set of global benchmarks. In this case, the global benchmark is a mix of 80% global equities, and 20% global bonds. Through the end of last month, it had returned 1.6%.

The benchmark for the second portfolio in this group is a mix of 60% domestic equities and 40% domestic bonds. Through the end of last month, it had returned 1.6%, while our model portfolio had returned 1.8%, and the global benchmark had returned 1.3%.

The benchmark for the third portfolio in this group is a conservative mix of 20% domestic equities and 80% domestic bonds. Through the end of last month, it had returned 1.1%, while our model portfolio had returned 1.3% and the global benchmark 0.7%.

The objective of our third set of model portfolios is not to outperform a benchmark index, but rather to deliver a minimum level of compound annual real return over a twenty-year period. Through last month, our 7% target real return portfolio had returned, in nominal terms, 1.9%

year-to-date, our 5% target real return portfolio had returned, in nominal terms, 1.9%, and our 3% target real return portfolio had returned, in nominal terms, 1.5%.

Later in this issue we describe our new fourth set of model portfolios. These are the same as our target real return portfolios, but also include the possibility of investing in a hedge fund index. Through last month, our 7% target real return HF portfolio had returned, in nominal terms, 1.9% year-to-date, our 5% target real return HF portfolio had returned, in nominal terms, 1.5%, and our 3% target real return HF portfolio had returned, in nominal terms, 1.5%.

Equity Market Valuation Update

Our equity market valuation analysis rests on two fundamental assumptions. The first is that the long term real equity risk premium is 4.0% per year. The second is the average rate of productivity growth an economy will achieve in the future. As described in our June, 2003 issue, we use both high and a low productivity growth assumptions. Given these assumptions, here is our updated market valuation analysis at the end of last month:

Country	Real Risk Free Rate Plus	Equity Risk Premium Equals	Required Real Return on Equities	Expected Real Growth Rate* plus	Dividend Yield Equals	Expected Real Equity Return**
Australia	3.43%	4.00%	7.43%	4.90%	3.77%	8.67%
Canada	2.53%	4.00%	6.53%	2.10%	1.78%	3.88%
Eurozone	1.66%	4.00%	5.66%	2.50%	1.90%	4.40%
Japan	1.62%	4.00%	5.62%	2.70%	0.90%	3.70%
U.K.	1.96%	4.00%	5.96%	2.50%	3.20%	5.70%
U.S.A.	2.23%	4.00%	6.23%	4.50%	1.60%	6.10%

**High Productivity Growth Scenario. See Asset Class Review, in our June 2003 Issue, for assumptions used in both productivity growth scenarios for each region.*

*** When required real equity return is greater than expected real equity return, theoretical index value will be less than actual index value – i.e., the market will appear to be overvalued.*

Country	Implied Index Value*	Current Index Value	(Under) or Overvaluation in High Growth Scenario	(Under) or Overvaluation in LowGrowth Scenario
Australia	149.01	100.00	(49%)	(7%)
Canada	40.18	100.00	60%	67%
Eurozone	60.13	100.00	40%	59%
Japan	31.91	100.00	68%	76%
U.K.	92.49	100.00	8%	35%
U.S.A.	92.49	100.00	8%	41%

* *High productivity growth scenario.*

This Month's Letter to the Editor

How often do you plan to change the asset allocations in your model portfolios?

Our baseline position is that we change our model portfolio asset allocations as infrequently as possible. If we reviewed them every year, we would confront the normal human tendency to sell last year's worst performing asset class, and buy more of last year's best performer. This is a temptation best avoided, because "performance chasing" has been shown to reduce long term performance (e.g., because too often you end up buying something at the top, while selling something else at the bottom – and buy high, sell low isn't a recipe for long term success). As we have repeatedly written, superior long term performance results from identifying the asset allocation that will maximize the probability of achieving the portfolio rate of return you need to reach your long term goals, and then rebalancing over time to maintain these portfolio weights.

On the other hand, there are two circumstances that will trigger a review of our model portfolio asset allocations. The first is the introduction of new index investment products which make it possible for individuals to invest in an asset class that had previously been available only to institutional investors. In recent years, these innovations have included the introduction of commodity index funds, and, more recently, the first hedge fund index

products. Looking to the future, there are at least four potential new product offerings that, if they were introduced, would trigger an asset allocation review. The first would be an index product tracking the private equity asset class. The second would be an index product tracking residential real estate. The third would be the launch of index products that are linked to foreign exchange returns. And the fourth would be index products that are based on the underlying volatility of an asset class. Some have asked if the introduction of an index product that track global commercial property would also trigger a new asset allocation review. Our answer is that it might, though we would first have to see by how much the risk/return characteristics of such an instrument differed from national or region-specific commercial property indexes.

The second trigger for an asset allocation review would be the publication of significant new research findings that cause us to re-think some aspect of our underlying asset allocation methodology. For example, last year we decided that the application of new Bayesian statistical techniques could help us significantly improve the way we handle estimation errors in the inputs we use in our asset allocation models. Looking forward on the methodology front, as we discussed in our November, 2003 issue we are currently testing a methodology which integrates rebalancing with asset allocation decisions. Depending on the size of the potential benefits from this approach, it might trigger an asset allocation review and changes to our model portfolios. We are also monitoring research in a number of other areas (some of which we'll write about later this year). These include (a) asset allocation using higher statistical moments (i.e., coskewness and cokurtosis), (b) advances in combinatorial optimization (the second part of the "simulation optimization" methodology we use to develop our long term target return portfolios), (c) asset allocation using Conditional Value at Risk, and (d) the application of extreme value theory to long term asset allocation decisions.

However, the bottom line is that unless any of these developments (or something similarly important) comes to pass, we aren't going to be changing the target return portfolios' asset class weights we developed in 2003. The same is basically true for our benchmark relative portfolios. As you can see in this issue, this year we have made a slight change in some of them, reflecting our decision to treat foreign developed markets equities as a single asset

class, rather than taking tilts within it toward different regions. Just to make sure we're clear on this, readers of some of our editions will still notice allocations to different regions: e.g., the U.S., U.K., and Pacific if you're reading our Euro edition. These are the weights of these areas in a broader index of foreign developed markets equities. Finally, as these benchmark relative portfolios are based on only a one-year time horizon, we originally developed them using the mean/variance optimization methodology. Later this year, we plan to publish an article that shows how their allocations would change if we developed them using our simulation optimization methodology and the same combined historical and forward looking assumptions we used last year's asset allocation review.

