



Sequence of Return Risk



Most analytical people love spreadsheets...myself included. Personally, I would put Microsoft Excel on my list of top 10 inventions of all time. However, spreadsheets are dangerously inadequate when it comes to creating a financial plan. The problem with this type of “traditional” planning is it assumes that annual investment returns are a constant number, such as 5, 6, or 7% per year. They may average out to one of those numbers. However, using averages can be dangerous. The reality is investment returns vary significantly and randomly from year to year.

Investment returns should be thought of as a combination of average expected return and volatility of those returns (standard deviation). This “volatility” of returns (AKA: [Sequence of Return risk](#)) is not as big of an issue when you are still working and accumulating assets for retirement, but it’s a huge issue once you are retired and taking withdrawals from your portfolio. (see: [Why Volatility Matters for Retiree Investors](#))

Sequence of Return Risk cannot be modeled in a spreadsheet

Sequence of return risk cannot be modeled in a spreadsheet, which is why we need Monte Carlo simulations. These simulations are the cornerstone of good financial planning software. The Monte Carlo engine in financial planning software simulates hundreds or thousands of random sequences of returns based on the average expected return and projected volatility for the portfolio. The return in each of the thousands of simulations is then applied to the portfolio balance, after accounting for all inflows and outflows that are planned for that year.

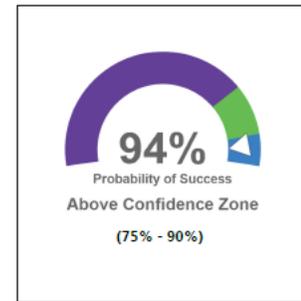
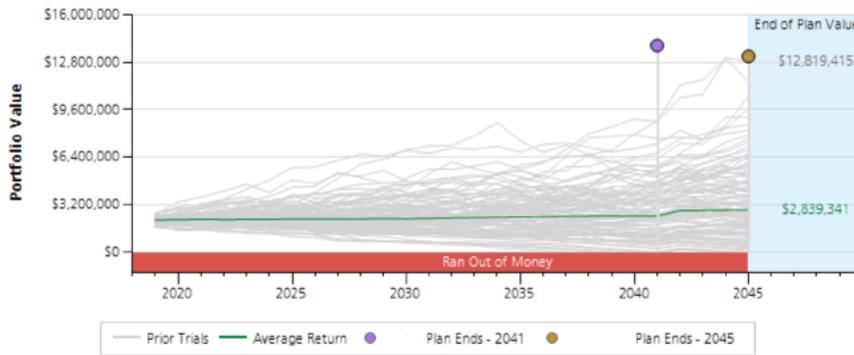
The Two Main Benefits of Monte Carlo Analysis

The main benefit of Monte Carlo analysis is that it enables you to look at your financial plan in terms of probabilities. For example:

- 1) There is a 94% chance that you will not run out of money.
- 2) The median case (50% chance it will turn out better and 50% it will turn out worse) is that you will still have more than \$1.5 million (in current dollars) at the end of your life.
- 3) There is a 25% chance that you will end up with more than \$2.9 million, but also a 25% chance that you will have less than \$737,000. (see image below)

Inside the Numbers - Final Result For Planned Scenario

- The graph below shows the results for all 1000 Monte Carlo Trials.
- The Probability of Success meter displays the percentage of trials that were successful in funding all of your goals.
- We identify the Confidence Zone as a probability of Success between 75% and 90%.



In the table below, values are shown for the 99th, 75th, 50th, 25th and 1st percentile trials based on the End of Plan value. For each trial displayed, the corresponding portfolio value is illustrated for specific years of the plan. These trials serve as checkpoints to illustrate how the portfolio might perform over the life of the plan.

Although the graph and table help illustrate a general range of results you may expect, neither of them reflect the Final Result, your Probability of Success.

Trial Number	Percentile	Year 5	Year 10	Year 15	Year 20	Year 25	End of Plan Future Dollars	End of Plan Current Dollars	Year Money Goes to \$0
10	99th Percentile	\$2,530,017	\$3,838,137	\$5,802,775	\$7,964,468	\$10,609,273	\$12,819,415	\$6,746,021	
250	75th Percentile	\$2,518,622	\$3,569,116	\$3,897,653	\$5,141,775	\$4,952,178	\$4,984,366	\$2,622,946	
500	50th Percentile	\$2,119,864	\$2,657,852	\$3,081,227	\$2,458,454	\$2,930,324	\$2,920,189	\$1,536,705	
750	25th Percentile	\$2,461,404	\$1,867,616	\$2,128,146	\$1,546,992	\$1,403,101	\$1,399,130	\$736,271	
990	1st Percentile	\$1,643,210	\$837,047	\$453,334	\$0	\$115,647	\$0	\$0	2037

Keep in mind that even a plan with a 51% probability of you not running out of money would have been shown to be successful if you were using a spreadsheet with constant investment returns.

The other benefit of Monte Carlo simulations is you can test how changing each variable or assumption in your financial plan is likely to affect the outcome. The most common variable to change is the investment mix (AKA: asset allocation) to see which portfolio gives you the highest probability of success. You can also test changes to other variables in the plan such as spending, life expectancy, retirement dates, pre-retirement savings rates, Social Security claiming ages, incorporating insurance, or annuities into your plan, etc.)

Garbage In, Garbage Out

Your analysis (output) will only be as good as the assumptions you used (input). The process of developing a good financial plan is about making the most accurate assumptions possible and then applying the Monte Carlo simulation to those assumptions. The main assumption or data that only you can provide to your financial planner is how much you want to spend. You can think of expenses in terms of recurring core living expenses, recurring big expenses (a new car every 7 years), and then one-time expenses (e.g., a child's wedding or purchase of a vacation home). Your financial advisor should be able to provide realistic assumptions for the other aspects of the plan (e.g., projected returns and volatility).

Final Thought

Your life will not play out exactly in accordance with your financial plan. It never does. However, a good plan gives you a framework for making spending and investing decisions. Spreadsheets were a quantum leap from the "back of the napkin" approach. Monte Carlo simulations are an equal if not greater leap in planning tools.

- Jeremy Kisner, Senior Wealth Advisor