



FINMASON MONTE CARLO ENGINE FOR GOALS-BASED PLANNING

Planning Your Retirement Using Monte Carlo Simulation

A Monte Carlo simulation helps investors understand the likelihood that their investment strategy will meet their goals to and through retirement. The analysis models the probability of different investment outcomes by running hundreds or thousands of individual forecasts ("iterations") on the portfolio using information collected on the investor's profile.

The FinMason Monte Carlo analysis provides a powerful goals-based financial projection tool that allows an advisor to easily model actual portfolio options for their clients and interactively highlight the impact of the client's savings, investing and spending decisions up to retirement, through the retirement draw-down phase to possibly leaving an inheritance to beneficiaries. In cases where those goals are not likely to be met (shortfalls), our interactive tool allows the investor to instantly see new forecasts if their savings rate is increased, or date of retirement is prolonged or expected expenses in retirement are decreased.

We calculate a 10,000-iteration Monte Carlo analysis using the sensitivities of the investor's portfolio. In fact, our analytic engine can turn around a 10,000-iteration, 50-year Monte Carlo analysis on a 50-security portfolio in under 50 milliseconds. It has the capability to project out what a strategy will look like 50 years into the future through retirement including cashflows (contributions, lump sum withdrawal or monthly withdrawals) and probability distributions over time. These capabilities are very useful for goals-based planning.

Key Assumptions Used In Our Goal Based Planning Tool

The portfolio level inputs used in the FinMason Monte Carlo calculations are the current market value of the investor's portfolio, as well as the FinMason expected return and expected volatility analytics of the portfolio, both of which are calculated using FinMason's factor-based approach as follows:

- a) Expected returns are the long-term future returns for an investment or portfolio by analyzing the sensitivity of the portfolio to various macroeconomic factors alongside estimates of long-run future returns for each of those macroeconomic factors. The estimated returns of macroeconomic factors are calculated using various academically-accepted methodologies depending on the factor. FinMason utilizes a factor-based approach, calculating the exposure of a portfolio or investment to a set of macroeconomic factors designated as the FinMason Global Factor Set. FinMason can calculate the portfolio's expected return by analyzing the expected returns of the various factors and the portfolio's sensitivities to those factors.
- b) Expected volatility is the long-run estimate of the future volatility of an investment or portfolio based upon its exposure to various macroeconomic factors and their behavior over the last 20 years. The method utilized in this tile computes the sensitivity of the investment or portfolio to a list of economic and market factors designated as the FinMason Global Factor Set. This describes the portfolio not as a group of investments, but as a group of exposures to various economic factors (generally less than 20).

The calculation measures how volatile each of the factors have been over the last 20 years and how those factors have interacted with each other over that time (correlation).

Our Monte Carlo tool allows several calculation inputs to be customized for the investor's preferences and the changes are immediately reflected 'on-the-fly' in the simulation. For example:

- a. Investor's time horizon; includes current age, age planning to retire, and end of planning analysis.
- b. Pre-retirement contributions; monthly contributions to a 401k plan or some other retirement savings plan.
- c. Post-retirement expenses; the anticipated living expenses while in retirement.
- d. Large balance withdrawals; future lump sum expenses such as college tuition, retirement home purchase, or any other substantial anticipated withdrawal(s).
- e. Annual inflation rate; defaulted to 1.5% but works on a slider for adjustment preferences.

User Inputs

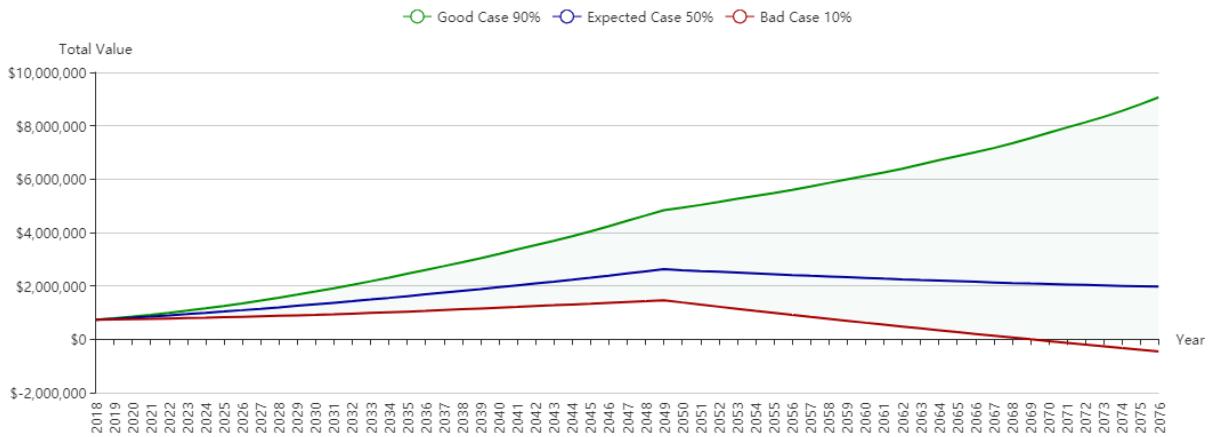
Expected annualized return:	4.7%
Expected annualized volatility:	14.12%
How old are you? <div style="text-align: center;"> 1 32 118  </div>	
Are you already retired? <input checked="" type="radio"/> No <input type="radio"/> Yes	
When do you plan to retire? <div style="text-align: center;"> 33 63 119  </div>	
Analysis Horizon <div style="text-align: center;"> 64 90 120  </div>	
Monthly Pre-retirement Contribution	\$ 2500
Monthly Post-retirement Expense	\$ 12000
Expected Annual Inflation <div style="text-align: center;"> 0% 1.5% 8%  </div>	
Contribution Increase Rate <div style="text-align: center;"> 0% 1% 8%  </div>	

The Monte Carlo Result Set

The Monte Carlo output illustrates probabilities of achieving various retirement balances starting with the portfolio value in the current year and moving in 5 year increments to retirement and through end of analysis projections illustrating portfolio's values at various probabilities ranging from 5% to 95% probability.

The expected "base" case is marked at the 50% Monte Carlo probability analysis (i.e., a 50% probability of achieving this balance), good case is marked at 90% or 95% Monte Carlo Analysis while a bad case is marked at the 5% or 10% Monte Carlo Analysis. If there is greater than 0% portfolio value across the probabilities at the end of the analysis horizon, one can state that their retirement planning strategy is likely to be a success.

Projected Portfolio Value



Disclosure

A Monte Carlo analysis models the probability of different investment outcomes and does not imply or guarantee future returns. FinMason calculates a 10,000-iteration Monte Carlo analysis that produces probability distributions over time, accounting for contributions, retirement-stage withdrawals, and one-time large balance withdrawals from a portfolio. The inputs used in the Monte Carlo calculations are based on current portfolio balances and holdings, as well as the FinMason expected return and expected volatility analytics, both of which are calculated using FinMason's factor-based approach. The models may utilize market proxies, individual fund returns, or security level returns where relevant data is available. The hypothetical expected case, bad case, and good case are for illustrative purposes only, and not a guarantee of future returns.