

The Index Investor

Why Pay More for Less?

Products and Strategies: New Benchmarks and Portfolios for 2001

This year, we are adding to the benchmarks we use to evaluate the performance of our model portfolios. Specifically, we are adding benchmarks that reflect our inclusion of non-U.S. equities and bonds in these portfolios.

Our new benchmark indexes are, on the equity side, the Morgan Stanley Capital International All Country World Index, and on the bond side, the Salomon Smith Barney World Government 1+ Year Maturity Bond Index. The former is a market capitalization based index that includes all the countries covered by the MSCI indexes. By region, the breakdown of this index is roughly as follows: 50% United States, 25% Europe, 15% Pacific (Japan, Australia, New Zealand, Hong Kong, and Singapore), and 10% Emerging Markets.

The Salomon index includes bonds issued by 19 major countries. By region, the breakdown of this index is roughly as follows: United States, 28%, Euro Area Countries, 35%, Japan, 27%, United Kingdom, 6%, All Others, 4%.

To implement these indexes, we recommend the use of the Dow Jones Total U.S. Market Index Exchange Traded Fund (ticker = IYY), the Vanguard Total International Fund (VGTSX), and the Brinson Global Bond fund (BPG BX). The latter very closely tracks our target index, and is normally available only to institutions; however, retail investors can invest in it via Schwab's OneSource funds supermarket.

Each month, in addition to our U.S. benchmarks, we will also report the year-to-date performance 80/20, 60/40, and 20/80 mixes of our global equity and global bond funds.

This brings us to our model portfolios. A number of readers have given us feedback on our model portfolios for 2001. Specifically, they requested that in addition to portfolios that attempt to match benchmark returns while taking on less risk, we also include model portfolios whose goal is to deliver greater than benchmark returns while taking on the same amount of risk. In short, different people have different approaches to the risk return trade-off, and our model portfolios should reflect this. We agree. We have constructed these portfolios using the same possible asset classes and investment constraints we used to develop our other portfolios (no more than 50% of the portfolio in any asset class, except for emerging markets and real assets, which are limited to 10% and 15% respectively). The additional model portfolios have been included in this letter, and will be a regular part of our performance update section.

Finally, a follow up from last month. As you recall, up to now, the fund we have used to implement our non-U.S. bonds asset class recommendation has been the T. Rowe Price

International Bond Fund (ticker RPIBX). However, given the performance of this fund relative to some similar funds (notably the Fidelity International Bond Fund -- FGBDX and the PIMCO Foreign Bond Fund -- PFODX), a number of readers have asked why we haven't recommended a switch. Last month, we reviewed the arguments for and against making a switch away from the RPIBX. Most recently, we compared these funds respective correlations with the index we are trying to track, the Salomon Brothers Non-U.S. 1+ Year Maturity Government Bond Fund. In this case, the RPIBX substantially outperforms its two competitors, with its .99 correlation with the index over the past three years (.96 over five years), compared to .88 for FGBDX (.50 over five years) and (.57) for PFODX.

Performance Update

The goal of our first set of model portfolios is to match their benchmarks' returns while taking on significantly less risk. Our high return portfolio is designed to match the returns earned by 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. At the end of the first month of 2001, our model portfolio trails both of these benchmarks. While the U.S. benchmark has a year-to-date return of 3.5%, and the global benchmark a YTD return of 2.0%, our model portfolio has delivered only 1.7% YTD. The major reason for this is the weak performance of European equities relative to U.S. equities during the first month of the year, as well as a negative 6.2% return on the Oppenheimer Real Assets fund. On the other hand, Emerging Markets delivered an outstanding 11.8% return for the month. Bottom line: the year is young, and we'll wait and see how things shape up.

The story is somewhat similar in the case of our benchmark 60% equity/40% bonds portfolio. Here, the U.S. benchmark delivered a return of 3.1% in January, while the global benchmark delivered 1.5% and the model portfolio delivered 1.6%.

The same story held true for our benchmark 20% equity/80% bonds portfolio. In this case the U.S. benchmark returned 2.2% for the month, while the global benchmark managed just .5% and our model portfolio delivered 1.0% (using an unhedged international bond fund) or 1.3% if a hedged international bond fund was used.

