ADVISOR PERSPECTIVES

The Retirement Portfolio Showdown: Jeremy Siegel v. Zvi Bodie

By Geoff Considine, PhD
July 21, 2009

When investing for retirement over long time horizons, advisors can choose from two apparently conflicting approaches. They can follow the advice of Wharton professor Jeremy Siegel, who has steadfastly advocated equity-centric portfolios, most notably in his highly popular book, *Stocks for the Long Run*. Or they can listen to Boston University professor Zvi Bodie, who says equities are simply too risky over the long term, and the core of a retirement portfolio should be Treasury Inflation Protected Securities (TIPS).

Siegel and Bodie cannot both be correct. Understanding which approach is best for long-term investors, however, requires an analysis of the subtle risk and return tradeoffs an investor faces. A sophisticated Monte Carlo simulation reveals how to reconcile these apparently conflicting conceptual models, as I demonstrate below.

But before getting to that, let's review Bodie's and Siegel's positions.

In 1995, Bodie published a paper in *The Financial Analyst's Journal* in which he challenged the idea that stocks become less risky for investors over a long time horizon. His alternative approach, which he also describes in a book called *Worry Free Investing*, is to place the core of retirement savings in inflation-protected bonds (TIPS), with very modest exposure to equities. Bodie's argument is that a portfolio of equities does not, in fact, become less risky the longer you hold it. While stocks have beaten bonds on average over history, there are multi-decadal periods in which bonds have beaten equities (see here). Bodie received renewed attention for his proposal after the massive stock market decline in 2008.

Bodie has debated the logic of 'stocks for the long run' with Siegel for years. Siegel's thesis is that stocks thrash bonds over long periods of time so soundly that investors need substantial exposure to equities in order to accumulate meaningful wealth. Siegel puts heavy emphasis on the fact that stocks have beaten bonds by more than 3% per year, on average, from 1871 through 2008. A range of analysis suggests that equities will out-perform bonds, on average, in the future as well. Even given that that the historical period upon which he draws has provided equity investors with returns that are too high to be used on a forward-looking basis, Siegel has repeatedly projected that stocks will out-perform bonds by 3% per year over future decades. Siegel believes that the most recent years' poor relative performance in equities is an extremely rare historical anomaly and that investors need to maintain substantial buy-and-hold exposure to equities.

Bodie counters that an equity focus is just too risky and is a poor way to hedge against future income needs of individuals. Instead, he says inflation-indexed bonds are a good proxy for individual investors' future income needs, so the real question is the extent to which a mix of stocks and bonds can match that the future performance of TIPS.

Checking the numbers

The S&P500 has a substantially higher expected return than an aggregate bond index —about 4.5 percentage points of average excess annual return (see here). But stocks are also more volatile than the bond index. If we take reasonable forward-looking estimates of the risks and returns for a bond index (AGG) and the S&P500 (SPY), we can easily estimate the probability that stocks will cumulatively beat bonds over a specific holding period.

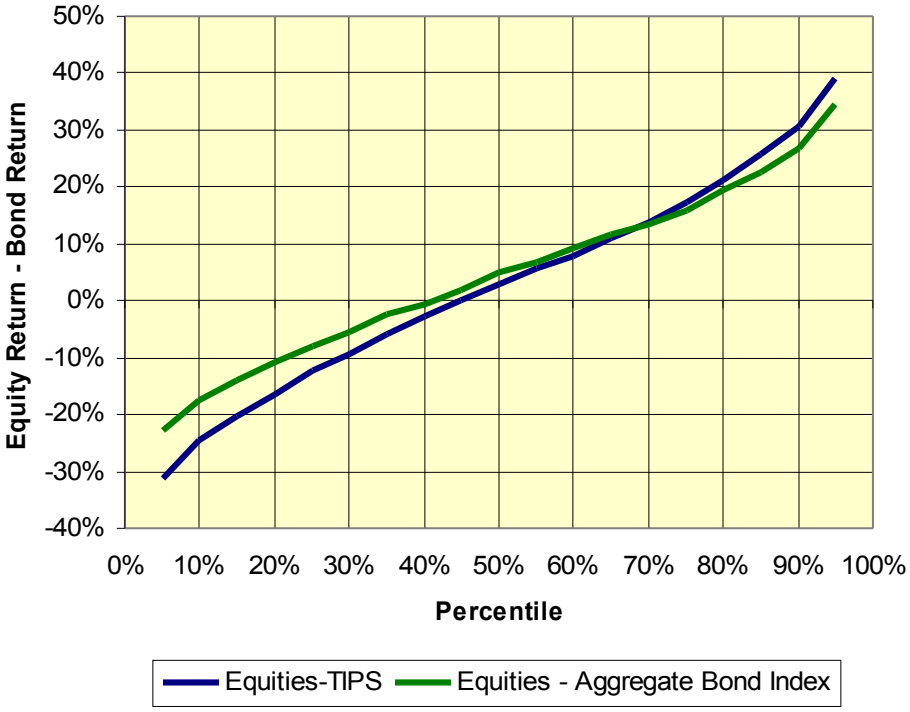
More importantly, however, we need to look at the probability that equities will under-perform TIPS (TIP). To assess that probability, we need to account for the correlations among TIPS, nominal bonds (AGG), and equities (represented here by the S&P500). A Monte Carlo Simulation – which generates forward-looking estimates of risk and return for the various asset classes – can do just that.

