



Case Study for Coffeehouse Investor

Geoff Considine, Ph.D.

I recently received an email from an individual investor asking about what I thought about the following model portfolio for long-term investing:

- (40%) Total Bond Market Index - AGG
- (10%) Standard & Poor's 500 - SPY or IVV
- (10%) Large-Cap Value Index - IVE
- (10%) Small-Cap Index - IJR
- (10%) Small-Cap Value Index - IJS
- (10%) Total International Stock Index - EFA
- (10%) REIT Index - ICF

This portfolio can be found at <http://www.efitopics.com/?p=11> and is referenced back to a book called *The Coffeehouse Investor* by Bill Schultheis. The individual who was asking my assistance in analyzing this portfolio is 35 years old. He was interested in what our Monte Carlo simulation model would indicate about this portfolio. He was most interested in what the model would indicate about the attractiveness of cutting back on the bond allocation in order to make the portfolio somewhat more aggressive.

The baseline portfolio shown above looks okay when I run it through Quantext Portfolio Planner, but not especially good. In our analysis, we have substituted VBIIX for AGG. The portfolio has a Beta of 66.7% and an average yield of 2.9% (see chart below). The yield and fairly low Beta are achieved by largely driven by the bond portion of the portfolio. REIT's also generate reasonable yields. The average return and standard deviation in return are 12.14% and 6.4% respectively for the last three years. This is a very attractive ratio of return to risk for the three year period. The projected future average return is 9.26% per year (*Portfolio Stats*, below). That said, the standard deviation in annual return is 13.48% per year---a fairly high level of volatility for a portfolio with 40% in bonds. The projected future results from the Monte Carlo simulation in *Quantext Portfolio Planner* assume an average return for the S&P500 of 8.3% per year and a standard deviation in annual return of 15.07% per year.

Portfolio Stats	
Average Annual Return	Standard Deviation(Annual)
9.26%	13.48%
Historical Data	
Start: 6/1/2003	End: 5/31/2006
Average Annual Return	Standard Deviation (Annual)
12.14%	6.40%
Historical Beta: 66.74%	
Historical Yield: 2.90%	

Baseline Portfolio

This baseline portfolio is projected to generate 1% per year more than the market as a whole (9.26% vs. 8.3% assumed for the S&P500), with less overall volatility as reflected by the standard deviation in return (13.48% vs. 15.07 for the broader market). This portfolio does not, however, make particularly good use of diversification effects in its equity portion, however. This portfolio is an example of pure style analysis without regard for the quantitative aspects of the portfolio.

In an attempt to generally keep with the spirit of this portfolio, we have added several portfolio components. We have added a utility-focused ETF (IDU) and a healthcare-focused ETF (IYH). These two sectors provide very good diversification opportunities. Further, we have chosen to substitute two international ETF's for the one used in this example. Note that the original portfolio discussion did not specify which international funds to use. Rather than EFA, we have found that ADRU (large cap Euro blend) and ADRD (large cap developed markets blend) provide superior portfolio diversification effects (see <http://www.quantext.com/ForeignETF2a.pdf>).

			Portfolio Stats	
Fund Name	Percentage of Funds	Average Annual Return	Average Annual Return	Standard Deviation(Annual)
IVV	5.0%	8.35%	9.68%	13.44%
IVE	6.0%	8.69%		
IJR	7.0%	11.97%		
IJS	5.0%	12.11%	Historical Data	
EFA	0.0%	9.04%	Start:	End:
ICF	11.0%	17.06%	6/1/2003	5/31/2006
VBIX	26.0%	6.46%	Average Annual Return	Standard Deviation (Annual)
IDU	10.0%	10.24%	12.39%	6.42%
IYH	15.0%	5.34%	Historical Beta: 62.52%	
ADRU	10.0%	14.97%	Historical Yield: 2.43%	
ADRD	5.0%	9.37%		
-	0.0%	-		

Modified Portfolio

The modified portfolio, with results shown above, has been tuned to have exactly the same historical volatility as the original portfolio (SD in annual return = 6.42%), but with an attempt to improve the portfolio diversification effects and increase average return relative to risk. This portfolio has essentially the same projected standard deviation in annual return from the Monte Carlo analysis (see Portfolio Stats above), but with an additional 0.42% per year in average return (9.68% vs. 9.26% for the original portfolio). This portfolio has lower Beta than the original but also has a lower yield. This is a good portfolio, and an extra 0.42% per year is nothing to sneeze at. This portfolio is definitely preferable to the original in all aspects unless you are specially looking for yield.

Looking at this portfolio, I decided to tweak the yield slightly by incorporating some high-yield stocks that would also complement this portfolio in terms of strategic diversification effects. I added GNI (Great Northern Iron Ore Properties) and CEI

(Crescent Real Estate Equities). Both have high sustained yields and we have examined these before as part of a portfolio proposed by Ben Stein and Phil DeMuth.