The goal of our second set of model portfolios is to match their benchmarks' risk while delivering significantly higher returns. In the case of 80% equity/20% bonds, the U.S. benchmark portfolio delivered a return of 3.5% for January, while the global benchmark delivered 2.0% and our model portfolio delivered 2.3%.

In the case of 60% equity and 40% bonds, the U.S. benchmark delivered 3.1% for January, while the global benchmark delivered 1.5% and our model portfolio returned 1.4%. Finally, for 20% equity/80% bonds, the U.S. benchmark delivered 2.2%, the global benchmark delivered .5%, and our model portfolio delivered between 1.2% and 1.6%, 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. Unlike the latter, our target return portfolios 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 how to maximize the chances of achieving (on a compound basis) at least this 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%. For the first month of 2001, these portfolios returned, respectively, 2.3%, 1.7%, 1.5%, and 1.2%.

Finally, 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. As committed indexers, we don't believe we will do too well relative to our model portfolios, perhaps not in the short term, and certainly not over longer periods. Nevertheless, we thought it would be interesting to give it a try. Our initial portfolio 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). So far, we've been right on the direction, but not on the magnitude; in January, at least, the U.S. equity market delivered relatively stronger returns than we had expected. But such is the life of an active manager...you can't guess right all the time. Stay tuned!

Special Topic: How Monte Carlo Simulation Can Help You Make Better Asset Allocation Decisions

In recent months, a new term has begun to enter discussions of financial planning: "Monte Carlo Simulation." In this section, we'll briefly review what it is, discuss how it is used, and summarize its strengths and weaknesses.

Today, when someone uses the term "financial planning model", many people think of a spreadsheet model. Your basic spreadsheet is called a "deterministic" model because it

accepts just one value for every assumption variable, and, as a result, produces just one result for its forecast variables. For example, if I invest \$1,000 for one year and earn 10% on it, I will receive \$1,100.

In contrast, a "Monte Carlo Simulation" model is called a "probabilistic" model because it allows you to specify a range of potential values for each assumption, along with the extent to which these values are related to each other (that is, their correlations). As a result, the model generates a range of potential outcomes (along with their respective probabilities) for your forecast variables. To return to our example, let's I invest between \$750 and \$1,000 at a return of between 8% and 12% for 1 to 2 years. To simplify, let's assume that all values within these ranges are equally probable. A Monte Carlo simulation model would work as follows. First it would choose a value for each of the assumptions from within the range I have specified. Next it would calculate the amount of money I would receive. Then it would repeat the process. As the model conducted more "trials" (each trial being one repeat of the process), it would build up a distribution of potential amounts that I could receive. Using this distribution, it would calculate the probability of my receiving different amounts. In the example we have used, the mean (or 50% likely outcome) is for me to receive \$1,010.75. The standard deviation of the range of potential outcomes is \$88.22. Given this, the probability that I will receive at least \$1,000 is 53%.

By now, you are undoubtedly thinking about the applications to more sophisticated financial planning problems. Let's take a look at one of those now.

As we've said time and time again, for most people, financial planning comes down to one question: what are the chances that I'm going to be able to meet my goals? Unfortunately, traditional financial planning models are deterministic, and don't do a good job of answering this question. We believe this is one of the main reasons so few people do much in the way of planning for their financial future. Consider the case of retirement planning.

Let's say that today you have saved \$200,000 for your retirement, and when you do retire you want to have an annual pre-tax income (in current dollars) of \$100,000 (for simplicity's sake, we'll assume that all of this has to come from your savings). Finally, you know that you want to generate this income from capital (which you can leave to your children) rather than purchasing an annuity. This much you know for certain. About everything else, however, you're not so sure. When are you going to retire? Let's say anywhere from 20 to 25 years from now. What will inflation average between now and when you retire? Let's assume between 2 to 4 percent per year. How much more can you add to your retirement savings? And for how long? Let's assume between \$10,000 and \$15,000 per year, for 5 to 15 more years. Finally, let's assume that you'll be able to earn inflation plus 3.5% on whatever amount of capital you have when you retire.

How much capital do you need to accumulate? And what is the minimum rate of return you need to earn on your retirement investments to ensure that you have the amount you need when you retire?