This Month's Feature Articles: Key Points

This month's first feature article takes an in-depth look at the impact of including hedge fund index products in our target real return model portfolios. While hedge funds are undeniably growing in popularity, we fear that too few investors have a clear understanding of the issues surrounding the questionable data upon which rest many of the claims made for investing in this asset class. This month we cover these in depth, and then go on to describe the analysis that backs our new target real returns (with hedge funds) portfolios. We find that while there are potential benefits from investing in hedge funds, there are also important trade-offs involved between different types of risk. In sum, investors should proceed with caution in this area.

Our second feature article this month compares indexes that track two important asset classes. The first is hedge funds, where we compare the new investable hedge fund indexes from S&P, MSCI, and CSFB/Tremont. The second is the U.S. equity market, where we compare exchange traded funds that track the Wilshire 5000, Russell 3000, S&P 1500, and Dow Jones Total Market Index This month's issue also includes our new list of funds that can be used to implement our model portfolios' asset allocations.

Using Hedge Funds in Our Target Return Portfolios

We suspect that many of our readers have recently had the same experience we have. You're at a party, and, after the weather, sports, politics, and house prices, people start talking about investing. These days it seems almost inevitable (or sadly unavoidable, depending on your perspective) that, relatively early on in the conversation someone will try to impress everyone by rather loudly noting (let's face it, most women don't do this) that they're "in hedge funds." As we shortly thereafter make our excuses, and head off to get another drink, many of us naturally wonder to ourselves (if not to others), "should I be 'in hedge funds' too?"

Clearly, this is a timely question to ask. As the Financial Times recently noted in its January 27th issue, "Investors poured a record US $60 billion into hedge funds worldwide in 2003, lifting the industry's capital to between $725 and $750 billion." And since many hedge funds leverage this capital with debt, the total value of the investments they control is a multiple of this amount. The FT went on to note that "there was also a big leap in the number of new funds during [2003], with only a handful of funds closing." TASS [a producer of a leading hedge fund index] estimates there were about 1,000 new funds launched in 2003, taking the total to about 6,700. Of these, about 1,700 are funds of funds."

It also seems likely that more and more investors will be thinking about hedge funds. Not only are more hedge fund index products being launched, but more professional financial advisers are considering their use in client portfolios. As investmentadvisor.com recently noted, "a recent study, "Asset Gathering in Intermediary Channels", conduced by Financial Research Corp and the Financial Planning Association, found that 62% of the 635 advisers surveyed planned to increase their usage of hedge funds over the next three to five years."

Given this growing interest in hedge funds, we have analyzed how they might fit into our target real return portfolios. Before we begin, let's start with a quick review of what hedge funds are, and the investment strategies they follow.

The definition of a hedge fund used by the Presidential Working Group on Financial Markets is "any pooled investment vehicle that is privately organized, administered by professional

investment managers, and not widely available to the public." Hedge fund managers have much more lucrative compensation arrangements than mutual fund managers. A typical hedge fund receives an annual management fee equal to 1% to 2% of the fund's assets, and can earn an incentive fee equal to 15% to 20% of the fund's profits above a certain minimum level of return. Most hedge funds also include what is called a "high water mark" provision, which requires that past year's losses be made up before this incentive fee takes effect. Given the attractiveness of this package, it should come as no surprise that many of the best mutual fund managers have left their old jobs to manage hedge funds.

A more interesting question is how hedge fund managers make money for their investors. Hedge funds are not a true asset class, in the sense that we usually use that term. Asset classes represent some type of claim on real productive assets that share common characteristics. The return on an asset within an asset class has two components: compensation for the risk of the asset class itself (also known as "beta risk"), and compensation for risks unique to the specific asset under consideration (also known as "alpha risk"). When you hold a diversified portfolio of assets from within the same asset class, the alpha risks (and the returns associated with holding them) cancel each other out, and you are left with non-diversifiable risk (also known as beta or systemic risk), and the return for holding it. When you diversify your portfolio across asset classes, the beta risk is reduced, but not eliminated.

In contrast to a true asset class, the broad term "hedge funds" refers to a very diverse collection of actively managed investment strategies which aim to maximize the return for holding alpha risk in one or more asset classes. As we have discussed in the past, there are two fundamental sources of superior active investment management performance: a manager can have better information than other investors, and/or he can have a better model for making sense of information that is available to all investors. This holds for both active mutual fund and hedge fund managers. The difference between them, however, lies in how they make use of whatever advantage they have.

In principle, an advantage can affect either where you invest, and/or how you invest. By where you invest, we mean the allocation of your investments between different asset classes,

and, within those classes, between different regions (or countries), styles (e.g., momentum vs. value), sectors, and individual securities. By how you invest, we mean the extent to which you take directional bets on whatever assets you are investing in (that is, the extent to which you take long or short positions), and the extent to which you try to magnify your gains by using leverage to increase the size of your investment positions. This leverage can come either from the use of debt (e.g., margin borrowing), or derivatives (options, futures, etc.) which you can purchase for less than their full face value.

Mutual fund managers are far more limited in how they invest than are hedge fund managers. First, many mutual fund managers are expected to stay within a certain "style" category (e.g., large cap growth). As a result, their performance is usually measured relative to the relevant "style benchmark" (e.g., the S&P 500 growth index). In contrast, hedge fund managers are generally allowed to invest in a wider range of asset classes, and, as important, their performance is usually measured relative to an absolute return target (e.g., at least 12% per year), rather than any index (although that is changing, with performance versus a hedge fund index increasingly used as hedge fund investing becomes more popular).

Second, mutual fund managers are generally prohibited from taking short positions in the stocks in the stocks in which they invest. In contrast, hedge fund managers are allowed to take short positions. Practically, this "long only" constraint means that mutual fund managers can only make money from investing in assets that they believe to be undervalued, while hedge fund managers can make money from both undervalued and overvalued situations.

