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In Search of Better Odds in Retirement Planning

By ELIZABETH HARRIS Published: October 06, 2002

BEFORE Walt Huckabee, a retired engineer, buys mutual fund shares, he likes to take a test drive using a computer-based statistical technique known as Monte Carlo simulation.

He contends that crunching numbers online, using a service available through his account at Vanguard, gives him a better sense of the range of possible financial returns for his investments, in good and bad markets. "It's the difference between theory and practice," said Mr. Huckabee, 60, of Placerville, Calif.

The bear market has made people like him look for more precise methods of assessing whether their portfolios will provide enough retirement income. Companies seeking independent advice to help employees invest for retirement have made Monte Carlo simulation widely available.

The developers of Monte Carlo simulation warn that the technique is imperfect at best, but they say it helps display the range of possible returns more accurately than do other methods.

Traditional financial projections generally assume a fixed annual compounded return, and fixed interest and inflation rates. Monte Carlo simulations, which use random numbers to imitate behavior, run investments through thousands of situations to assess the probability of reaching a financial goal. Calculations assume variations in inflation, interest rates and market returns based in part on history's wide range of returns, going back to the 1920's.

The largest companies that generate Monte Carlo simulations for investors include Financial Engines of Palo Alto, Calif., Morningstar of Chicago and Fidelity Investments, the biggest mutual fund company.

Financial Engines supplies online simulations to 20 financial institutions, including Vanguard, which generally make the techniques available free to their investors. Financial Engines also provides number-crunching services to 800 companies, including McDonald's and Occidental Petroleum, for their employees. Together, these investors number more than three million.

Fidelity has made its Monte Carlo simulations available to 15 million customers. Investors may also get the services directly from Morningstar and Financial Engines.

Mathematicians developed the statistical technique in the 1940's, and it was used in thousands of calculations to develop the first atomic bomb in the Manhattan Project during World War II, said Christopher Jones, executive vice president for financial research and strategy at Financial Engines.

As computer power has become cheaper, many professions have adopted Monte Carlo simulation to describe the behavior of complex systems. It is used to manage traffic, search for oil and determine proper doses for radiation cancer therapy.

"It's useful where the problem you are studying is so complex, it's analytically very hard to determine the overall behavior of the system," Mr. Jones said.

William F. Sharpe, the chairman of Financial Engines and a Nobel winner in economics in 1990, began applying Monte Carlo simulations to individual investors' portfolios later in the decade. With Mr. Jones, he created a software recipe that mixes thousands of pieces of data by tracking 15 types of investments, or asset classes, like long-term government bonds or large-cap value stocks, with financial and economic factors like interest rate shifts and their effects on capital markets. Information about 20,000 stocks and mutual funds contributes in forecasting performance.

Because Monte Carlo simulation takes into account the inherent uncertainty of financial markets, Dr. Sharpe regards it as superior to other ways of gauging future performance -- like calculating a linear, or

fixed rate of return. One such linear calculator, found on Quicken.com, tallies investment performance by assuming an annual average rate of return, like 8 percent, and projecting it forward. Monte Carlo simulations use more varied assumptions. All presume differing rates of return over time, but Morningstar's ClearFuture projects returns for entire asset classes, while Financial Engines projects returns for individual mutual funds and equities.

WHEN using an online Monte Carlo program, an investor saving for retirement enters information about when he wishes to retire, how much he has saved and what investments he owns. The results show potential outcomes based on the best, worst and most likely results.

For example, using Financial Engines, a 48-year-old investor with a $300,000 portfolio of stock and bond mutual funds who saves an additional $6,500 annually has an 83 percent likelihood of retiring with at least a $50,000 income at age 65 (including about $20,000 in Social Security income). The results of the calculation would be a range of outcomes, the most likely being $64,700. The calculation also indicates a 5 percent likelihood of hitting $103,000 a year, and an equal probability of receiving $42,100 a year.

With the Quicken calculator, the same investor would get one outcome. Using fixed projections, the investor would retire at 65 with an average income of $71,240, based on an 8 percent expected return and a 3 percent inflation rate. (That includes the same Social Security income.)

"In the past, people were happy to project a linear model, but the problem with that is, it's linear," said Ray Martin, president of CitiStreet Advisors. "If you're projecting a 10 percent return, the problem is it has to be 10 percent. I call it a perfect 10 and there's no investment that even grows at a perfect 3 -- there's always variability."

Understanding variable market returns helped Mr. Huckabee, the retired engineer, reshape his portfolio. When he retired in 1998 as a system engineer at Lockheed Martin, he began to understand the risks of his growth-heavy 401(k) portfolio. Financial Engines calculations suggested that adding more value stocks would lower his risk; he says his portfolio has been beating the market. "I've been treading water in this downturn," he said, "but it's better than the significant declines you would have if you were just taking the total market approach."

But the Monte Carlo method has its critics. David Nawrocki, a finance professor at Villanova University, challenges the simulations' reliance on normal distributions, or results that resemble bell curves, when those are not typical in financial markets.

"The probability results from Monte Carlo simulation may look impressive to a client," said Dr. Nawrocki, a consultant to PIE Technologies, a company that developed MoneyGuidePro, financial planning software. "However, if that number is derived from assumptions that are not realistic, there is no value to the number." He said he is working on alternatives.

Dr. Sharpe acknowledges that market returns do not always mirror the pattern of a bell curve. So, he said, Financial Engines makes more complex assumptions and mixes in asymmetric patterns to mimic real life. "I don't see how anyone can be a critic of trying to project that there is uncertainty," he said. "If you're going to project anything like the complexity of the market, you're almost doomed to Monte Carlo rather than using analytic projections."

Andrew Clark, a senior research analyst at Lipper, points out that the calculations are based on limited financial market history. "From my standpoint, it is more of a learning tool -- it may give you a bounce, the top and bottom, but please do not take it as gospel," Mr. Clark said.

Chris Cordaro, chief investment officer at RegentAtlantic Capital, a wealth management firm in Chatham, N.J., says that while the approach does not yield precise predictions, it gives investors a more sophisticated picture. "There's no perfect forecasting tool, but Monte Carlo simulations are the best ones we have," Mr. Cordaro said. "At least you're demonstrating there's a probability for different returns, and we're at least acknowledging it's not going to come out perfectly."