The Index Investor

Why Pay More for Less?

Model Portfolios Performance Update

Before discussing the year-to-date performance of our model portfolios, a little perspective is in order. Let's assume that you had disregarded everything we ever wrote in these pages about the virtues of diversification across asset classes, and implementation through low cost indexing. Instead, let's assume that you had bet the ranch on "new economy" stocks. Using Dow Jones' industry definitions, here's how you would have done so far this year. If you had invested in communications technology, you'd be down (49.01%), year to date. If you had invested in biotechnology, you'd be down (30.4%). And if you'd invested in software companies, you'd be down (27.69%). As we have written, concentrating your investments in a few narrowly defined areas is certainly one way you can get rich quickly (assuming you pick the right ones). However, it is more often the case that doing this is an even better way of getting poor quickly. And over the long term, avoiding big losses is the most important factor in winning the investment game (which we define as ending up with assets that are equal to or greater than the liabilities -- like college educations, weddings, and retirement -- that you are trying to fund).

Now, on to the model portfolios. The goal of our first set of model portfolios is exceed their benchmarks' returns, while matching their risk.

Our high return portfolio is designed to match the risk of a benchmark portfolio comprised of 80% U.S. equities (represented by the Dow Jones Total Market Index ETF) and 20% U.S. bonds (represented by the Vanguard Total Bond Market Index Fund). We are also comparing our model portfolio to an 80/20 global benchmark comprised of 40% Dow Jones Total Market Index ETF, 40% Vanguard Total International Index Mutual Fund, and 20% Brinson Partners Global Bond Market Mutual Fund. Through the end of March, 2001, our model portfolio trails both of these benchmarks. While the U.S.

benchmark has a year-to-date return of (10.3%), and the global benchmark a YTD return of (11.5%) our model portfolio has delivered only (13.3%) year-to-date. The major reason for this is the weak performance of European equities relative to U.S. equities during the first quarter of the year (offset, somewhat, by the appreciation of the Euro versus the dollar), as well as an (11.3%) return on the Oppenheimer Real Assets fund, as commodity prices have weakened along with growth in the major world economies.

The story is much the same in the case of our benchmark 60% equity/40% bonds portfolio. Here, the U.S. benchmark has delivered a return of (6.9%) through March, while the global benchmark delivered (9.6%) and the model portfolio delivered (10.2%).

A semi-bright spot is our low risk portfolio, which aims to deliver better returns than its benchmark 20% equity/80% bonds portfolio, while taking on the same amount of risk. In this case the U.S. benchmark returned (.2%) through the quarter, while the global benchmark was off (5.7%) and our model portfolio delivered (3.0%), using an unhedged international bond fund (RPIBX or FGBDX, the latter of which apparently didn't do much currency hedging this quarter) or (1.5%) if a hedged international bond fund (PFODX) was used. In this regard, it is very interesting to note the impact of currency hedging (or the lack thereof) in our international (non-U.S.) bond funds. As we have written before, T.Rowe Price (RPIBX) states in its prospectus that it doesn't hedge its exchange rate exposure to its investment in non-dollar bonds. Fidelity (FGBDX) says it does this from time to time, while PIMCO (PFODX) comes out and says that it very actively hedges its currency risk exposure. During the first quarter, the J.P. Morgan (un-hedged) non-U.S. bond index delivered a return (in U.S. dollars) of (4.84%); in fact, all of our recommended funds delivered a better performance than this. However, the quarter also saw a rather remarkable rise in the value of the U.S. dollar versus many other currencies (see the discussion in the section below on our Active Portfolio). Whether by correctly anticipating this move, or simply being on the "right side" of an automatic hedge, PIMCO was able to leverage this to deliver returns roughly 6% above those earned by T. Rowe and Fidelity.

The goal of our second set of model portfolios is to match their benchmarks' returns while delivering significantly lower risk. In the case of 80% equity/20% bonds benchmark, and our model portfolio delivered returns of (13.6%) through March. In the case of the 60% equity and 40% bonds benchmark, our model portfolio returned (8.3%) through the first quarter. Finally, for 20% equity/80% bonds benchmark, our model portfolio delivered between (3.2%) and (1.6%) through March, depending on whether one chose to use unhedged or hedged international bonds in it.