This is important because historical returns from the market are not necessarily a reasonable basis for the future. It is likely that the equity risk premium will be smaller and that correlations between asset classes will be higher than in the past. I used the Quantext Portfolio Planner (QPP) to generate these projections. To underscore the value of such comparisons, I have generated Monte Carlo simulations using data available only through May 2008. This will allow us to consider the forward-looking projections vs. what actually happened in 2008-2009.

The chart below shows the cumulative probability that equities (the S&P500, SPY) will under-perform or out-perform TIPS and nominal bonds (AGG) by a certain amount. This is a generalized long-term probability, and does not include tactical considerations of current value. In other words, we are showing a general illustration of the equity risk premium, but from a probabilistic perspective. This type of chart takes a little explaining. The horizontal axis shows the percentile of the outcome and the vertical axis shows the cumulative return of the S&P500 vs. bonds. One curve shows the S&P500's performance against TIPS and the other shows the S&P500 against the AGG. The model estimates that the S&P500 has a 5% chance of returns 30% less than TIPS over a one-year time horizon. The model also estimates that the S&P500 has a 5% chance of returns 22% less than AGG in a single year. These results are not too surprising. We all know that in a single year, there are significant odds that equities will greatly under-perform bonds.

ADVISOR PERSPECTIVES

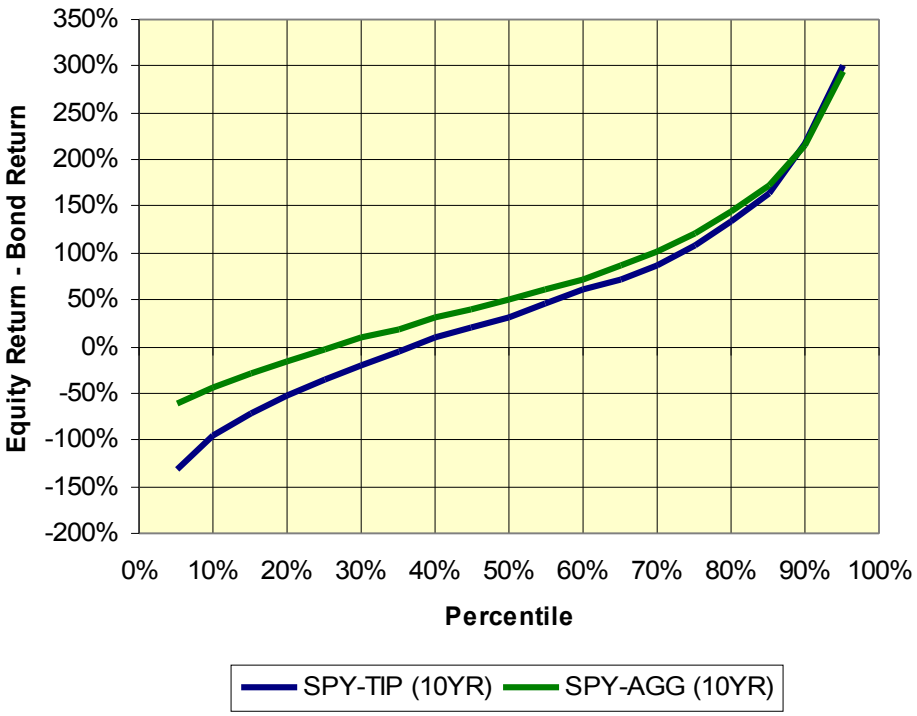
Cumulative Returns of S&P500 vs. Bonds for 1 Year



If we now extend the projection period out to ten years, how do things look? The standard notion that underlies 'stocks for the long run' is that the risk of stocks under-performing bonds diminishes with holding time, which is partly true – but not entirely so. The chart below shows the same percentiles of cumulative return for a ten year period.