A traditional, deterministic approach to these questions might work as follows. Assuming inflation of 3% per year between now and your retirement in 25 years, your target retirement income will increase from \$100,000 to \$209,378 ($=100,000 \times (1.03)^{25}$). Assuming you earn 6.5% (3% + 3.5%) on your capital when you retire, you must have at least \$3,221,197 ($209,378/.065$) available to generate your target income. Assuming you save an additional \$15,000 per year for 10 more years, you need to earn at least 10.08% per year on your portfolio to meet your goal (technically, you use an internal rate of return calculation to determine this). Ah, you say, but what you have just described is but one future scenario for inflation, savings, and target retirement year. Of course, using the deterministic approach, you could perform this same analysis for other scenarios (more commonly known as "sensitivity analysis"). After doing this you would have a better feeling for how much you might need to save, and the rate of return you would need to earn on your portfolio.

Now compare this to the result of a Monte Carlo approach to needs assessment. This approach shows that the most likely amount you will need to have saved by the time you require is \$3 million. It also tells you that, given your assumptions, the most you will need is \$3.5 million. Moreover, you can be 90% sure that you will need no more than \$3.2 million and no less than \$2.8 million. Similarly, the Monte Carlo analysis shows that the most likely return you will need to earn on your portfolio is 11.4%, with a 90% confidence range of 10.1% to 12.7%.

So much for the easy questions. Now for the hard part. Your portfolio asset allocation is currently as follows: 50% U.S. Equity; 30% European Equity; 5% Emerging Markets Equity; and 15% Commodities (our high risk recommended portfolio). What are the chances that you will have the money you need when you retire? A deterministic approach would say that, given historical returns, your portfolio should generate 16.54% per year, which should comfortably exceed your target return of 10.08%. But that's about all a deterministic approach can say. The problem with this is twofold: First, as we have seen, the 10.08% target is probably on the low side of what might be needed. And second, because of the differing standard deviations and correlations between the asset classes in your portfolio, it is hard to tell in advance how much actual portfolio returns are likely to vary around the expected rate of 16.54%, and, consequently, the probability that the portfolio's actual return over 25 years will turn out to be greater than or equal to your 10.08% target.

A Monte Carlo simulation provides a better answer to this question. First of all, it can tell you that there is a probability of 96% that the realized return on your portfolio will be greater than 11.4%, and a 91% probability that it will be greater than 12.7%. However, as we have seen, the answer to the question "will I have enough money when I retire?" depends on more than just your portfolio's rate of return. It also depends on when you retire, how much more you save before you do, and the future rate of inflation. Here is where Monte Carlo analysis really shines, because it can take all these uncertainties into account in the same analysis. In this case, after 10,000 simulation trials, our Monte Carlo

analysis showed that there was a 95% chance that you would have enough money when you retired.

Okay, you think, but what about the worst case? Suppose I save nothing more, retire in only 20 years, and that we experience 4% annual inflation between now and then. What does Monte Carlo analysis say about that? In a nutshell, it says that to meet your retirement income goal you'll have to earn a compound annual rate of return on your portfolio of 14.35%. More importantly, it tells you that there's a 72% chance you'll have enough money to meet your goal, and a 28% chance you won't.

Hopefully, this example has shown the usefulness of the Monte Carlo simulation approach in financial planning. In fact, there are other applications that can be even more useful. Perhaps the most interesting is the combination of Monte Carlo with traditional optimization tools. Taking this approach enables you to "back into" key decisions about asset allocation and annual savings, based on your desired level of certainty about whether or not "you'll have enough money" when you retire. All in all, it is a very powerful and useful approach.

However, like all modeling techniques, Monte Carlo simulation does have one key drawback: its outputs are only as good as its inputs. For example, if your assumption is that you will save between \$10,000 and \$20,000 per year, and then you save nothing, the model's outputs are going to be inaccurate. Similarly, if the historical rates of return, standard deviations, and correlations for the asset classes you have included in your portfolio aren't accurate (and there is no guarantee that the future will be like the past), then the model's results won't be accurate either. At the end of the day, the main conclusion seems to be that while Monte Carlo simulation modeling is in many ways superior to other financial planning tools, it is still limited by irreducible inaccuracies caused by our inability to fully anticipate future events.