Our set of target return portfolios are based on a different approach from our first two sets of model portfolios. They assume that an investor has a clear idea of the minimum required rate of return he or she must earn over some time horizon in order to fund his or her future liabilities. For this investor, the key question is not how to beat a benchmark, but rather how to maximize the chances of achieving (on a compound basis) at least their target rate of return while taking on as little risk as possible. Mathematically, our hypothetical investor is trying to maximize the value of the following equation: (Return on Portfolio less Target Return) divided by the Standard Deviation of the Portfolio Return.

In this case, we have constructed four model portfolios, based on long term target rates of return of 12%, 10%, 8% and 6%. Through the first quarter of 2001, these portfolios have returned, respectively, (13.3%), (13.6%), (9.3%), and (5.3%).

Update on Our Active Management Experiment

This year we have constructed our own "actively managed" portfolio, whose weightings we have the option of changing in March, June, and September. We thought it would be fun to see the returns we could earn through active management. Our benchmark is the Vanguard Global Asset Allocation Fund (VHAAX), which is another actively managed fund that aims to earn superior returns through timely shifts of assets between major global asset classes.

As committed indexers, we don't believe we will do too well relative to our model portfolios (see above), perhaps not in the short term, and certainly not over longer periods. Nevertheless, we thought it would be interesting to give it a try. Through the end of March, this portfolio had generated returns of (7.5%), versus (5.0%) for VHAAX.

Our initial portfolio asset class weightings were based on two key assumptions: first, that the U.S. economy would slow down, and that Europe's would not. This in turn would cause U.S. interest rates to fall (and bond returns to rise), and the U.S. dollar exchange rate to decline relative to the Euro (which would boost the returns on European equities and international bonds positions). To some extent, our views were right on target. The U.S. economy has slowed, U.S. interest rates have fallen relative to European ones, and bond prices have risen. And in its most recent release, the European Central Bank stated that it still thought that real European economic growth this year would be on the order of 2.5%. In spite of this, however, European equity markets have been falling, and the U.S. dollar has generally risen rather declined. What's going on?

Broadly speaking, it would appear that there are two differing points of view about where the world economy is headed.

In one camp, we have people who apparently (to simplify their views) believe that the popping of the technology bubble has brought U.S. equity market valuations down to attractive levels, and that further cuts in U.S. interest rates (and/or a short term tax cut that is considerably different from President Bush's current proposal) will lead to faster economic growth and improved company earnings in the second half of this year. Moreover, some proponents of this view also point out that the European Central Bank has cut rates too slowly in light of increasing evidence that the U.S. slowdown has spread to that continent. Consequently, the upside in European equities is more limited than had been thought. Finally, the Japanese Central Bank is increasing the rate of monetary growth in a bid to spur inflation and consumer spending (dragging Japan out of the liquidity trap into which its economy has fallen). At the same time, its government is cutting back deficit spending, as debt/GDP has risen to quite high levels as the result of

multiple failed attempts to use government spending to propel that economy out of its lingering semi-depression. Assuming that Japanese private sector savings do not fall very much from their current high levels, this may well lead to an outflow of savings from Japan and into Europe and the U.S, where they will they will boost demand for equities. In short, this scenario looks a lot like the short sharp recession and recovery we experienced in 1998.

