



Ruminations on Monte Carlo Simulations

I am a proponent of using Monte Carlo Simulations (MCS) in financial planning. For the uninitiated, MCS is a math technique used to model situations that involve uncertainty and thus cannot be modeled deterministically but can be described statistically (the technical term would be modeled “stochastically”). For example, while you may estimate a portfolio return to be 7% per year on *average*, it certainly won’t be 7% *each* year. Thus, a financial plan that works *on average* can be disastrous a high percentage of the time. Remember, a statistician is a person with his feet in ice water and his head in the oven and who *on average* is very comfortable. The term “Monte Carlo Simulation” was coined during the technique’s use in the Manhattan Project in World War II.

MCS is particularly useful in testing the reasonableness of a financial plan – especially one with irregular cash flows where rules of thumb (such as a 4% withdrawal rate being “safe”) can’t be applied easily. Please do not confuse precision with accuracy. In many respects it would be better if financial planning software rounded the results off to the nearest hundred thousand dollars so people would realize that they are estimates. In financial planning you can be accurate (“This is a prudent plan.”) even when you can’t be precise (“You will have \$2,057,387 in your portfolio at age 65.”). You can’t have precise results when most of the inputs are estimates of the unknown.

Most financial planning software today incorporates MCS, but I have found it wanting in three respects: 1) it is frequently a “black box” with assumptions that may not be obvious or desired (or even correct!), 2) it frequently has bugs, and 3) it is priced too high. The software I used previously was \$750 the first year (which is fine) but then required an additional \$750 payment *every year!* That seemed a little unreasonable.

MCS is not that complicated; so when I ran across a great little Excel add-in called “RiskAMP,” I simply wrote my own program in a few hours. It is available for your use as well from our web site. Risk AMP itself is available at www.RiskAMP.com. After the 30-day free trial, you pay only a one-time fee of \$129.95. After the initial purchase, you own the program. I am not affiliated with RiskAMP in any way and get no benefit from you purchasing their tool.

Of the two programs available on our web site, one is for “normal” financial planning for individuals; the other is designed for endowments, foundations, and similar funds and allows percentage withdrawals, smoothing of withdrawals, and a ratchet feature. The directions below pertain to the regular version. If you can figure it out, the other shouldn’t pose a problem.

I am not, nor do I desire to be, in the software development business. Thus, while I am happy to assist my fellow practitioners by sharing, I regret I cannot perform user support. If you are not comfortable with Excel, you should probably purchase a commercial financial planning package. Also, it probably goes without saying that there won’t be a slick user interface on this either. With that said, the following page of instructions should get you started.

MCS Instructions

- The first tab is where you enter your information. You may input or modify information in any yellow cell.
- There is space for 20 cash flows and other self-explanatory general assumptions. There is also room for 6 portfolios. The return is the arithmetic average, and the risk is the standard deviation. If you don't know what those terms mean, don't use this for other than entertainment purposes. Again, all yellow cells, including the names of the portfolios and cash flows, may be changed.
- The next three tabs are used to perform the calculations and otherwise prepare data for the reports. They should generally be ignored unless you are experienced with Excel and want to modify my calculations or reports in some way.
- The last three tabs are the reports which, combined with the first tab, can be printed and given to clients as you deem it appropriate. You may have to modify the format of the charts depending on the age of the client. For those of you who have compliance departments to deal with, 1) I am sorry, 2) you should probably check with them to seek approval before using this with clients.
- It is a simple matter to save each plan you do for your clients as you normally would save a document. I recommend using the client name, the date, and the scenario name in the filename.
- You may notice there are no tax assumptions in the software. Modeling taxes introduces *lots* of complexity and even more problems. When it is done in commercial programs, it is generally done incorrectly. For example, tax-inefficient assets should be held in tax advantaged accounts and tax-efficient investments in taxable accounts. These two types of accounts thus will have different asset allocations but can't be modeled independently because there is a correlation between them. I have not seen any software that handles this correctly. In addition, there is probably more uncertainty about future tax policy than there is about future investment returns. Thus, I advocate simply grossing up all withdrawals by an approximate blended tax rate. For example, if someone needs \$100,000 per year net to live on, and you assume a 25% blended tax bracket $\$100,000 / (1 - .25) = \$133,333$. To the extent they have retirement plans with no basis, the rate will be closer to ordinary income rates. Taxable accounts with stocks and low turnover will be at capital gains rates (on gains only), while Roth IRAs will not be grossed up at all. Thus, the combined tax rate is clearly a fudge though probably not much worse than extremely detailed computations with high precision but low accuracy (see above).
- Once you have input your data, go to the "Monte Carlo" menu item (if you don't see it, you either didn't purchase or install RiskAMP correctly), and choose "Run Monte Carlo..." I recommend a minimum of 1,000 trials for accuracy, and even more to make the lines on the graphs smoother when you are ready to run the final reports. If you uncheck the "Allow Screen Updates during Simulation" box, it will run much faster.
- This spreadsheet is *free*. Thus, I obviously can make no warranty that it is free of bugs, etc. Your mileage may vary.

Notes:

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