Third, mutual fund managers are generally limited in the amount of leverage (be it in the form of debt or derivatives) they can use to magnify their returns. From a regulatory point of view, there is a good reason for this: using leverage is a risky strategy, that magnifies not only gains, but losses as well (remember Long Term Capital Management?). Presumably, sophisticated "accredited investors" understand this risk, and are willing to take it when they invest in hedge funds, which can and do use leverage.

Now that we know, in general terms, how hedge funds make money, let's look in somewhat more detail at the different strategies they employ.

The first major group of strategies used by hedge funds are known as "event-based" investing. "Event Driven" funds try to make their money by taking long or short positions based on their forecast about the outcome of an expected event. For example, some of these funds invest in the securities of companies involved in merger and acquisition transactions, while others invest in the debt and equity of firms facing serious financial problems. At the end of 2003, Event Drive hedge funds accounted for 17% of the assets in the CSFB/Tremont Investable Hedge Fund Index.

The second major investing strategy used by hedge funds is arbitrage. In the traditional meaning of the term, arbitrage was a low risk strategy, in which one simultaneously bought an asset in a market in which it appeared underpriced, while selling the same or a very similar asset in another market in which it appeared overpriced. As practiced by hedge funds, however, this strategy is considerably higher risk, and often involves holding open long and short (and highly leveraged) positions in assets whose alleged similarity occasionally turns out not to be the case (just ask the people who ran Long Term Capital Management).

Within the overall arbitrage strategy group, "Convertible Arbitrage" funds try to make money by taking advantage of pricing differences between a company's convertible bonds (that is, bonds that have the option of being converted into equity shares at a later date) and its outstanding shares. For example, a hedge fund might buy a company's convertibles while selling short its stock, assuming the latter was perceived to be overvalued. The profit on the strategy would come from both the interest earned on the bond, plus the profit earned on the short sale of the stock (when you sell a stock short, you receive a price for the shares today, but promise to deliver them at a later date. If the shares have declined in price by that date, you can buy the shares you need to deliver for a price that is lower than what you have received for them). However, because the profit margins on these convertible arbitrage trades are usually small, hedge funds in this category generally use substantial amounts of leverage

to magnify their returns. At the end of 2003, approximately 11% of the total amount invested in hedge funds tracked by the CSFB/Tremont Index was invested in funds in this category.

"Fixed Income Arbitrage" funds try to profit by taking advantage of pricing differences between similar fixed income securities (buying the undervalued one, and shorting the overvalued one). Again, because the profit margins on individual transactions are small, these funds typically use large amounts of leverage. Long Term Capital Management was in this category, and provides a vivid example of how high leverage can quickly lead to a hedge fund's demise if its view of the market proves incorrect. Fixed Income Arbitrage funds accounted for 10% of the total amount invested in the hedge funds tracked by CSFB/Tremont.

A third type of hedge fund is often included in the arbitrage category, but its fit there is awkward at best. The managers of "Equity Market Neutral" funds essentially hunt for pure alpha. That is, they take long and short positions in different companies depending on their view of those companies expected future performance relative to the overall market. However, they do not take any overall equity market (beta) risk, as they hedge it away by using derivative contracts, or by taking offsetting long and short positions. At the end of 2003, Equity Market Neutral funds accounted for 10% of the total capital of the CSFB/Tremont Hedge Fund Index.

The majority of money invested in hedge funds, however, is not in any of the strategies we have already discussed, but rather in what are broadly called "directional strategies." These funds try to earn high returns by taking large directional bets, in the expectation that overvalued assets they are short will fall in price and undervalued assets they are long will rise in price. Because directional trading typically generates higher profit margins per transaction, these funds generally use less leverage than the arbitrage funds.

"Long/Short Equity" funds are different from market neutral funds in that the long and short positions they take may be of different sizes. Long/Short funds may either invest in a broad range of asset classes, or be more narrowly focused (e.g., a biotechnology hedge fund). At the end of 2003, they accounted for 13% of the CSFB/Tremont Index.

"Global Macro" funds hunt for alpha using a market timing approach. They take long and short positions across a very broad range of asset classes and markets around the world, depending on their view of their respective future returns. These funds may also use substantial amounts of leverage on a tactical basis to increase the potential payoffs from some of their directional bets. Famous hedge funds, such as George Soros' Quantum Fund or Julian Robertson's Tiger Fund are in this class. They accounted for 13% of the CSFB/Tremont Index at the end of 2003.

"Managed Futures" funds invest in listed financial and currency futures, and their managers are usually called commodity trading advisors, or CTAs. They often employ momentum strategies. These funds accounted for 10% of the hedge fund assets tracked by CSFB/Tremont at the end of 2003.

"Emerging Markets" funds try to make money through superior market timing and security selection in markets that are often less liquid than those of developed countries. They accounted for 3% of the total hedge fund assets tracked by CSFB/Tremont at the end of 2003.

"Dedicated Short Bias" funds have greater than fifty percent of their assets invested in short equity market positions. Because of the difficulty of making money over the long term taking this approach (given that the economy grows, and markets rise, in far more years than they fall), dedicated short funds accounted for only 2% percent of total hedge fund assets at the end of 2003.

Finally, hedge funds which employed multiple investing strategies accounted for 11% of hedge fund assets at the end of 2003.

Now let's move on to our analysis of how hedge funds fit into an investor's portfolio.

In conducting this research, our first problem was the quality of the available data on hedge fund returns. To put it mildly, it is questionable at best. Because this data underlies much of

the current enthusiasm for investing in hedge funds, it is critical that people understand its limitations.

To begin with, there are at least ten different indexes that claim to track the performance of the hedge fund universe. However, many of these indexes are constructed using different methodologies (e.g., how they classify different hedge fund strategies, whether they use equal or market capitalization based weighting, and whether they require audited results from the funds they include). Just to make things more interesting, hedge fund managers themselves decide whether or not to report their results to an index provider. For example, a fund with a poor performance record may choose not to report its results. At the other extreme, a fund with an outstanding performance record, which is closed to new investors, also may choose not to report its results. This is called "self-selection bias."

Moreover, reporting funds provide their results to different index providers. As a result, no index comes close to covering the entire hedge fund universe. But the problems don't end there. When a hedge fund initially decides to report its results to an index provider, it delivers not only its current and future returns, but also a history of its past returns as well. Unfortunately, in the case of an indexed hedge fund product, you can only invest in a fund after it has been added to the index. In other words, what counts from an index investor's point of view is performance after a fund has been added to an index, not before it. The extent to which fund returns are lower after they join an index than they were before this point is called "backfill bias."