In the other camp we find people who think what we're in for is something longer and nastier. They believe that cuts in the interest rate won't increase either consumer or investment spending in the U.S. economy. First, consumer savings are well below long term averages, which is probably due to the substantial gains people have experienced on their equity market investments. Take away the latter, and people are going to start saving more in order to rebuild their balance sheets. The resulting reduction in consumer spending will further depress business investment, which is already being held down by the need in many sectors to work off the excess capacity that was built up over the past few years, and reduced access to debt financing, as perceived credit risk and the cost of borrowing has increased. Some of these people go on to make a larger point, which is that for the past twenty years or so (since the start of the great bull market in 1982), increases in equity valuations have largely been driven by falling inflation and interest rates, increases in corporate borrowing, and gains in corporate efficiency (e.g., due to cost cutting and increased use of information technology). To this we would also add the impact of trend following (or momentum) investors on overall equity market valuations, which, as we have seen, has now reversed, thought not enough to lower overall market price/earnings ratios to an attractive level in historical terms. In a nutshell, most of the low hanging fruit that drove equity valuations upward has been picked; the task of growing equity values by growing corporate revenues is much, much harder, and investors haven't completely absorbed this yet. In this environment, continued rate cuts without any improvement in consumer spending, corporate earnings, or equity valuations will eventually trigger a run on the dollar, with Europe the most logical beneficiary.

The beauty and the horror of active management is that you can't simply say that these are interesting points of view. You are compelled to act on them through the allocation of your portfolio between different asset classes. So here we go.

On balance, the more pessimistic scenario still seems the more likely to us (though we dearly hope the former comes to pass). As such, here is our asset allocation for the next three months:

- Vanguard Total Bond Market (VBMFX): 45%
- TRP International Bond Fund (RPIBX): 25%
- Vanguard Europe (VEURX): 25%
- Vanguard Pacific (VPACX): 5%

Products and Strategies: Three Short Topics

A number of readers have sent us questions about three topics we think many people may be interested in learning more about. Here they are:

What is Free Float Indexing?

The free float is that percentage of a company's shares that are potentially available for purchase by investors. For example, if a company had 100 shares in total, 20 of which were owned by its managers, 10 by an affiliated company, and 70 by unaffiliated individuals and institutions, its free float would equal 70 times its market price, while its market capitalization would equal 100 times its market price. A key issue in the indexing world has, until recently, been whether an index should be based on companies' "full market capitalization" or their free float. With Morgan Stanley Capital International's announcement that, over the next year, it will be moving to free float calculations, the battle is over, as MSCI was the last holdout. Other index providers, such as Dow Jones, FTSE and Salomon Smith Barney, had already moved to this approach. As part of its move to free float weighting, MSCI will also be expanding the percentage of a market covered by its index, from 60% to 85%, which will bring it more into line with the FTSE

indexes. Some people have also wondered about whether or not this move will distort the underlying indexes. To some extent, it will; however we don't anticipate that the distortions will be so large as to change any of our conclusions with respect to the asset allocations used in our model portfolios.

What is a Hedge Fund?

The short answer is that a hedge fund is something particularly obnoxious people brag about at parties you attend. But let's move on to a more technical description. The term "hedge fund" generally refers to a pooled investment that has some or all of the following characteristics: (1) It is organized as either a limited partnership or limited liability company; (2) has no more than 100 owners, who must have sufficient liquid assets to qualify as sophisticated investors; (3) is managed by people who charge fees based on both assets under management -- e.g., 2% -- and a percentage -- usually 20% -- of the fund's profits; (4) employs leverage, via the use of debt or derivatives, to increase the returns earned by its equity investors; and (5) to preserve its exemption from S.E.C. regulation and reporting requirement, does not advertise or raise funds via public offerings.

Hedge funds have been around for a long time; the first one was established in 1949. By 1968, an SEC survey identified 140 hedge funds; by 1998 this had grown to between 2,500 and 3,500, with as much as $300 billion in capital and between $800 million and $1 trillion in assets under management (the difference being funded with debt). By way of comparison, in 1998 mutual funds had assets of about $5 trillion, while private and public pension funds had assets of about $6 trillion.

So how do hedge funds generate their profits? Different funds do it in different ways. One characterization broke down trading approaches into these categories: (1) market timing strategies that take positions in different asset classes based on their forecasts of future relative returns; (2) relative value strategies that speculate on favorable changes between the prices of different assets -- e.g., that U.S. high yield bonds will rise in price

as the difference between their yields and those on U.S. Treasuries come back into their historical trading range; (3) event-driven strategies that invest in distressed securities based on extensive research and expectations as to their future performance; (4) good old fashioned stock picking, supercharged with leverage and the ability -- which mutual funds lack -- to sell short.

