Monte Carlo Theory

Retiring to the French Riviera – Or Not

Joel Greenwald, M.D.*

Do you know the chances of your retirement plan succeeding? If not, a Monte Carlo simulation should be in your future. Any plan is only as good as the assumptions within it. And unfortunately, most financial plans are based on many poor assumptions.

Did your financial or retirement plan project the recent market declines? Is your portfolio’s current valuation near where it was projected to be? Have you ever audited your financial plan to stress test how sensitive it would be to market declines?

If you answered “no” to any of these questions, then you are leaving your financial future to chance.

A 58-year-old dentist recently consulted me about whether she and her husband could afford to retire with no compromise in lifestyle. Their net worth is $2 million, of which $1 million is in her pension plan, $500,000 is in an equity portfolio, and they own their house outright, which is worth $300,000. She estimates her practice would net $200,000. She had run a financial planning program showing that given her assets and annual living expenses, and assuming a hypothetical 9% rate of return on her portfolio, she and her husband could live to age 95 and not run out of money. She asked me for a second opinion before selling her practice to pursue her hobby of breeding sheepdogs.

I reviewed the plan she had run herself and confirmed the conclusion at which she had arrived. The plan showed them both living to age 95 without running out of money. In fact, at their deaths they left an estate of more than $1,000,000. But I then ran a more sophisticated retirement plan, one using software which incorporates Monte Carlo Theory. This program calculated only a 49% chance of making it to age 95 without running out of money. In other words, her plan was more likely to fail than to succeed.

In order to bring her plan’s chances up to a 90% likelihood of success, she either needed to (1) delay her retirement until age 65 and continue funding her retirement and pension accounts as she had been, or (2) lower her standard of living by 30% in retirement — that is, live on 30% less money per year in retirement than she had been hoping.

How could this be? Why had the financial plan she had run been so far off in helping her make such a critical life decision?

Let’s examine the assumptions contained in the plan that my client ran for herself, which is also the way most plans are run for financial planning clients.

The annual return on the portfolio is projected to be 9% per year, not an unreasonable assumption given the historic returns of the markets. But these plans run showing the portfolio getting a straight-line return of 9% per year every year. There are no years when the portfolio earns a 15% to 20% return, as it might. More importantly, there are no years when the portfolio declines in value. And this is a fatal flaw. It is important to consider not only what the average annual return of the portfolio will be for the next 37 years, but also the timing of those returns; when the bull and bear markets occur. If a bear market occurs early in a person’s retirement, the chances of the original plan succeeding are dramatically reduced.

In fact, in the Monte Carlo simulation, which showed the client’s plan succeeding only 49% of the time, there were scenarios where the average return was 13% per year and the client’s plan still failed.

When it comes to financial planning, a Monte Carlo simulation takes into account returns, volatility, correlations, and other factors, all based on historical statistical estimates. That is similar to the traditional financial planning approach. But Monte Carlo programs generate thousands of different scenarios by randomly changing a component in each run, such as return. A Monte Carlo simulation is a far more realistic measure of financial risk and reward.

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than many of the traditional financial planning alternatives.

Even more important, Monte Carlo gets people thinking about their financial plans in terms of probability rather than certainty. It helps people get a handle on the trade-offs they may need to make to accomplish their goals. It provides a more realistic scenario of what they must do to fulfill their dreams.

For example, let’s say that by traditional planning methods, you have been told that you can retire at age 58. This can lead to a false sense of security. The truth is that if someone retires at age 58, he or she is looking at the possibility of living 30 or more years off that nest egg. A lot can happen within such an extended time frame. Inflation could soar to the double-digit levels of the early 1970s; the stock and bond markets could suffer a prolonged, severe downturn. An accurate financial plan has to incorporate these possibilities.

That is what a Monte Carlo simulation does: it reports outcomes as probabilities. A probability of a successful outcome of 90% looks good. On the other hand, if the projected success of a plan is 10%, it is cause for a serious re-evaluation of assumptions. Monte Carlo allows one to vary assumptions and see how this affects the odds of a financial plan succeeding. You can change variables such as:

- The portfolio composition of stocks and bonds. By increasing the percentage of stocks, and thereby raising the expected rate of return, one can improve the odds of success of a plan (but also raise the volatility of the portfolio).
- The age at which you will retire. By delaying retirement, the odds of being able to fund retirement go up.
- Consider partial retirement or income supplementation in retirement. By bringing in some income during retirement, the chances of success increase.
- Lower the amount spent in retirement. By lowering spending, an individual can make a portfolio last a longer time.

Why is this type of simulation called Monte Carlo? The mathematics behind Monte Carlo came out of the Manhattan Project to build the atomic bomb during World War II. The work is largely credited to Stanislaw Ulam, an Austrian-born mathematician, along with John von Neumann. The simulations offered a way of arriving at approximate solutions to troubling problems associated with nuclear explosions. Ulam named the method Monte Carlo after the casinos in Monaco.

While the mathematics of Monte Carlo may be esoteric — the same as that used for nuclear physics and judging the toxic potential of hazardous waste sites — it can provide you with more realistic answers to the financial planning questions that keep you up at night. It pays to take your retirement plan through Monte Carlo.

These reports are hypothetical and are not intended to project the performance of any particular investment.