

Monte Carlo Simulation: Still Stuck in Low Gear

by Ed McCarthy

Here's a quick quiz: Can you name the forecasting method that is widely recognized as a valuable tool but has been adopted by only a handful of planners? If you guessed Monte Carlo simulation (MCS), congratulations. The technology has received extensive coverage in industry publications, including the Journal of Financial Planning, and has been the subject of numerous conference presentations. Yet very few advisors are using MCS in their practices. For many planners, the technology falls into the "it's interesting, but..." category, where the reasons for not using the software outweigh the potential benefits.

The low MCS adoption rate has led to an interesting situation. Although most practitioners recognize the technology's value, they don't use it because of its perceived complexity. In addition, clients have not been clamoring for MCS analyses, so there has been no "pull" from that direction. That situation is changing on both fronts, however. Several companies offer MCS software designed specifically for the financial planner market. Consumers can now visit Web sites, such as that of Financial Engines, that offer the technology via an easy-to-use interface with graphical output to aid understanding. Simulation is going mainstream, and those planners who don't use it run the risk of being left behind. This article examines the causes for planners' slow adoption of MCS and looks at some encouraging developments for the technology.

The Basics

In case you haven't been exposed to Monte Carlo simulation, it is a forecasting method that models random events. For instance, assume that a stock's annual return could take only one of six distinct values each year: -20 percent, -5 percent, 0 percent, +5 percent, +20 percent, +30 percent. Each return is equally likely; in other words, each outcome has a 1/6 probability of occurring. If you wanted to simulate the stock's performance for a given year, you could take a die and assign a return to each side of the die: A roll of 1 is a -20 percent return; a roll of 2 represents a -5 percent return, and so on.

Each roll would simulate one annual return. If you rolled the die ten times, you would have simulated one possible history of returns for that ten-year period. Because each roll produces a random result, your next ten rolls should produce a different set of returns. While there is a chance that you would duplicate the previous ten-roll sequence, it's extremely unlikely. (Technically speaking, statisticians would describe the odds of that occurring as a "fat chance.") Rolling dice is a low-tech simulation method, of course—obviously, it's much more efficient to use random-number generation software.

MCS is not new. It has been used in the physical sciences for decades, and it has been a staple in business school curriculum for years. (I was first exposed to it as an M.B.A. student in the late 1970s.) MCS users previously needed access to mainframe computers; today, the software can run on any desktop PC. Most programs allow users to model complex financial events, such as stock returns with lognormal distributions, inflation and interest rates, and mortality tables. The purpose of MCS is not simply to electronically re-create random events, though. Its real value comes from analyzing the simulation's outcomes, which can reveal the event's expected value and the dispersion of results around that value. For planners, these analytical results can aid the discussion of risk and uncertainty with clients.

Working with Spreadsheets

I first started writing about MCS and its potential applications to financial planning and investment management in the early 1990s. At that time, users who wished to run simulations on their PCs had two choices: Write the code in a programming language—a truly masochistic exercise for non-programmers—or buy add-in software that ran under Lotus 1-2-3 or Microsoft Excel spreadsheets. Recognizing my limits as a programmer, I worked with two add-in packages: @RISK from Palisades Corporation and Crystal Ball from Decisioneering Inc. (Both programs are still available and in widespread use. See the sidebar for contact information on the programs mentioned in this article.)

These add-ins run inside an existing spreadsheet, and this requirement highlights the first stumbling block for planners who wanted to try MCS: You needed an adequate level of spreadsheet expertise to use the add-ins properly. "Crystal Ball is pure Monte Carlo, not Monte Carlo for financial planners," says Jim Franklin, vice president of sales for

Decisioneering. "For planners to adopt it, they must know Excel with some degree of dexterity and have the time and inclination to create the financial models in Excel. Those can be tricky, and that's really where the bulk of the work is. Beyond that, you've got to add Monte Carlo to that Excel model. So if you are already building customized models for your clients in Excel, then it's a fairly easy task to add Monte Carlo. If you're not doing that modeling, though, it's virtually an insurmountable task."