How well do they do? Why do people invest in them? Now we get to the crux of the matter. Because of they don't want to run afoul of SEC regulations, getting accurate performance data on hedge funds is no easy task. This has led to quite a bit of controversy over just how well hedge funds perform versus other investments. In a nutshell, a lot of the controversy revolves around the extent to which hedge funds hold illiquid securities (that is, securities which trade), and, when they do, the accuracy with which they are priced. Some studies have found that illiquid securities holdings are low, that hedge funds' returns, on average, are high, along with their risk, and that on balance the managers add considerable value. Support for this view also comes from the now well established phenomenon of successful active mutual fund managers leaving to run hedge funds where they can earn much more money (another argument in favor of indexing, when you think about it). However, other studies have found that hedge funds' returns, on average, trail many indexes when illiquid securities are valued more accurately. Whatever the case with average returns, most commentators agree that the dispersion of hedge fund returns (that is, their standard deviation around a mean) is much wider than it is for mutual funds; that their use of leverage makes them much more risky than mutual funds (does the name Long Term Capital Management ring any bells?); and that their returns tend to have low correlations with other asset classes, and between hedge funds themselves.

Should someone add to a portfolio if they meet the investment requirements? There is no obvious response to this question, as so much of the answer depends upon the manager, holdings, and historical performance of the specific hedge fund in question. However, this much can be said with confidence: where people have invested, hedge funds generally account for no more than 5% to 10% of their portfolios. At best, they are an

asset class worth investing in; at worst, they are nothing more than a leveraged bet on an asset class that is already in the portfolio. What they most certainly are not is the magical silver bullet that they are often described as in hushed cocktail party conversations.

Does Indexing Work in Bear Markets?

The recent downturn in many markets seems to have given some commentators the idea that now is a great time to attack index funds, and indexing in general. Having reviewed many of the articles in question, we have identified two major themes that we would like to address (the articles themselves being notable for their lack of a defense case).

The first argument is that because index funds are, by definition, fully invested all the time, active managers can outperform them in bear markets because they have the ability to hold back and keep a percentage of their assets in cash. This is nothing more or less than the traditional argument that active managers use market timing to outperform indexes. Over the medium term, the great weight of evidence suggests that this assertion is false. In the short term, however, there is no doubt that there are some periods in which it may be true (e.g., "even my grandmother knows tech stocks are going to fall further this quarter…"). On the other hand, commentators may put too much weight on the latter cases. Consider as an example of what has happened this year: through March 30th, there have been 27 trading days on which the change in the value of the S&P 500 Index has been equal to or greater than 1%; 16 of these have been negative, *but 11 of them have been positive.* If the market timers out there were so skilled, we'd be reading a lot of stories about how they've blown the doors of the index. I don't know about you, but we're still searching for these stories…

The second argument is, in our opinion, potentially more valid. While different commentators put it differently, essentially the argument is twofold. First, on a secular or structural basis, there is an argument that globalization has resulted in closer integration of different equity markets, and has consequently increased the correlations between their returns, and therefore reduced the risk reduction benefits from investing in

a range of asset classes. Second, on a cyclical basis, it is argued that correlations are lower when markets are rising, but rise when markets are falling. Let's start with the last argument. As we have written in previous newsletters, the way investors make use of information (along with increased interlinkages through derivative instruments) provides a theoretical basis for the rise in correlations that is claimed to occur when markets decline. But how much of this do we see in practice?

Let's look at one example: a comparison of correlations between January, 1988 and June, 1999 with those between July, 1999 and December, 2000. How much increase did we see when markets turned down? During the first period, the correlation between the Russell 3000 and the MSCI Europe Index was .61; during the more recent period it rose to .67. For the Russell 3000/MSCI Pacific relationship, the increase was more significant, from .37 to .63. For the Russell 3000 and the MSCI Emerging Markets Index, the change in correlation was from .53 to .71. So one thing we can say is that there is definitely some evidence of the phenomenon in question between equity markets, but, having said that, we need also point out that the correlations didn't go to 1.0; there was still some benefit from diversifying.