Finally, the treatment of funds that leave an index can also create bias in the reported index returns. If either the returns of these funds are removed from the index database after they stop reporting, or if (in the case of failing funds) their final returns are not obtained, then the reported index returns can be biased upwards. This is known as "survivorship bias."

While a number of authors have examined the potential impact of these different biases, one of the best papers we've read on the subject is "A Reality Check on Hedge Fund Returns" by Posthuma and Van der Sluis. They directly examined the backfill bias in the TASS database

(which contains over 3,000 hedge funds) over the period 1996 to 2002 (previous studies had only estimated the size of the problem). The authors found that more than half the reported returns in the database were backfilled. They went on to create a proxy for a truly investable index by (a) using only non-backfilled returns, (b) including the returns from funds which left the index; and (c) using two different approaches to estimate the final returns from failing funds (one assumed that investors received all their money back, while they second assumed a 50% loss of capital). When constructing their index, the authors equally weighted each hedge fund's return. This is the practice used by almost all the major hedge fund index vendors, except CSFB/Tremont, which weights funds' returns by their assets under management (in line with the way most other asset class indexes are constructed).

Posthuma and Van der Sluis found that due to backfill bias, average annual hedge fund index returns were overstated by 4.35% during the 1996 – 2002 period (10.73% before the bias was removed, versus 6.34% after). By strategy, the impact of backfill bias ranged from a high of 6.34% for Long/Short Equity to 3.13% for Global Macro, 2.60% for Equity Market Neutral, and 2.45% for Event Driven. However, these returns assumed that investors suffered no loss after a fund left the investable index. When the authors assumed that such funds incurred a 50% loss of capital, the overall return on the index declined to 7.43%, and the backfill bias rose to 7.24% -- essentially leaving the overall investable index return equal to zero. Moreover, the authors also found that the net impact of these biases also distorted (unfavorably) various measures of risk. Let's look at these. Standard deviation (also known as volatility) measures the extent to which returns are disbursed around their average. In general, investors who are risk averse prefer lower levels of standard deviation, and seek to maximize the amount of return per unit of volatility they take on. Posthuma and Van der Sluis found that backfill and survivorship biases artificially lowered their hedge fund index's reported standard deviation. Skewness measures the extent to which positive or negative returns are more probable. In a positively skewed distribution (which risk-averse investors prefer), positive returns are more probably than negative ones. A normal (bell curve) distribution has skewness equal to zero, because positive and negative returns are equally probable. In this case, the authors found that removing the survivorship and backfill biases made hedge fund returns' skewness more negative. Finally, kurtosis measures the

"peakedness" of the distribution of returns, relative to what would be found in a normal distribution. Positive kurtosis means the distribution has "fatter tails" than a normal distribution. Practically, positive kurtosis means that extreme returns – both positive and negative (skewness tells you which is more likely) – are more likely than they would be if returns were normally distributed. Investors' kurtosis preference depends on the skewness of the distribution. If it is negative, risk-averse investors dislike positive kurtosis, because it means that big negative returns are more likely than big positive ones. On the other hand, if a distribution is positively skewed, then a risk averse investor may prefer somewhat higher than normal kurtosis, which would raise the probability of realizing big positive returns. In their study of hedge fund returns, Posthuma and Van der Sluis found that the backfill and survivorship bias tended to depress reported kurtosis. Similar findings on the impact of survivorship and backfill bias on reported average returns, standard deviation, skweness and kurtosis were also reported by Professor Ross Barry of Macquarie University in his paper "Hedge Funds: A Walk Through the Graveyard." Last but not least, we should also mention that Posthuma and Van der Sluis found that there was "no persistence between the returns of the backfilled hedge fund returns and the non-backfilled returns." In other words, what is true of mutual funds also seems to be true in the hedge fund world: you can't use past performance to pick future winners.

Impressive as it was, Posthuma and Van der Sluis' study left out another important bias. The returns that hedge fund managers report each month to various index providers are based, in part, on changes in the market value of the assets in which they have invested. However, if those assets are sufficiently illiquid (as would be the case for example, with some distressed debt, exotic derivative instruments, or privately placed equity), it can be very difficult to obtain accurate market prices for them each month. As a result, estimated values are frequently used, in an approach that is not dissimilar to the way residential real estate is often re-valued by appraisers during the long period in between market transactions. In both cases, the appraisal approach leads to a higher degree of correlation between asset prices in succeeding periods than is normally found in liquid markets. Statistically, this is called "autocorrelation." Practically, the autocorrelation bias in some hedge fund returns causes reported standard deviations to be lower than what their "true" value probably is.

Perhaps the greatest limitation of most studies of hedge fund performance is the relatively short periods they cover. More than anything else, this is a function of the length of the available hedge fund index data series, which generally only go back as far as 1994. A number of researchers have tried to overcome this limitation by using regression modeling to artificially create a longer series of hedge fund performance data. In practice, this involves regressing the performance of a hedge fund (or hedge fund index) against the values of a number of other independent variables that have longer data series. If the model produces a reasonably good fit between the actual and predicted hedge fund performance, then the historical values of the independent variables can be used to project back into the past a longer series of estimated hedge fund returns. Of course, developing these regression models is not without its challenges, including which independent variables to use, and the actual form of the model itself (e.g., should it be a simple linear model or a more complex polynomial one?).

One of the most interesting approaches of this type is described in the paper "Risks and Portfolio Decisions Involving Hedge Funds" by Agarwal and Naik. They started with the observation that "a large number of equity oriented hedge fund strategies exhibit payoffs [return distributions] resembling a short position in a put option on the market index, and therefore bear significant left tail risk." As we shall see, this is a very important point to keep in mind.