ADVISOR PERSPECTIVES

Cumulative Returns of S&P500 vs. Bonds for 10 Years



If we look at the median outcome (the 50th percentile), it is evident that stocks are likely to soundly beat both TIPS and nominal bonds over a ten-year period. The model suggests that the S&P500 will provide an additional 50% in total return vs. bonds (AGG) and 30% in total return beyond TIPS. This is the basis of the 'stocks for the long run' argument: The average gains on equities far exceed the gains on bonds.

The problem with simply using this logic as the basis for planning is evident when we look at the lower percentiles—the 5th percentile, for example. At the 5th percentile, the results show the S&P500 will under-perform TIPS to the tune of 130% in total return on the initial investment over a ten-year period. This means that there is a 1-in-20 chance (5%) that TIPS will out-perform stocks by an amount equal to 130% of the initial investment over a ten-year period. Even at the 20th percentile (a 1-in-5 chance), stocks will under-perform TIPS by 50% in cumulative return on the initial investment.

Now comes the key point: the 5th percentile under-performance of equities relative to bonds (both TIPS and nominal bonds) is far greater after ten years than after one year! This belies the notion that stocks become less risky the longer you hold them—and this is precisely the point Bodie was making in his 1995 paper. If our liabilities are indeed well-matched by TIPS, these data show that the risk that equities will fall significantly short of meeting our liabilities doesn't decrease with time, it increases!

A different way to explain this point is provided in the following excerpt from Bodie's original paper:

> *The basis for the proposition that stocks are less risky in the long run appears to be the observation that the longer the time horizon, the smaller the probability of a shortfall. If the ex ante mean rate of return on stocks exceeds the risk-free rate*

> *of interest, it is indeed true that the probability of a shortfall declines with the length of the investment time horizon. For example, suppose the rate of return on stocks is lognormally distributed with a risk premium of 8% per year and an annualized standard deviation of 20%. With a time horizon of only 1 year, the probability of a shortfall is 34%, whereas at 20 years that probability is only 4%. But as has been shown in the literature, the probability of a shortfall is a flawed measure of risk because it completely ignores how large the potential shortfall might be. [emphasis added]*

The two charts above from our Monte Carlo Simulation show this effect quite clearly. After one year, there is a 47% chance than TIPS will out-perform the S&P500 (this is the percentile at which the SPY-TIPS curve crosses 0% return). After ten years, there is only a 37.6% chance that TIPS will out-perform SPY. The probability of stocks under-performing bonds (including TIPS) diminishes in time. On the other hand, the severity of the potential shortfalls increases with time horizon as we have discussed: the 5th percentile after ten years is much worse for an equity investor than the 5th percentile after one year.

What this means for you

So where does this leave an investor trying to save for retirement? First, there is solid evidence to support the notion that stocks can be expected to out-perform bonds at the levels used in this discussion —and that is not a small factor. If stocks out-perform bonds by 4.5% per year, investors will be well-served by equities **on average**. The problem that most people do not understand is that this higher return comes with risk and that they are not likely to receive the 'average' – they will realize only one of many possible future outcomes. Any given generation of investors may end up with the best 1-in-50 outcome or the worst 1-in-50 outcome, or any of the possible outcomes in between.

The simulations described above show that the risk in equities is high enough that any investor has some probability of needing his or her money on a time horizon such that he or she may end up having been better off in bonds over even very long time horizons. This is related to the outcome in game theory known as 'gambler's ruin.' Even when the odds may be on your side, you can still end up having to leave the game before you get ahead. After the bruising markets of 2008-2009, this is painfully obvious, and my analysis demonstrates this point before the actual market declined (remember that our Monte Carlo Simulations from Quantext Portfolio Planner used data available only through May 2008).

There is a tendency to look at the downturn in 2008-2009 as a 'black swan' – an event beyond our capacity to anticipate – but the chart above suggests that, as we look at ten-year periods, such an event was not outside of the realm of possibility using straightforward statistical models.