The story elsewhere, however, is a bit different. Between 1/88 and 6/00, the correlation of returns between the Russell 3000 and the Lehman Brothers Aggregate Bond Market Index was .41; during the 6/00 to 12/00 period it dropped to .14. During the first period, the correlation between the Russell 3000 and the Salmon Brothers Non-U.S. Government Bond Index was .02; for the latter period it was .12. And for the first period, the correlation between the Russell 3000 and the Goldman Sachs Commodity Index was (.08); during the second period, it "rose" to (.06). In short, in these markets while there was certainly directional evidence of increased correlation, the magnitude of the changes were so small as to leave the potential benefits from diversification essentially unchanged.

The secular/structural argument for increased correlations is potentially the strongest of the bunch. As a recent study from the IMF ("The New Economy and Global Stock

Returns", Working Paper #216), covered 5,500 firms in 21 developed and 19 emerging countries during the period between March, 1986 and August, 2000. It showed that the global industry sector to which a company belonged now accounts for as much as 28 percent in the variation in its stock price, up from 11% during the early years of the study. From our perspective, this is the strongest evidence presented in any of the arguments we have reviewed, and it is one we shall explore more in depth in an upcoming article on the use of sector funds. On the other hand, this evidence does not lead one to the conclusion that indexing doesn't work in bear markets. All it really says is that, given increasing globalization, there may be a good argument to be made in favor of optimizing equity allocation across global industries, rather than across different geographic regions. In sum, we don't believe that a good case has been made that indexing doesn't work in bear markets. Indexing is a long term strategy whose benefits compound the longer it is applied.

Asset Allocation: A Primer

At the beginning of March, the U.K. Treasury published the results of an extensive study it has undertaken into institutional investment in the U.K. We would highly recommend reading it, as it offers a particularly lucid overview of the investment management industry in general. From our perspective, one of its most interesting findings was that "asset allocation -- the selection of which markets, as opposed to which individual stocks, to invest in -- is an under-resourced activity. This is especially unfortunate given the weight of academic evidence suggesting that [asset allocation] decisions can be the critical determinant of investment performance." It went on to recommend that "the attention devoted to asset allocation decisions [by fund trustees] should fully reflect the contribution they can make to achieving the fund's investment objective."

Smart asset allocation lies at the heart of what The Index Investor's mission. With that in mind, we'd like to respond to a number of subscriber requests for a short asset allocation primer. Here it is:

What is Asset Allocation?

How you choose to allocate your investments between different types of assets (that is, between "asset classes") is the most important decision you make when it comes to determining whether or not over time you will earn the minimum rate of return you need to meet your goals. Unfortunately, this "asset allocation" decision is one that most people don't spend nearly enough time thinking about before they make it.

Given this, let's start with the basics. First, what is an asset class? To some extent, this is a theological question, on which experts can argue for hours without reaching agreement. For example, you may hear some people define "mid-cap U.S. value stocks" as an asset class, while someone else calls "European stocks" or "U.S. government bonds" an asset class. The basic concept of an asset class is relatively straightforward. An "asset class" is a group of securities of some type (bonds or stocks) that have more in common with each other than they do with securities from outside the group. The rate of return on an asset class is measured by an index. So far, so good. But how and where does one draw the lines? What does "have more in common with each other" mean?

Here is how we've approached this question at The Index Investor. The basic purpose of dividing securities into asset classes is so that they (the asset classes) can be combined into portfolios that are "optimal." In this case, optimal means that there is not another combination of asset classes that generates a higher ratio of return to risk (for those of you who are familiar with modern portfolio theory, we're talking about the efficient frontier).

When you are calculating the expected return and risk of different portfolios (that is, different combination of asset classes whose weights sum to 100%), return is pretty easy to calculate: it is simply the weighted average of the expected returns of the different asset classes included in the portfolio.