For those readers who are a little unclear about what it means to be short a put option, it means that you are, in essence, an insurance company. In selling (or, as it is known, "writing") a put option you have promised the other party that, for a specified period of time (say the next 360 days), you stand ready to purchase a specified quantity of an asset (say, 1,000 shares of the exchange traded index fund that tracks the Russell 3000 Index) at a specified "strike price" (say, $65 per share). In exchange for making this promise (or, to be more accurate, taking on this risk), the purchaser pays you a premium. Now let's think about what happens next. Suppose that over the next year, the R3000 ETF never trades below $65/share, and the holder of the option you have sold therefore chooses not to exercise it. At

the end of the year, you add the option premium you earned to your other gains and losses to calculate the total return on your investment portfolio. You notice that said return is higher because of the option premium, so you decide to do the same thing again next year. And again, the ETF never trades below $65/share. So you do it again for a third year, and, again, nothing happens. Now think about how what you have done has affected the three-year portfolio returns you have reported to your key investors (say, your spouse).

First, the option premiums you earned raised your reported average return. Second, because those premiums were constant over three years, they reduced the reported standard deviation of your reported returns. Third, if in any year the option premium turned what otherwise would have been a negative return into a positive one, they made the skewness of your returns look more positive. Finally, because you never had to pay out under the insurance contract (er, the put option), you had no big negative returns – so selling the put option had no affect on the reported kurtosis of your returns.

By now, I rather suspect you're getting the larger picture: Agarwal and Naik's finding that "a large number of equity oriented hedge fund strategies exhibit payoffs [return distributions] resembling a short position in a put option on the market index, and therefore bear significant left tail risk" is potentially a ticking time bomb for all those people (think back to whichever self-style "hedge fund guru" you most recently encountered) who believe that, in essence, hedge funds are a free lunch that can magically improve a portfolio's risk/return tradeoff.
This really isn't news, however. The hints have been there for quite a while. It wasn't just Long Term Capital Management that was brought down by the Russian Debt Crisis in 1998; a lot of other hedge funds went out of business then too. And, as we will demonstrate below, despite their acknowledged shortcomings, the existing hedge fund return indexes still give an indication that this is a very different animal from other asset classes.

But let's for the moment go back to our investor who had discovered the joys of selling put options. Say he does it again in year four, but this time the market tanks, and the R3000 ETF drops to $25/share. At this price, the holder of the put option exercises it, which forces our intrepid investor to pay $65,000 for 1,000 ETFs that are only worth $25,000. Given his track

record over the previous three years, that big a loss seems like it will take quite a bit of explaining to his investors (ouch!). On the other hand, a statistical analysis of his reported returns will finally reflect the large risk (in the form of greatly increased standard deviation and kurtosis, as well as negative skewness) that was lurking all along in his investment strategy. The moral of the story is simple. Investing is like the rest of life: if something seems too good to be true, it probably is too good to be true.

But back to Agarwal and Naik's paper. When they used their regression model (which included option payoffs as some of its factors) to extend their estimated hedge fund index return data series back to 1927, they made another disturbing discovery. Hedge funds' recent performance seems to be significantly better than their long-term performance. More specifically, they found that their projected average historical hedge fund returns were significantly lower, and their standard deviation higher than those estimated using just their more recent performance. Seems like another caution flag to us.

With these shortcomings in mind, we set out to explore the potential impact of using hedge funds in our model target return portfolios.

Our first step was to choose an index to use. We decided on the CSFB/Tremont Index, because it is (a) has a history dating back to 1994; (b) is relatively free of survivorship bias, and (c) is the only major index that is asset weighted. The latter factor makes it more comparable with the other returns series we use in our analysis.

Our next step was to develop inputs to use in our simulation optimization model. We began by looking at both the overall index, and a number of strategy sub-indexes, including Equity Market Neutral, Global Macro, and Event Driven. We chose the first two because our past analyses had found them to be potentially valuable additions to a portfolio, in terms of their impact not only on returns, but also on standard deviation, correlation, skewness and kurtosis (for a paper which also reaches this conclusion, see "Fund of Funds Portfolio Selection" by Davies, Kat, and Lu). We chose Event Driven because it provides a good contrast with the first two strategies.

The following table shows summary real return data covering the 1994 –2003 period.

A$	Aggregate Index	Equity Mkt. Neutral	Global Macro	Event Driven
Average Real Return	9.58%	4.78%	14.46%	8.38%
Std. Deviation	12.38%	10.04%	15.86%	9.76%
Average/Std. Dev.	0.77	0.48	0.91	0.86
Skewness	-0.06	0.50	0.11	-0.02
Kurtosis	-0.27	-0.82	-0.06	-0.86

C$	Aggregate Index	Equity Mkt. Neutral	Global Macro	Event Driven
Average Real Return	9.36%	8.57%	13.10%	9.46%
Std. Deviation	8.38%	6.02%	12.51%	6.53%
Average/Std. Dev.	1.12	1.42	1.05	1.45
Skewness	0.30	-0.21	0.01	-1.18
Kurtosis	-0.07	-0.08	0.98	3.49

Euro	Aggregate Index	Equity Mkt. Neutral	Global Macro	Event Driven
Average Real Return	8.18%	7.40%	11.89%	8.28%
Std. Deviation	13.71%	9.94%	16.79%	11.67%
Average/Std. Dev.	0.60	0.74	0.71	0.71
Skewness	0.33	0.16	0.40	-0.73
Kurtosis	0.33	-0.29	1.08	2.00

Yen	Aggregate Index	Equity Mkt. Neutral	Global Macro	Event Driven
Average Real Return	11.37%	10.56%	15.17%	11.46%
Std. Deviation	16.87%	12.25%	20.74%	14.34%
Average/Std. Dev.	0.67	0.86	0.73	0.80
Skewness	-0.46	-0.34	-0.53	-0.89
Kurtosis	2.83	1.61	4.24	2.57

UK£	Aggregate Index	Equity Mkt. Neutral	Global Macro	Event Driven
Average Real Return	7.19%	6.41%	10.86%	7.28%
Std. Deviation	11.81%	8.34%	14.94%	10.16%
Average/Std. Dev.	0.61	0.77	0.73	0.72
Skewness	0.46	0.47	0.56	-1.23
Kurtosis	1.74	1.14	1.12	6.31

US$	Aggregate Index	Equity Mkt. Neutral	Global Macro	Event Driven
Average Real Return	8.86%	8.07%	12.58%	8.95%
Std. Deviation	8.52%	3.08%	12.18%	6.04%
Average/Std. Dev.	1.04	2.62	1.03	1.48
Skewness	0.06	0.10	-0.06	-3.36
Kurtosis	1.61	0.41	1.89	22.18

These tables are interesting for a number of reasons. First, most studies done to date have used hedge fund returns in U.S. dollars (the currency in which over 80% of hedge funds report their returns). As you can see, the U.S. dollar table confirms the findings from many of these studies that, at the level of the aggregate index, hedge funds' impressive ratio of average return/standard deviation also requires the acceptance of quite a high level of kurtosis (i.e., a greater probability of experiencing extreme returns). The U.S. dollar table also show the relative attractiveness of the Equity Market Neutral strategy, and the unattractive skewness and kurtosis characteristics of the Event Driven strategy.

