PMG Wealth Management
Phil Guerrero, CFP®
President
60 Landover Parkway, Suite D
Hawthorn Woods, IL 60047
847-550-6100
phil.guerrero@lpl.com
mypmgwealth.com

Monte Carlo Analysis

When you sit down with a financial professional to update your retirement plan, you're likely to encounter a Monte Carlo simulation, a financial forecasting method that has become popular in the last few years. Monte Carlo financial simulations project and illustrate the probability that you'll reach your financial goals, and can help you make better-informed investment decisions.

Estimating investment returns

All financial forecasts must account for variables like inflation rates and investment returns. The catch is that these variables have to be estimated, and the estimate used is critical to a forecast's results. For example, a forecast that assumes stocks will earn an average of 4% each year for the next 20 years will differ significantly from a forecast that assumes an average annual return of 8% over the same period.

Estimating investment returns is particularly difficult. For example, the volatility of stock returns makes short-term projections almost meaningless. Multiple factors influence investment returns, including events such as natural disasters and terrorist attacks, which are unpredictable. So, it's important to understand how different forecasting methods handle this inherent uncertainty.

Basic forecasting methods

Straight-line forecasting methods assume a constant value for the projection period. For example, a straight-line forecast might show that a portfolio worth $116,000 today would have a future value of approximately $250,000 if the portfolio grows by an annual compounded return of 8% for the next 10 years. This projection is helpful, but it has a flaw: In the real world, returns aren't typically that consistent from year to year.

Forecasting methods that utilize "scenarios" provide a range of possible outcomes. Continuing with the 10-year example above, a "best-case scenario" might assume that your portfolio will grow by an average 12% annual return and reach $360,000. The

"most-likely scenario" might assume an 8% return (for a $250,000 value), and the "worst-case scenario" might use 4%, resulting in a final value of roughly $171,000. Scenarios give you a better idea of the range of possible outcomes. However, they aren't very precise in estimating the likelihood of any specific result.

Forecasts that use Monte Carlo analysis are based on computer-generated simulations. You may be familiar with simulations in other areas; for example, local weather forecasts are typically based on a computer analysis of national and regional weather data. Similarly, Monte Carlo financial simulations rely on computer models to replicate the behavior of economic variables, financial markets, and different investment asset classes.

Why is a Monte Carlo simulation useful?

In contrast to more basic forecasting methods, a Monte Carlo simulation explicitly accounts for volatility, especially the volatility of investment returns. It enables you to see the spectrum of thousands of possible outcomes, taking into account not only the many variables involved, but also the range of potential values for each of those variables.

By attempting to replicate the uncertainty of the real world, a Monte Carlo simulation can actually provide a detailed illustration of how likely it is that a given investment strategy will meet your needs. For example, when it comes to retirement planning, a Monte Carlo simulation can help you answer specific questions, such as:

• Given a certain set of assumptions, what is the probability that you will run out of funds before age 85?

• If that probability is unacceptably high, how much additional money would you need to invest each year to decrease the probability to 10%?

The mechanics of a Monte Carlo simulation

A Monte Carlo simulation typically involves hundreds or thousands of individual forecasts or "iterations," based on data that you provide (e.g., your portfolio, timeframes, and financial goals). Each iteration draws a result based on the historical performance of each investment class included in the simulation.

Each asset class--small-cap stocks, corporate bonds, etc.--has an average (or mean) return for a given period. Standard deviation measures the statistical variation of the returns of that asset class around its average for that period. A higher standard deviation implies greater volatility. The returns for stocks have a higher standard deviation than the returns for U.S. Treasury bonds, for instance.

appear as a series of statistical "bands" around a calculated average.

Example: Let's say a Monte Carlo simulation performs 1,000 iterations using your current retirement assumptions and investment strategy. Of those 1,000 iterations, 600 indicate that your assumptions will result in a successful outcome; 400 iterations indicate you will fall short of your goal. The simulation suggests you have a 60% chance of meeting your goal.

Pros and cons of Monte Carlo

A Monte Carlo simulation illustrates how your future finances *might* look based on the assumptions you provide. Though a projection might show a very high probability that you'll achieve your financial goals, it

Sample Monte Carlo Portfolio Analysis
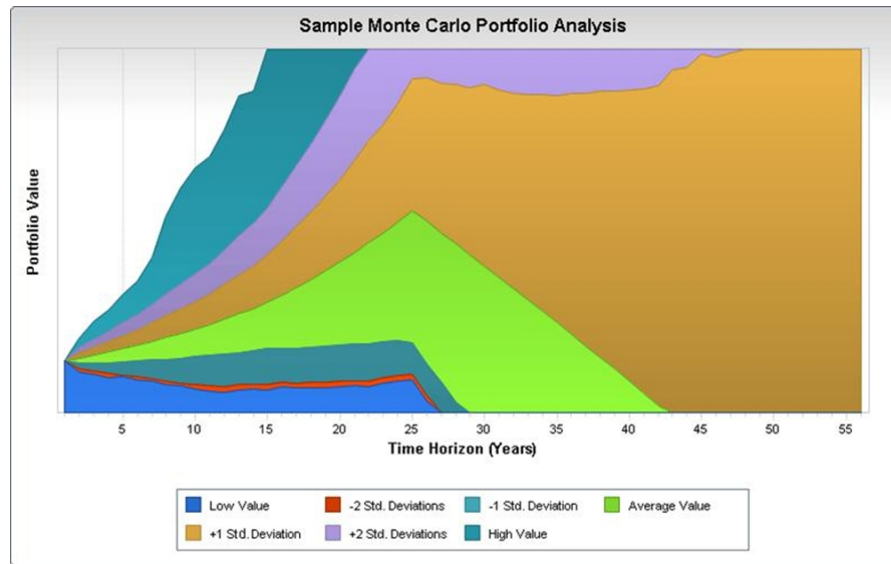
There are various types of Monte Carlo methods, but each generates a forecast that reflects varying patterns of returns. Software modeling stock returns, for example, might produce a series of annual returns such as the following: Year 1: -7%; Year 2: -9%; Year 3: +16%, and so on. For a 10-year projection, a Monte Carlo simulation will produce a series of 10 randomly generated returns--one for each year in the forecast. A separate series of random returns is generated for each iteration in the simulation and multiple combined iterations are considered a simulation. A graph of a Monte Carlo simulation might

can't guarantee that outcome. However, a Monte Carlo simulation can illustrate how changes to your plan can affect your odds of achieving your goals. Combined with periodic progress reviews and plan updates, Monte Carlo forecasts can help you make better-informed investment decisions.

Important: The projections or other information generated by Monte Carlo analysis tools regarding the likelihood of various investment outcomes are hypothetical in nature, do not reflect actual investment results, and are not guarantees of future results. Results may vary with each use and over time.