Calculating risk, however, isn't as easy. Why? Because the riskiness of an asset class depends not only on how variable its returns are relative to their historical average (that is, their standard deviation), but also on the extent and direction in which the asset class's returns vary with those of other asset classes (that is, its correlation). For example, an asset class with a relatively low rate of return might be a very good one to hold in a portfolio if those returns tended to go up when other asset classes' returns went down.

This brings us to the crux of the argument about what constitutes an asset class: the real question (in our eyes, at least), is where you draw the line on maximum correlation of returns you will accept between two "asset classes." Consider the following correlations (of monthly returns from January, 1988 through December, 2000). Between the Russell 3000 (an index that measures the performance of the broad U.S. equity market) and the S&P 500, the correlation of returns was .99; with the S&P 400 (a mid-cap index) it was .92, and with the Russell 2000 (a small cap index) it was .78. However, the Russell 3000's correlation with the Lehman Brothers Aggregate Bond Index (a broad measure of returns in the U.S. bond market) was only .38; with the MSCI Europe Index (which measures returns on European equities), it was .61, and with the MSCI Emerging Markets Index (emerging market equities) it was .55.

By now you can see where we're going with this. Given that the real power of diversifying your portfolio across asset classes comes from reducing risk as much as it does increasing returns, at The Index Investor we think it makes sense to define asset classes broadly enough so that their returns have a relatively low degree of correlation with each other. So for our purposes, European, Emerging Markets, and U.S. Equities (represented by the Russell 3000) are asset classes, while the S&P 500 or the Russell 2000/Value are not. Rather than being asset classes in themselves, the latter two represent, respectively, size-based and value-based "tilts" within the U.S. Equity asset class which, depending on your point of view, may or may not be worth making in pursuit of a better return versus risk tradeoff.

Is Asset Allocation Important?

One of the most important lessons about asset allocation is that, assuming you define your asset classes correctly, investing in more of them often increases your expected returns while asking you to take on no more risk than you would with a mix that uses fewer classes.

Here's an example. Assume that for the period between January, 1988 and December, 2000, you had invested 60% of your portfolio in a broad U.S. equity index fund (for which we'll use the Russell 3000 Index as a good proxy), and 40% in a broad U.S. bond index fund (for which we'll use the Lehman Brothers Aggregate Bond Index). Your portfolio would have earned an average annual return of 13.83% per year, with a standard deviation of 9.99% (standard deviation measures the dispersion of returns around the mean, and is often used as a measure of risk).

By adding three additional asset classes to this mix (international equities, non-U.S. bonds, and commodities), you could have raised your average return to 14.57%, while taking on no more risk (that is, while keeping standard deviation at 9.99%).

By breaking down international equities into three different asset classes (European equities, Pacific equities, and Emerging Market equities), and by adding high yield U.S. bonds, you could have raised your average annual return to 14.64 %, while still taking on no more risk.

Finally, by making it possible to take size tilts within U.S. equities (by substituting the S&P 500 large cap, 400 mid cap, and 600 small cap indexes for the Russell 3000), and maturity tilts within U.S. Bonds (dividing them into short, intermediate, and long maturity indexes to replace the Lehman Brothers Aggregate), you could have raised your average annual return to 15.23% per year, again while holding standard deviation (risk) constant at 9.99%.

Does this matter? Over time it sure does. Over a ten year holding period, the expected value of the 15.23% return portfolio is 12% higher than the 2 class, 13.83% return portfolio. And after twenty-five years, the difference in expected values grows to 35%. Can you actually achieve this kind of performance improvement in practice? All we can say is that if you implement your asset allocation strategy by using no-load index funds that have very low expense charges, you can come very close to improvements of this magnitude. And sometimes, you can even do much better. For example, last year our model U.S. dollar portfolio outperformed its benchmark of 80% equities and 20% bonds by over 500 basis points (5%).

How Do You Do It?

The quantitative approach to asset allocation is part science and part art. Let's look at the science first.

Technically, asset allocation is about optimization – that is, the science of how to make the best decision when you are confronted with a range of possible choices.In the case of investments, the range of choices is clear. The challenge is to make the best decision.

