Efficient Frontier

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The Retirement Calculator from Hell, Part III:

Eat, Drink, and Be Merry

The advances in financial engineering over the past several decades have profoundly improved the lot of the average investor. The most spectacular are plainly visible to anyone willing to read—the mean-variance paradigm, which throws the tradeoff between risk and return into sharp relief; the efficient-market hypothesis, which reduces portfolio implementation to finding the least expensive comprehensive asset-class exposure; and finally, factor-based analysis, which identifies those risks that reward.

The essence of investing is the deferral of current income for future consumption. For most people, this means retirement. And in this vein, one important advance has received relatively little attention—the switch from deterministic to probabilistic methods of liability planning. There are two ways to perform a probabilistic analysis: the so-called Monte Carlo method, which runs a large number of scenarios containing random variations in input data, and the "closed-form" method, which accomplishes the same thing with a single formula. The closed-form method, although mathematically more elegant, is not nearly as flashy as Monte Carlo, which can produce psychedelic graphics, beloved by users and journalists alike. It’s not surprising, then, that the clunkier Monte Carlo method has won out.

For centuries, investors used the amortization algorithm—the same formula used to calculate mortgages. Let’s say that you plan a 30-year retirement, estimate a 4% real return, and need $100,000 in annual income. Toss these figures into your trusty retirement calculator, and hey presto, out pops a required nest egg of $1,729,203. (Or, working from the opposite direction, if you have a nest egg of $1,000,000, you can spend $57,830 per year. (This $57,830 is "pre-tax"; that is, it must cover your tax bill as well, unfortunately.) As most of you are aware, you make life much easier for yourself when you work with inflation-adjusted returns and payments.

This "deterministic" method is hideously flawed. In the first place, your returns assumptions could be wrong. You or your spouse might not die exactly on schedule, thus outliving your money. And finally, you could get hit with an adverse returns sequence—even if you are correct about your life span, withdrawals, and portfolio's long-term return. If results are worse than planned in the early years of your retirement, you are likely to run out of money. (I explored this topic in the first article of this series.)

The remedy for most of these problems is to use a probabilistic formulation (the Monte Carlo simulation)—that is, to toss in an element of random variation. This extra dimension of input, usually expressed as the standard deviation of annual returns, results in an extra dimension of output—the probability of retirement success. In the second part of this series, we examined such a probabilistic approach. (I was able to coax my friend David Wilkinson into writing a Windows-based application,McRetire, that computes retirement-success probabilities.)

But even this method, advanced as it is, can still mislead. Let's take a look at some output. Assume that you have a $1,000,000 nest egg with an expected 4.5% real return and a 10% standard deviation—about what a reasonable person can expect from a 60/40 globally-diversified stock/bond mix. Here are the 40-year success probabilities for the following before-tax monthly withdrawals:

Monthly Withdrawal Rate	**40-Year Success Probability**
$5,000	30%
$4,500	46%
$4,000	63%
$3,500	78%
$3,000	90%
$2,500	97%
$2,000	99.5%

A wide variety of web-based services are now available, such as Financial Engines, ClearFuture, and mPower, that will calculate the flip side of the above, estimating the success probability of the investment phase of your retirement plan.

The hard part, of course, is how to interpret this kind of output. Realize that these probabilities are merely an imperfect estimate of the *investment risk* you are taking. In other words, they assume the continuity of financial and political institutions over the period studied. Consider the implications of the above 97% success rate at a withdrawal of $2,500 per month ($30,000 per year). For this to be a useful estimate of your true chance of not running out of money, the "success rate" of your ambient political, economic, and military environment must be at least 97% over this 40-year period. Do you think that this is likely? Only if you are an historical illiterate (which, I'm afraid, subsumes many finance academics).

Let's examine a small sampling of possible political, economic, and military failure modes:

- The mildest scenario is that of catastrophic inflation, as experienced in Germany and Hungary in the 1920s or, more recently, in much of the developing world.

- Political failures are slightly worse, since these threaten the basic human motivation to work and produce. The state, for whatever reason, can decide to confiscate your assets or, worse, society's means of production. Anyone who judges this unlikely should turn on CNN during any G-8 or WTO conference.

- Local military action. Probably the lowest-probability item on this list, but something to think about on other continents.

- The Big One: Some deranged prime minister or colonel in central Russia, Pyongyang, or South Asia could let loose the four horsemen upon the planet.

So, think about what a 97% 40-year success rate means: the absence of all of the above for approximately the next 1,200 years. (A 97% success rate means a 3% failure rate; those 40 years divided by 0.03 is 1,200 years.) Ignore for a minute the uncertainties of the less-developed world and think only about the winners: Germany—in this century alone, three episodes of military and/or economic disaster, the first two associated with mass starvation. Japan—wartime devastation even worse than Germany's. England—near brushes with disaster in 1812-1814 and in both world wars. And even the United States—repeated banking failures, civil war, and the near-bankruptcy of the Treasury in the 19th century. The near collapse of the capitalist economy in the 1930s. And oh yes, I almost forgot—the entire globe barely missed mass incineration in October 1962.

History's best-case scenario was the Roman Empire, which survived more or less intact for about seven centuries (if you ignore the odd sackings of the capital after 200 A.D.).

A wildly optimistic historian might give us another few centuries of economic, political, and military continuity. Back-of-the-envelope, that's about an 80% survival rate over the next 40 years. *Thus, any estimate of long-term financial success greater than about 80% is meaningless.*

Now, let's return to the above table. The historically naïve investor (or academic) might consider reducing his monthly withdrawals to a very low level to maximize his chances of success. But history teaches us that depriving ourselves to boost our 40-year success probability much beyond 80% is a fool's errand, since all you are doing is increasing the probability of failure for political, economic, and military reasons relative to the failure of banal financial planning.

Mind you, this is not a call for wild abandon. The above table constrains the retiree desiring a theoretical 97% success rate (of portfolio survival) from spending more than 3% per year of the initial real amount of his nest egg. Taking the accident propensity of the species into account would allow him to spend about 4%. But if you believe that we're about to encounter a bad returns sequence or simply wish to leave a few baubles to your heirs, you're right back to 3% again.

So live a little, and enjoy your money, for tomorrow we may be consumed by the ghosts of Hitler, Lenin, and Attila the Hun. And at withdrawals of 3% to 4% of your nest egg, don't spend it all in one place.