

## ***Rolling the Monte Carlo Dice***

To get a handle on those worst-case scenarios, economists employ a risk analysis tool called the Monte Carlo method. Essentially, it's an algorithm that automates statistical sampling through the use of a computer. (Statistics junkies can purchase Monte Carlo software for Excel called Crystal Ball at [www.crystalball.com](http://www.crystalball.com).)

The Monte Carlo concept was developed by the Polish-born mathematician Stanislaw Ulam, who worked on the atomic Manhattan Project during World War II and later invented the hydrogen bomb with Edward Teller. During a long illness in 1946, Ulam occupied himself playing solitaire and began to ponder how many ways existed to win (or lose) at the Canfield variation. Ulam later recalled, "After spending a lot of time trying to estimate them by pure combinatorial calculations, I wondered whether a more practical method than 'abstract thinking' might not be to lay it out, say, 100 times and simply observe and count the number of successful plays." (This was already possible to envisage with the beginning of the new era of fast computers.)

It's not a perfect system. For one thing, Monte Carlo simulations don't reflect that portfolio performance depends on future returns, which no one can predict, rather than past performance. And they don't take into account the various asset classes that a real stock portfolio would have; everything is random, which is not the way real people allocate their investments. Finally, Monte Carlo simulations assume an investor will stick it out, even in a bear market; that is often not the case.

Those caveats aside, Monte Carlo simulations can help us understand, and avoid, worst-case scenarios. For example, projections show that withdrawing 8 percent annually from a stock fund can sometimes be very bad for your health. How bad? During nine twenty-year periods of withdrawing 8 percent annually from the S&P 500, you ended up with less than your original \$1 million at the end of the game. During eight more twenty-year periods, *you lost everything . . . ran out of money . . . died broke*. In other words, in seventeen out of fifty-nine periods of taking out 8 percent a year, you ended up with *less principal than you started with*. That's 30 percent of the time. There are circumstances in which we'll take those odds—but not with our life savings.

So the point is, yes, stocks have been a proven way to build wealth over time. A fully invested portfolio of stocks is an excellent

way to grow your money. But if you have income needs (the way retirees do), and you're thinking about taking money out of stocks, you'd better be extremely careful about *when* and *how much* you withdraw. During a bear market, even withdrawing 4 percent annually can be risky especially if you have retired recently and you need that money to last for decades.

In a bull market, we'd recommend limiting withdrawals to 6 percent or 7 percent. If you're looking for a simple back-of-the-envelope number to use for a withdrawal program (from a good blue-chip stock fund), [then] plug in 5 percent. Normally, if stocks continue to average 8-12 percent per year returns, you should be okay. Be sure to talk to your financial advisor, however. Your situation may warrant a more cautious approach.