Based on feedback I've received from CFP practitioners over the past few years, I believe that planners' spreadsheet skills range from very experienced power users to complete novices. The former group has the skill to properly use MCS add-ins, but the latter group lacks the experience. Lynn Hopewell, CFP, chairman of The Monitor Group, a planning firm in Fairfax, Virginia, has addressed many audiences on the benefits of MCS. His assessment of the profession's spreadsheet skills points to a need for additional training. "The use of spreadsheets to solve financial planning problems is only done, in my opinion, by a minority of planners," Hopewell observes. "Over the past 20 years, I've had hundreds of people ask me what software I use, and when I answer 'Excel,' they ask, 'What's that?' I'm not saying that applies to everybody, of course, but we have to remember that the roots of this business are in the sales and brokerage world, and a lot of brokers are English and history majors. There is a vanguard of financial planners who use a spreadsheet as easily as a doctor uses a stethoscope, but that's a small proportion. I think those people are the only candidates to take the initiative with Monte Carlo simulation."

In defense of those planners who do not build their own spreadsheet models, there are valid reasons for deciding against that approach. The first issue is the availability (or lack) of time: While a novice user can quickly build a simple spreadsheet, more complex models require a much larger commitment. A second issue is the risk of model error: Does the planner have a system for ensuring the spreadsheet's accuracy? "The spreadsheet add-in approach is good if you can write a good spreadsheet," according to Bernie McCabe, a senior vice president with Wagner Associates in Malvern, Pennsylvania. McCabe's firm produces The Retirement Spending Planner, a stand-alone simulation program that focuses on portfolio and retirement spending issues. "The problem is that most people can't or shouldn't spend the time writing such a spreadsheet because they don't have the skills to do it. Even a well-done homegrown spreadsheet has problems of maintainability," says McCabe. "With a big, complicated spreadsheet that you don't use every day, you tend to lose track of all the formulas' implications. You may do something to alter a spreadsheet, and not realize you've botched another relationship in the spreadsheet. And in an office where you have several people using the spreadsheet, you might not have protected things, and another person can start changing formulas. Professionally written code by a programmer is maintainable, it's modular and the implications of changes are clear."

As these comments indicate, MCS add-in users need spreadsheet proficiency. It's certainly possible to acquire that skill, but it takes an ongoing commitment. For Dan Moisand, an @RISK user and CFP practitioner with Optimum Financial Group in Melbourne, Florida, the solution was a spreadsheet skills refresher. "I re-familiarized myself with Excel and spreadsheets because it had been some time since I had done any work in that area," says Moisand. "Once I became more comfortable with spreadsheets, the next step was to apply simulation technology."

Struggling with Statistics

Spreadsheet mastery is the first requirement for working with add-ins; a solid grasp of statistics is the second. MCS add-ins rely on the user to supply the statistical distribution and its parameters. In other words, the user must specify the particular distribution from which the software will sample, and that distribution's mean and standard deviation. This input requirement is another hurdle that has been slowing planners' adoption of MCS. For example, the lognormal distribution is frequently used to model stock market returns, but what distribution is appropriate for inflation or interest rates? How do you handle mortality risk in a retirement or estate distribution model?

This need for statistical input can daunt even experienced PC users. Greg Friedman, CFP, principal with Friedman & Associates in San Rafael, California, has a strong analytical background, but he experienced problems with the add-in approach. Friedman, who started working with MCS two years ago, found the software's lack of a planning-specific orientation frustrating. "My background is pretty good in statistics, and I thought that implementing MCS would not be that difficult," Friedman says. "But I found out that you have to have the spreadsheet template built to begin with, and I also learned that what you really needed to know from statistics was phenomenal. I bought Crystal Ball, went to the two-day training class, but came away from the class really frustrated. For example, you have to know the distributions you want to simulate, which is something we can't possibly know. Those two issues became the big

hurdles."

Assuming you can specify the distributions and their parameters correctly, you still need a good grasp of statistics to present the Monte Carlo simulation results to clients. Unless your clients have quantitative backgrounds, you must be prepared to explain concepts, such as expected return and standard deviation, in language the clients can understand. The MCS programs mentioned in this article generate graphical output, but you still need sufficient knowledge of statistics to interpret those graphs properly.