The first step in the science side of the process is to define what you mean by the "best" decision. Most of the theory that underlies asset allocation assumes that this refers to the identification of a portfolio (that is, the weights one gives to different assets) that is expected to produce the highest possible return for a given level of expected risk, or, the lowest level of expected risk for a given level of expected return.The expected return of a portfolio is simply the sum of the expected return for each asset times its weight in the portfolio. The expected risk of a portfolio presents a bit more of a challenge. First of all, there is the basic question of what we mean by risk. The theory that underlies most of the asset allocation literature defines risk as the standard deviation of an asset's returns, which measures how tightly they cluster around the asset's average return. An asset with a high standard deviation is deemed to be more risky, because its annual returns tend to

be widely distributed around their average, while one with a low standard deviation is deemed to be less risky. Things get a bit more complicated when you calculate the expected standard deviation of a portfolio's returns. Without going into the math, the key issue here is that a portfolio's standard deviation is a function not only of the weighted standard deviations of its underlying assets, but also of the extent to which those assets' returns are related to each other. All other things being equal, if the assets' returns have a low degree of correlation with each other, the portfolio will have less risk.In its simplest form, quantitative asset allocation involves building an optimization model (or using a readily available piece of software like Excel's solver function), inputting expected returns, standard deviations, and correlations for the potential assets in the portfolio, and specifying the goal of the optimization process: for example, maximizing the portfolio's return subject to it having an expected standard deviation of no more than 12 percent (this is termed "setting a constraint" on the optimization). The output of this model is a set of weights for the different assets that, together, sum to 100%, along with an expected return and standard deviation for the portfolio. When this process is repeated for different risk constraints (e.g., standard deviations of 6%, 8%, 10%, etc.), the line graph of the resulting portfolios' expected returns against their expected levels of risk is termed "the efficient frontier", because it describes the set of portfolio combinations that are optimal for the set of assets you have specified. To repeat: these portfolios are termed "optimal" because no other combination of asset weights can produce a higher level of expected return and still stay within the risk constrains you have specified.

So far, so good. The science seems straightforward enough. So what's with the art?

The artistic side of asset allocation comes into play because, as is so often the case in life, the apparent science isn't quite as precise as it first appears. Let's start by reviewing the main criticisms that have been raised about the use of quantitative optimization models to determine asset allocations within a portfolio.

The biggest criticisms revolve around the nature of the expected returns, standard deviations, and correlations that are used as inputs into the optimization model. To begin

with, where do they come from? General practice is to use historical standard deviations and correlations. One question here is the extent to which the past will be a good guide to the future. If, for example, the conditions that gave rise to a particular asset's returns in the past do not hold in the future, then an asset allocation based on the historical data will, when viewed in hindsight, turn out to have been sub-optimal (one thinks, for example, about an asset allocation done when Japan was at the height of its bubble economy in the late eighties). What, however, is the alternative to using historical data? For standard deviations and correlations, the general answer seems to be that there aren't any alternatives that are viable. In the case of returns, however, some users of asset allocation models have taken various approaches to develop "forward looking" estimates of future returns for different assets. Unfortunately, in one way or another, all of these approaches rely on some type of historical information, and are thus subject to the same criticism.

Here's an example. One approach to developing estimates of future returns is to start with a basic building block – say the rate on short term U.S. government bonds. To this basic "risk free" rate, one can then add additional amounts to reflect the incremental riskiness of different types of assets – say, add 1.5% to reflect the additional risk of holding long term instead of short term government bonds, or add 7% to reflect the incremental risk of holding U.S. equities (as an asset class). But where did 1.5% and 7% come from? From history. As you can see, the criticism that the assumptions used in asset allocation models are based on historical relationships that may not hold in the future pretty quickly bogs down. Either you're going to rely on history and admit it, or you're going to rely on someone else's judgment, which, absent either divine intervention, tarot cards, or other such means will itself also be based on history.