What is equally interesting, however, is the way exchange rate changes affect the perception of these strategies' results when they are expressed in different currencies. In general, the relationship between the Equity Market Neutral and Event Driven strategies remains the same. An exception to this, however, is the table showing real hedge fund returns expressed in Australian dollars, where the Global Macro approach comes out best.

Despite the attractiveness of Equity Market Neutral relative to the aggregate hedge fund index, we chose to use the latter in our asset allocation analysis because the only hedge fund index products available thus far are based on this measure. While we performed a sensitivity check to get a rough idea of the impact of moving away from the aggregate index, we did not, in this analysis, include Equity Market Neutral and Global Macro as separate asset classes.

In our analysis, we followed the same approach we used in last year's asset allocation review. We first used our simulation optimization model to develop optimal target return portfolios using inputs based on historical data. For hedge funds, we used returns from 1994 to 2003; for the other asset classes we used the same longer set of returns that we did last year. The correlation matrix we used, however, covers only the 1994 to 2003 period. We then repeated the process using estimated future returns as inputs. Again, we used the same future returns for our non-hedge fund asset classes as we used last year. For hedge funds, our examination of comparable historical data showed a rather close relationship between the return on the aggregate hedge fund index and the return on the Wilshire 5000 U.S. equity index, albeit with a substantially lower standard deviation. The following table shows this data:

Currency	Average Hedge Fund Index Real Return (94-03)	Average Wilshire 5000 Real Return (94-03)
A$	9.58%	8.43%
C$	9.36%	9.57%
Euro	8.18%	8.39%
Yen	11.37%	11.58%
UK£	7.19%	7.39%
US$	8.86%	9.06%

Given this historical data, we set our future hedge fund real return assumptions equal to the expected local currency real return on the Wilshire 5000 Index.

These model inputs are summarized in the following table:

US$	Hist Ret	Fut Ret	Std Dev	RB	DB	FB	CP	C	DE	FE	EE	HF
Real Bonds	2.30%	2.50%	2.50%	1.00	0.43	0.35	-0.06	0.26	-0.16	-0.13	-0.14	-0.04
Dom Bonds	3.80%	4.00%	5.40%		1.00	0.30	0.01	0.04	-0.06	-0.11	-0.16	0.16
For Bonds	9.50%	3.61%	11.20%			1.00	0.02	0.17	-0.02	0.23	-0.05	-0.18
Comm Prop	7.90%	3.70%	9.80%				1.00	0.10	0.32	0.29	0.33	0.23
Commod	8.10%	8.10%	18.30%					1.00	0.07	0.14	0.12	0.17
Dom Eq	7.30%	6.20%	16.30%						1.00	0.79	0.73	0.54
For Eq	7.00%	5.57%	17.20%							1.00	0.71	0.42
EM Eq	9.60%	7.50%	24.00%								1.00	0.52
Hedge Funds	8.86%	6.20%	8.52%									1.00

Given the relatively questionable quality of the hedge funds return data we used, we capped the maximum allowable allocation to hedge funds at twenty percent of our model portfolios. Finally, as was the case in last year's asset allocation review, our final model portfolios are a weighted combination of the optimal portfolios derived using both historically based input assumptions (67%) and those derived using forward looking assumptions (33%).

The resulting model target real return portfolios are shown in the following tables.

US$	**7% Historical**	**7% Future**	**7% Weighted**
Real Return Bonds	5%	0%	3%
Domestic Bonds	0%	0%	0%
Foreign Bonds	40%	0%	27%
Commercial Property	20%	0%	13%
Commodities	5%	20%	10%
Domestic Equity	5%	50%	20%
Foreign Equity	0%	0%	0%
Emerging Equity	10%	15%	12%
Hedge Funds	15%	15%	15%
Total	100%	100%	100%
Expected Annual Return	8.3%	6.8%	N/A
Expected Std. Deviation	6.9%	12.9%	N/A
Probability of Achieving Target	76.0%	38.0%	N/A

US$	5% Historical	5% Future	5% Weighted
Real Return Bonds	5%	5%	5%
Domestic Bonds	30%	0%	20%
Foreign Bonds	30%	5%	22%
Commercial Property	10%	0%	7%
Commodities	5%	20%	10%
Domestic Equity	5%	50%	20%
Foreign Equity	0%	0%	0%
Emerging Equity	5%	10%	7%
Hedge Funds	10%	10%	10%
Total	100%	100%	100%
Expected Annual Return	6.9%	6.4%	N/A
Expected Std. Deviation	5.3%	11.7%	N/A
Probability of Achieving Target	93.0%	62.0%	N/A

US$	3% Historical	3% Future	3% Weighted
Real Return Bonds	55%	15%	42%
Domestic Bonds	15%	20%	17%
Foreign Bonds	10%	15%	12%
Commercial Property	10%	10%	10%
Commodities	5%	10%	7%
Domestic Equity	5%	10%	7%
Foreign Equity	0%	5%	2%
Emerging Equity	0%	5%	2%
Hedge Funds	0%	10%	3%
Total	100%	100%	100%
Expected Annual Return	4.3%	4.8%	N/A
Expected Std. Deviation	3.2%	5.7%	N/A
Probability of Achieving Target	97.0%	91.0%	N/A

Finally, as another way of assessing the potential impact of adding hedge funds to our model target return portfolios, we backtested them using data from 1994 – 2003. When we were doing this, we also ran a simple sensitivity analysis to test the potential impact of using index funds tied to something other than the aggregate hedge fund index. Specifically, while we

kept our hedge fund allocations unchanged, we substituted a simple mix of 50% Equity Market Neutral Index return and 50% Global Macro Index return for the Aggregate Hedge Fund Index Return. The results were encouraging, and indicate that a superior asset allocation solution probably could be achieved by using a mix of hedge fund style indexes, rather than the aggregate index. We plan to complete a more detailed analysis of this issue later this year (by which time we hope that hedge fund style-based index product will have been introduced!).