PHD (Push Here, Dummy) Software

One of the most frequent comments I've heard in recent years from planners who were interested in using simulations was, "Why doesn't some company build MCS software for financial advisors?" It was a problem searching for a solution: Planners (and their clients) can benefit from the technology, but a lack of spreadsheet skills and statistics knowledge was holding back many potential users. Lynn Hopewell expressed many planners' hopes for dedicated MCS software: "The major software players are aware of simulation, and there are indications that this is the next level of sophistication for any tool that models the future and has uncertain variables."

Fortunately, there is good news to report on that front. As of late 1999, at least three software firms had developed reasonably priced MCS programs designed specifically for planners and investment managers. Macey-Holland & Co., an investment advisory firm in Atlanta, Georgia, launched AASim (Asset Allocation Simulation Software) in the summer of 1998. Daniel H. Wagner Associates in Malvern, Pennsylvania, released an upgraded version of The Retirement Spending Planner (R\$P) in early 1999. In mid-November 1999, Money Tree Software announced that their retirement planning programs would offer an additional report that used MCS technology to model portfolio rates of return and inflation rates.

The arrival of these dedicated programs has motivated some planners to begin using MCS, even in cases where their initial investigation of the technology discouraged them. "I spent a couple of years trying to find whatever I could on simulation, including spreadsheet-based options, and came to the conclusion that some people are good at developing spreadsheets—but I'm not one of those people," says Dan O'Leary Jr., a CFP practitioner with O Bee Credit Union in Tumwater, Washington. After hearing about the AASim program, O'Leary requested a demo, which eventually led to his purchasing the software and using it routinely in clients' retirement plans. After his initial foray into MCS add-ins, Greg Friedman also recently started working with AASim.

The developers of AASim and the Retirement Spending Plan report that sales are slower than they would like, although neither organization has mounted extensive marketing campaigns. To date, they are relying primarily on media exposure and referrals for new sales, but both firms report steadily increasing inquiries about their products. It is too early to gauge planners' reaction to Money Tree Software's initiative, but company surveys of its users indicate a strong level of interest in the technology.

Consumer Demand

The final hurdle to widespread MCS adoption among planners was a lack of demand from clients. "The issue isn't client-driven, and that's important," Lynn Hopewell points out. "At least not yet. Clients don't say, 'You didn't take into account the uncertainty in these variables.' So it's a professional competence issue when a planner decides whether to use MCS or not."

Most of your clients might not be interested in MCS yet, but don't be surprised when that interest starts growing. Renee Duba, CFP, provides retirement planning services for William Blair & Company's high net worth clients in Chicago, Illinois. She was unaware of simulation technology until a client requested it. "I was working on a retirement plan for a client—a sophisticated businessman. He drew my attention to the Financial Engines Web site and requested MCS by name because he wasn't satisfied with straight-line financial projections."

Don't kid yourself that Duba's experience won't happen to you. Financial Engines recently announced that visitors to Money magazine's Web site and the AOL Personal Finance Channel can access the Financial Engines technology. These affiliations, the firm's services to 401(k) plans and its ongoing marketing efforts will expose millions of potential users to the benefits of MCS. Mutual fund giant T. Rowe Price is offering its Retirement Income ManagerSM analysis,

which uses simulation modeling, for \$500. MCS is becoming ubiquitous; it's not hard to imagine its inclusion in Quicken and other inexpensive personal finance programs in the foreseeable future.

The use or non-use of Monte Carlo simulations probably won't be the deciding factor in whether a client retains your services. But the technology can enhance your services and help keep you ahead in an increasingly competitive business. "The standard is really going up in the financial advisory industry," Greg Friedman notes. "At the same time, a lot of people are entering the business. If you want to stay ahead, especially if your marketplace is the high net worth client, Monte Carlo simulation is an incredible, valuable tool for those cases—it really separates you from the competition."

Ed McCarthy is associate editor of the *Journal of Financial Planning* and is based in Warwick, Rhode Island.