A second criticism, that is closely related to the first is that financial markets have recently become more irrational (due, perhaps, to the greater number of individuals owning shares), which has invalidated the assumptions that underlie asset allocation models. Because this argument is often raised by active investment managers, it is well to look carefully at its different parts, and to test its implications. Let's start with the

evidence. How could you tell if financial markets had "become more irrational"? One way would be to look at changes in standard deviations over time for different asset classes. Presumably, if markets were indeed becoming more irrational, this would be reflected in sharper price swings, and higher standard deviations of returns. Unfortunately, this is not what one observes in the data. We divided the historical data into three periods, 1971-1980, 1981-1990, and 1991-2000, and looked at the standard deviations for the Russell 3000 Index (a broad U.S. equity market index) and the Lehman Brothers Aggregate Bond Index (a broad U.S. bond market index). The values for the former were 22.13%, 19.01%, and 15.69%. The values for the latter were 8.45%, 7.97%, and 4.02%. Not exactly the signs of an increasingly irrational market.

However, let's assume that this premise is true, and markets have in fact become more irrational over time. Does this argue for or against increased use of active investment managers (leaving the fee and tax questions aside for a moment). If markets are indeed more irrational, the superior information and/or superior models claimed by active investment managers should be less useful, because they assume rationality on the part of other investors. If this isn't the case, then they should deliver lower than expected returns. An exception might be models based on human psychology. However, if these were in widespread use, then one would expect to see a lot of active managers using them and delivering returns that are consistently above the indexes, even after taking fees and taxes into account. However, as we all know, this hasn't been the case. In sum, the criticism that increased market irrationality has invalidated quantitative asset allocation doesn't seem to hold water.

A third, and more valid criticism of quantitative asset allocation models is that their assumptions about asset returns, standard deviations, and correlations are all subject to measurement error. This is undoubtedly true, as it is for most other measurement techniques, particularly those used to capture economic or social phenomenon. The reason this is important is that, if the assets being used are quite similar (that is, they have roughly equal levels of expected return and risk, and are highly correlated), then even a

slight measurement error could result in an asset allocation that, in hindsight, will turn out to be sub-optimal.

This criticism is closely related to a fourth one, which is that, where the returns and risks of the assets used are very similar, and highly correlated, the solutions produced by an optimization model will be highly unstable – that is, a small change in one variable, say expected return, will produce a very different asset allocation recommendation.

At The Index Investor, we have taken a two step approach to these valid criticisms of quantitative asset allocation modeling. First, in developing our model portfolios we use asset classes that are defined sufficiently broadly that they have correlations with each other that are generally lower than .60. Mathematically, this makes our model solutions much more stable, in the sense that a change in expected return or risk is not likely to result in a significant change in our recommended asset weightings. In our view, this offsets most of the impact of potential measurement errors.

Just to be sure, however, we also take a second step, and place further constraints on the maximum weight that the optimization model may give to any asset class in our recommended portfolios. This also offsets another criticism of quantitative asset allocation models – that they sometimes produce "solutions" that are impractical, such as placing 70% of one's portfolio in emerging markets equities.

A fifth criticism of quantitative asset allocation models is that standard deviation is a poor measure of risk. More specifically, for while standard deviation is based on returns that are both above and below the average return, most investors are far more concerned with falling short of their goals than they are of exceeding them. In other words, this argument says most investors focus on "shortfall risk." We believe that this criticism is valid. For that reason, at The Index Investor one set of our model portfolios is based on target return levels, whose goal is to maximize the probability of achieving a given return over a given period while taking on as little risk as possible.

As a result of our approach, our asset allocation models typically produce recommended portfolios that are both stable and in line with most investors' common sense guidelines. Will they perfectly stand the test of time? Almost certainly not – in ten years, hindsight will undoubtedly show us where our portfolios could have been improved. But this isn't the question to ask. The real issue is whether or not there is a better way to decide on an asset allocation strategy. We don't think there is. Like democracy, the approach we have chosen to take is undoubtedly subject to criticism, some of which is quite valid. But in comparison with the alternatives, it is still the best way to go.