We should also note that due to a lack of data for some countries, we had to make a couple of assumptions in the backtesting analysis. First, we used the historical returns for domestic bonds for both that asset class and for real return bonds. Second, in some cases for commercial property we used the average of monthly returns for domestic bonds and equity.

1994 –2003 Backtesting Analysis

US$	3% Real Tgt	3% Tgt w/HF	3% Tgt w/EG
Avg. Annual Return	4.96%	5.15%	5.20%
Std. Deviation	3.96%	3.96%	3.92%
Return/Std. Dev.	1.25	1.30	1.33
Skewness	0.22	0.26	0.29
Kurtosis	1.29	1.48	1.50
CAGR 94-03*	4.71%	4.92%	4.96%

***Compound Annual (geometric average) return

US$	5% Real Tgt	5% Tgt w/HF	5% Tgt w/EG
Avg. Annual Return	6.04%	6.16%	6.30%
Std. Deviation	8.09%	6.25%	6.01%
Return/Std. Dev.	0.75	0.99	1.05
Skewness	-0.65	-0.41	-0.35
Kurtosis	1.11	0.76	0.63
CAGR 94-03	5.45%	5.75%	5.92%

US$	7% Real Tgt	7% Tgt w/HF	7% Tgt w/EG
Avg. Annual Return	5.81%	6.53%	6.74%
Std. Deviation	9.03%	7.96%	7.59%
Return/Std. Dev.	0.64	0.82	0.89
Skewness	-0.67	-0.73	-0.66
Kurtosis	1.47	1.69	1.49
CAGR 94-03	5.13%	5.98%	6.24%

Looking at these results, and those for our other five currencies, made a number of points clear. First, the potential impact of hedge funds seems to depend on a portfolio's target real return. For the 3% target real return portfolios, the impact was minimal, and the impact of improved return/standard deviation was usually offset by higher kurtosis (the impact on skewness was usually minimal). The inclusion of hedge funds seemed to provide the greatest benefits to our 5% target real return portfolios, and more often than not, this did not require taking on more skewness and/or kurtosis-related risk. On the other hand, the benefits of hedge funds to our 7% target real return portfolios, while usually significant in the area of return/standard deviation, typically required a worsening of those portfolios' skewness and kurtosis. Finally, as previously noted, even a simple replacement of the aggregate hedge fund index returns with a 50/50 mix of Equity Market Neutral and Global Macro style index returns in many cases significantly reduced hedge funds' negative impacts while preserving many of their portfolio return and standard deviation benefits.

Given these results, and the increasing availability of hedge fund index products, we will include these hedge fund based model portfolios to those that we regularly track. However, we reiterate that when it comes to investing in this area, a healthy degree of skepticism and caution are still warranted. Not only is the quality of the underlying data suspect, but a larger question remains unanswered. Can it really be that almost 7,000 hedge fund managers possess either the superior information or the superior models needed to consistently deliver superior returns over a long period of time, even as more and more money is pursuing the same general investment strategy? Wouldn't this also imply the equally sudden development of an opposite class of traders who are somehow doomed to be consistent losers?

Finally, for those of you readers who have been around the block a few times, we leave you with this quote from the Wall Street Journal, which speaks volumes about the points we have tried to make (albeit more quantitatively) in this article. “A year ago, [manager’s name], a 28 year old who runs a hedge fund, was taking cheap flights on JetBlue Airways and keeping a lid on his spending. But his fund’s investment portfolio surged nearly 40% last year [less than the gain on the Russell 2000, for those of you keeping score], and he says he’s confident that the market has regained its footing. So two months ago he bought a new $160,000 Lamborghini…These days when he and his girlfriend travel between his Florida home and his New York office, he charters a catered plane with a bar, paying as much as $10,000 for the three hour flight.” That says it all…

Product and Strategy Notes

Hedge Fund Indexes Compared

With a growing number hedge fund index products being launched around the world, we thought it would be useful to compare the major “investable” indexes on which they are based. Launched in October, 2002, the Standard and Poor’s Hedge Fund Index (SPHINX) includes 40 equally weighted funds in the three major strategy areas: Arbitrage, Directional, and Event-Based, as well as the usual suspects when it comes to sub-categories. In July, 2003, Morgan Stanley Capital International, another indexing powerhouse, launched its own hedge fund index, based on 82 equally weighted funds. MSCI’s index covers the same ground as S&P’s but uses a very different set of terms to describe it. However, it also allows investors who use it to benchmark their hedge fund managers’ performance to access a more finely grained set of metrics that encompass not only an investment strategy, but also its use in different regions. In August, 2003, CSFB/Tremont, the producer of the equally weighted CSFB/Tremont Index, introduced its own “investable” hedge fund index. Unlike the offerings from S&P and MSCI, the CSFB/Tremont Index is asset weighted, and based on the returns generated by the 6 largest eligible hedge funds in each of the 10 sub-strategies it tracks.

Statistically, the S&P and MSCI Indexes have much more in common with each other than they do with the CSFB/Tremont Index, as can be seen in the following correlation table, which covers actual and simulated index returns between January, 2000 and December, 2003.

	CSFB/Tremont	*S&P HFI*	*MSCI HFI*	*US Bonds*	*US HI YLD*	*World Bonds*	*World Equity*	*U.S. Equity*
CSFB/Tremont	1.00							
S&P HFI	0.51	1.00						
MSCI HFI	0.32	0.80	1.00					
US Bonds	0.12	0.10	0.13	1.00				
US HI YLD	0.41	0.50	0.30	-0.16	1.00			
World Bonds	0.24	0.21	0.09	0.67	0.00	1.00		
World Equity	0.41	0.27	0.19	-0.24	0.54	0.05	1.00	
U.S. Equity	0.48	0.23	0.15	-0.29	0.52	-0.10	0.94	1.00

This impression is further reinforced by looking at the three indexes returns, standard deviations, skewness and kurtosis over this period.