Equities provide the opportunity for reaping returns higher than we can obtain from bonds, but certainly not a guarantee of higher returns – even over long periods of time – and the potential severity of under-performance increases with the time horizon rather than decreasing. The ultimate 'safe asset' (in terms of market risk) for investors saving for retirement is TIPS, but these provide only a modest opportunity of building wealth beyond simply maintaining purchasing power. Bodie and Siegel can look at the same statistics and disagree on the best strategy for investors — and the disagreement is legitimate and not trivial to reconcile.

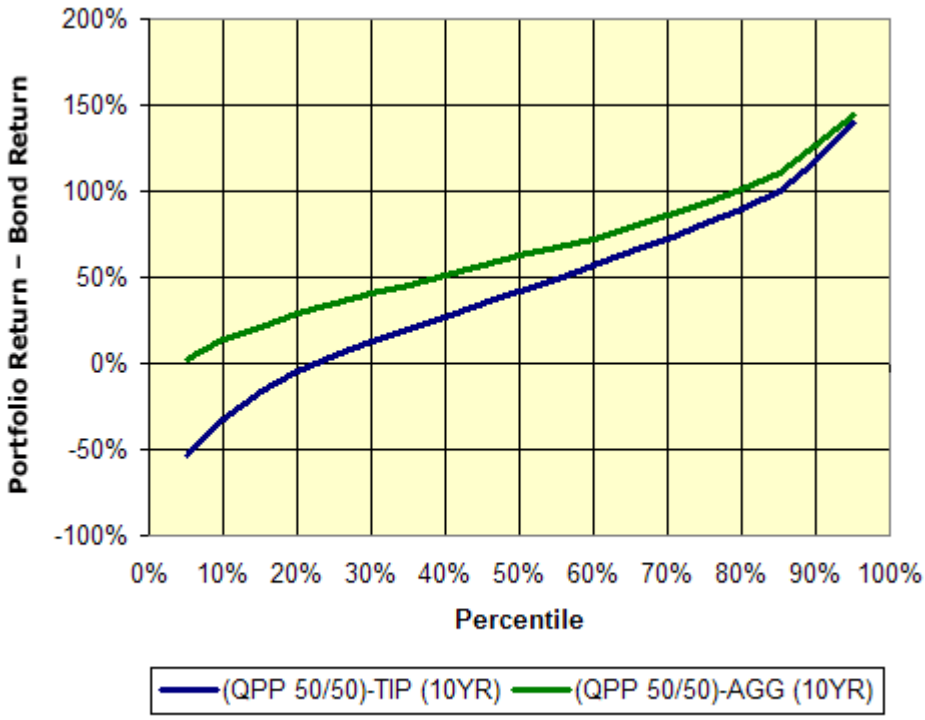
How to balance the risks

The tradeoff between higher and lower allocations to bonds vs. riskier asset classes is between risk tolerance and expected returns — there is no mystery and, in fact, surprisingly little disagreement on the statistics of risk and return among the participants in this many-faceted dialog. The real disagreement concerns which are the most appropriate choices for an investor to make.

Moshe Milevsky, in his 2008 book on retirement planning, finds (Figure 8.4) that a 65-year-old has his or her highest long-term sustainable income stream from a portfolio that is 70% in equities. In an article in May 2008, I suggested that a portfolio with 50% in bonds was a reasonable choice if the portfolio was diversified to include REIT's and commodities and also had most of its bond exposure via TIPS. That portfolio (let's just call it the *QPP 50/50 Portfolio*) had 40% of its assets in TIPS, 10% in commodities, and 5% in REIT's, all of which provide considerable inflation protection. I specifically noted that a portfolio that was 50% allocated to the S&P500 and 50% allocated to bonds would have a considerably lower probability of successfully supporting the same retirement income. Zvi Bodie has proposed that a portfolio that is 90% in TIPS is the right solution for retirement investing.