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IVE	5.0%	8.69%		
IJR	6.0%	11.97%		
IJS	6.0%	12.11%	Historical Data	
EFA	0.0%	9.04%	Start:	End:
ICF	6.0%	17.06%	6/1/2003	5/31/2006
VBIX	35.0%	6.46%	Average Annual Return	Standard Deviation (Annual)
IDU	6.0%	10.24%	11.77%	6.43%
IYH	6.0%	5.34%	Historical Beta: 64.15%	
ADRU	7.0%	14.97%	Historical Yield: 3.41%	
ADRD	8.0%	9.37%		
GNI	4.0%	27.75%		
CEI	6.0%	12.51%		

Final model portfolio with added yield

Our final model portfolio is, in my opinion, a very solid portfolio that makes good use of strategic asset allocation. While this portfolio has substantial weightings in several sectors, the total portfolio is extremely well diversified from a quantitative standpoint. Quantext Portfolio Planner accounts for correlations between the non-systematic components of return, so we have included any potential for this effect to increase total portfolio risk. Once again, we tuned the allocations in this portfolio so as to have the same level of historical volatility (see *standard deviation in annual return* under **Historical Data** above). This portfolio also has almost the same projected future standard deviation in annual return as the original portfolio (13.44% vs. 13.48% for the original portfolio). This portfolio has a very high level of diversification among the non-market components on return for the portfolio assets. The *Diversification Metric*, our measure of this effect in Quantext Portfolio Planner, is 49% for this portfolio. For a broad market portfolio, this indicates very strong diversification (more details of the measurements of diversification can be found at:

<http://www.quantext.com/TrueDiversification.pdf>.

The ultimate impact of using strategic asset allocation to maximize returns relative to risk on the overall portfolio is that the average annual (total) return projected for this portfolio is 10.13% per year (see **Portfolio Stats** above). This is a notable improvement on the original portfolio---a gain of 0.87% per year with slightly less total risk and a portfolio yield that is greater by 0.5% per year than the original.

It is often hard for people to conceptualize the portfolio impact of an improvement in annual return. Monte Carlo analysis can help to put this in perspective. *Quantext Portfolio Planner* projects how long your portfolio will be able to sustain your income in retirement at different confidence levels. The person, let's call him John Doe, who sent me the original question about the baseline portfolio said that he was 35 and had

\$150,000 invested. Let's imagine that he invests \$15,000 per year in this portfolio (increasing with inflation) and that he will retire at age 65 and he wants \$100,000 per year in income (in 2006 dollars) in retirement. How much difference does our final portfolio have on his prospects for funding his desired future income?

Probability of Running Out of Money	Age
10%	76
15%	78
20%	80
25%	82
30%	85
35%	89
40%	93
45%	99

Prospects for retirement with original portfolio

One of useful outputs from Monte Carlo simulation is the ability to calculate the odds of running out of funds by a certain age in retirement. Simple calculators that do not account for market volatility are hopelessly optimistic. Monte Carlo provides meaningful estimates of the impacts of portfolio risk. If John Doe invests in the original model portfolio and re-balances annually to maintain these allocations, how do things look? On average, John is fine—this we know. Still, he has a 25% chance of running out of money by age 82. This is a meaningful risk—one in four.

Probability of Running Out of Money	Age
10%	79
15%	84
20%	88
25%	92
30%	99

Prospects for retirement with the final portfolio

When we look at the Monte Carlo output for the same basic scenario, but with John investing in the final model portfolio, he now has a 25% chance of running out of money by age 92. It is common in financial planning circles to think in terms of the 20-30% chances of drawing down the portfolio because these are typically the types of odds that people are concerned with and can reasonably estimate. Further, as William Bernstein has argued, trying to estimate the lower probability cases is problematic because of the potential for unique one-off economic dislocations such as war or depression. If we think in terms of the 1-in-4 risk of drawing down his portfolio, **the final modified portfolio has added ten years to John's realistic investment horizon.** This does not mean that this is the optimal portfolio for John. We have designed our final model portfolio to maximize average return with a constraint that historical and projected standard deviation in returns (i.e. total risk) match the original portfolio. It is quite

possible that a portfolio with higher total return and risk will further increase John's ability to fund his desired income stream.

This article was inspired by the question of what the *Quantext Portfolio Planner* would indicate about the basic portfolio shown at the start of the article. While that portfolio looks okay from a basic style analysis standpoint, it is not particularly well designed to take advantage of strategic asset allocation effects. The final portfolio, which includes some sector concentrations and a couple of individual stocks, is clearly superior. Further, the Monte Carlo simulation suggests that the portfolio modifications could add ten years of retirement income for John with no additional risk.

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