	CSFB/Tremont	**S&P HFI**	**MSCI HFI**
Annualized Return	6.99%	9.44%	11.89%
Annualized Std. Dev.	5.71%	2.52%	3.06%
Return/Std. Dev.	1.22	3.74	3.89
Skewness	0.45	-0.03	0.15
Kurtosis	4.26	-0.38	-0.04

These tables makes an interesting point: to a sometimes considerable degree, the benefits you perceive from investing in hedge funds may be a function of the index you use to measure them. Yet another reason, in our mind, for acting cautiously when it comes to investing in this area (for more on this, see the paper “The Brave New World of Hedge Fund Indexes” by Amenc and Martellini).

The New S&P 1500 ETF

A number of readers have emailed to ask what we think about the new Exchange Traded Fund in the United States that tracks the S&P 1500 index. There are four main indexes that attempt to track the performance of the broad U.S. equity market. Each of them now has an associated exchange traded fund. The Wilshire 5000 Index includes companies that make up 100% of the market capitalization of the U.S. equity market. In 2003, its total return was 31.6%. For more information on this index, visit www.wilshire.com. VTI is the ticker for the ETF which tracks it. This fund is sponsored by Vanguard, and has an annual expense ratio of .15%.

The Russell 3000 Index includes the top 3,000 companies in the U.S. equity market, ranked by their market capitalization. Because of this approach to constructing the index, the percentage of the U.S. market's total capitalization that is covered tends to vary over time, but averages around 98%. In 2003, its total return was 31.1%. For more information on this index, visit www.russell.com. IWV is the ticker for the ETF which tracks this index. It is sponsored by Barclays Global Investors (the creator of iShares ETFs), and has an annual expense ratio of .20%.

The Dow Jones Total Market Index takes the opposite approach from Russell, and varies the number of companies so that it consistently covers 95% of the market capitalization of the U.S. equity market. In 2003, its total return was 30.8%. More information about this index is available at www.djindexes.com. IYY is the ticker for the ETF which tracks this index. It is sponsored by Barclays Global Investors (the creator of iShares ETFs), and has an annual expense ratio of .20%.

The Standard and Poor's 1500 Index includes the companies covered by the S&P 500 (large capitalization), S&P 400 (middle capitalization), and S&P 600 (small capitalization) indexes. In aggregate, these 1,500 companies account for approximately 90% of the capitalization of the U.S. equity market. There is no mechanical formula for deciding on which companies are included in these indexes; rather, they are chosen by a committee at Standard and Poor's. In 2003, its total return was 27.4%. For more information, visit www.spglobal.com. ISI is the

ticker for the new ETF which tracks this index. It is sponsored by Barclays Global Investors (the creator of iShares ETFs), and has an annual expense ratio of .20%.

In general, all of these indexes do a good job of tracking the performance of the U.S. equity market. Our preference, however, is the Dow Jones Total Market Index, because its consistent market capitalization approach tends to result over time in somewhat less volatility, while still delivering returns that are comparable with those on the more inclusive indexes. Why is this the case? If you plot the number of companies in the U.S. equity market against their respective market capitalizations, you end up with quite a steep curve. In other words, relatively few companies account for the bulk of the U.S. market's capitalization, while many of them collectively account for very little. In addition, because many of these smaller capitalization companies trade much less frequently, their bid/ask spreads tend to be wider than those on larger companies, and their prices more volatile. Hence, returns on the indexes which include a large number of these companies (i.e., the Wilshire 5000 and Russell 3000) will tend to be somewhat more volatile than returns on indexes which contain fewer of them (like the Dow Jones and S&P indexes). On the other hand, as shown by the difference between the Wilshire 5000's 31.6% 2003 return and the S&P 1500's 27.4%, in years in which small cap companies perform exceptionally well, there is a return price to be paid for this lower level of volatility. From our perspective, the best trade-off between these considerations is struck by the Dow Jones Total Market Index.

Funds That Can Be Used to Implement Our Model Portfolios' Asset Allocations

This year, in our relentless quest to become ever more user friendly, we thought it would be useful to summarize in a simple table a list of index mutual and exchange traded funds that can be used to implement our model portfolios' asset allocations. A larger list of index products, which also includes mutual funds and ETFs which can be used to take different tilts within these asset classes, is available on our website, and updated quarterly. The following table makes an important point clear: the lineup of index products that are available to U.S. dollar-based investors is still incomplete. In some cases (e.g., foreign currency bonds), we

lack both index mutual and exchange traded fund products. In others (e.g., commodities), we only lack an ETF. Hopefully, those gaps will be closed later this year.

Asset Class	Index Mutual Funds	Exchange Traded Index Funds
Real Bonds	· Vanguard Inflation Protected Securities Fund (VIPSX)	· iShares Lehman TIPS Bond Fund (TIP)
Domestic Bonds	· Vanguard Total Bond Market Fund (VBMFX)	· iShares Shearson Lehman Aggregate Bond Fund (AGG)
Foreign Bonds	· T Rowe Price International Bond Fund (RPIBX)	· None Available
Commercial Property	· Vanguard REIT Index Fund (VGSIX) · ABN AMRO Real Estate Fund (ARFCX) is a globally diversified, no load (but non-index) fund	· StreetTracks Wilshire REIT (RWR)
Commodities	· PIMCO Commodities Real Return Fund (PCRDX) (available through fund supermarket programs)	· iShares Global Energy Sector Index (IXC) · iShares Goldman Sachs Natural Resources Index Fund (IGE)
Domestic Equity	· Vanguard Total Stock Market Fund (VTSMX)	· iShares Dow Jones Total Market Index (IYY)
Foreign Equity	· Vanguard Developed Markets Index Fund (VDMIX) · Vanguard Total International Stock Market (includes Emerging Markets) (VGTSX)	· iShares MSCI EAFE Index Fund (EFA) · Total international market equals 89% EFA plus 11% EEM

Asset Class	Index Mutual Funds	Exchange Traded Index Funds
Emerging Equity	· Vanguard Emerging Markets Fund (VEIEX)	· iShares MSCI Emerging Markets Index Fund (EEM)
Hedge Funds	· Rydex SPHINX Fund (qualified investors only)	· None Available