Let's analyze one of those strategies—the QPP 50/50 portfolio—using the same techniques we used to examine Bodie's and Siegel's extremes:

Cumulative Returns of QPP 50/50 Portfolio vs. Bonds for 10 Years

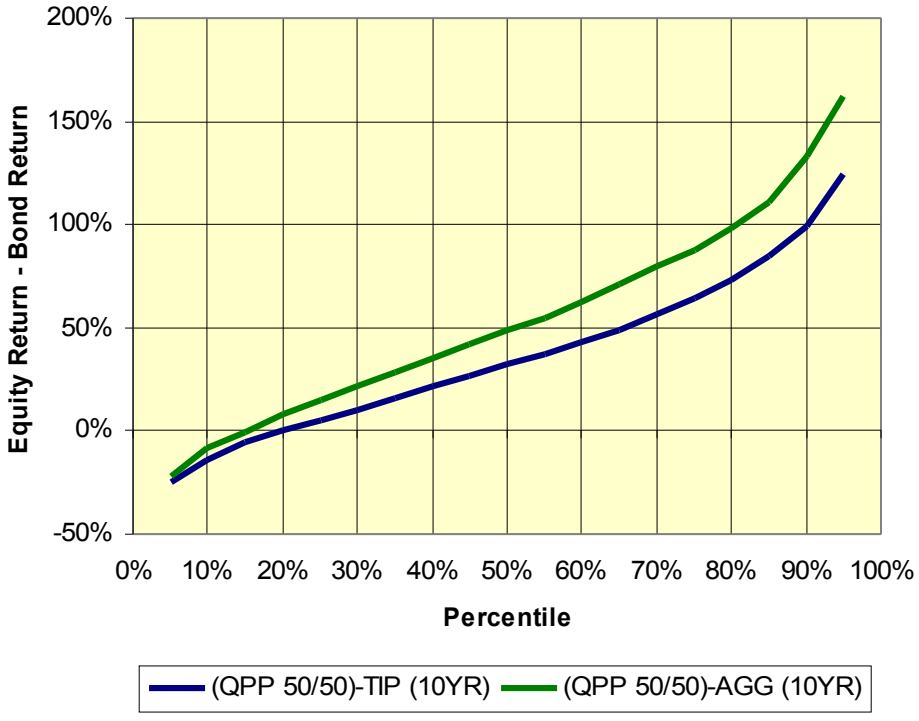


The QPP 50/50 Portfolio is projected to match the returns on the aggregate bonds index at the 5th percentile after ten years (see above), and the median outcome provides a cumulative increase in portfolio value that is 63% higher than a portfolio that is 100% allocated to bonds.

While Quantext Portfolio Planner's projections agree with Bodie that stocks do not become less risky with time horizon (as shown in the earlier charts), QPP still shows that a meaningful exposure to assets other than TIPS increases an investor's ability to successfully fund his or her retirement. The QPP 50/50 Portfolio is projected to provide a 4% income (adjusted up by 3% per year) for a person retiring at age 65, with only a 10% chance of running out of money by age 98. The 100% TIPS portfolio is projected to have a 10% chance of being completely drawn down by age 84. These projections use data through May 2008.

When we run the simulation with data through May 2009 as a sanity check, we find that the QPP 50/50 Portfolio is still a better choice vs. a 100% TIPS portfolio, though the projected advantage has been considerably reduced because the of massive increase in correlations between asset classes in 2008-2009. Interestingly, the projected probability of a cumulative shortfall of the portfolio vs. TIPS has decreased (see chart below). The situation has improved as the correlation between this portfolio's returns and TIPS has gone up.

Cumulative Returns of QPP 50/50 Portfolio vs. Bonds for 10 Years (data through May 2009)



All of these simulations highlight the tradeoff between market risk (the risks associated with market fluctuations) and longevity risk (the risk of outliving your money). In light of the market declines in 2008

and 2009, there will be many investors whose taste for market risk has declined to the point that they are willing to accept lower expected future income in return for taking on less market risk. This is a completely legitimate choice, but it is not universally preferable. Reducing longevity risk with a diversified portfolio of equities and bonds provides a higher probability of being able to meet future income needs. The optimal balance between these effects requires careful assessment of an individual's specific situation and future needs.

The best solution, given all of the uncertainties, is for investors to build portfolios that provide the maximum sustainable income streams, but also to ensure that worst-case outcomes are tolerable. This notion is receiving more attention, but is still not widely understood. An important part of a balanced investment process is to be aware of all of the risks, and the potential for severe under-performance of equities over extended periods of time is a risk that often gets overlooked. A person near retirement who has little or no flexibility in when they retire and how much income they need in retirement must have less exposure to risky asset classes.

Geoff Considine is founder and president of Quantext, and the developer of the Quantext Portfolio Planner, a portfolio management tool. Extensive case studies, as well as access to a free extended trial, are available at http://www.quantext.com