



*When More Risk is Less Risky*

Geoff Considine, Ph.D.

## *Executive Summary*

One of the most important issues in portfolio planning is determining whether a portfolio is allocated to properly meet an individual's specific needs. People frequently make allocation decisions that have very little connection to their personal situations. In particular, many investors do not understand how building more or less aggressive portfolios impacts their ability to provide for income in retirement. Quite often, a portfolio with higher short-term risk will reduce your long-term risk of running short of funds in retirement. Finding the right risk-return balance requires that you build strategically diversified portfolios and analyze them in the context of your specific case.

To demonstrate this effect, I have taken three well-designed portfolios by Agile Investing and looked at how well they would serve one specific person. To examine this issue, I have used our Monte Carlo portfolio simulation tool. Our projections suggest that the future returns and volatility in these portfolios will be:

	Projected Annual Return	Projected Annual Standard Deviation in Return
Conservative Growth	7.24%	8.26%
Moderate Growth	8.39%	10.34%
Aggressive Growth	9.45%	12.71%

The *Conservative* case has substantially less short-term risk than the *Aggressive case*, as measured by the annualized standard deviation in return. Do these results suggest that a more risk-averse person will prefer the Moderate or Conservative portfolio? These portfolio designations are correct for describing short-term volatility, but must be considered with some care in light of long-term planning goals.

I looked at a test case of a 40-year old John Doe with \$150,000 invested, and making annual contributions of \$18,000 per year. John plans to draw \$65K per year in income upon retirement (in 2005 dollars). If John looks at his probability of running out of money by a certain age in retirement, he can see which portfolio is riskier for him. In the *Conservative* case, John has 20% chance of running down his portfolio by age 85. If he follows the *Aggressive* allocation, he has a 20% chance of running down his portfolio only if he lives to 104. **John Doe's future is considerably less risky if he invests in the Aggressive portfolio than if he allocates according to the other two (less risky) portfolios.**

For any individual, there will be an appropriate balance between risk and return that will maximize his or her chances of reaching financial goals while limiting the chances of substantial losses. Without examining a portfolio allocation for your specific situation, however, it will be very difficult to determine where the optimal balance of risk and return falls. Generic approaches based purely on age have some value, but do not account for a range of factors including the specifics of current portfolio size, ongoing contributions, etc. Similarly, looking only at short-term risk/return tradeoffs may lead to decisions that are not ideal for longer-term investing horizons.

## ***Introduction***

In a recent paper, I analyzed three model portfolios proposed by Agile Investing. Agile Investing presented these portfolios and the rationales for them in a recent article on ETFInvestor.com:

<http://etfinvestor.com/article/5981>

This article proposed allocations for investors looking for *Conservative Growth*, *Moderate Growth*, and *Aggressive Growth*. The names of these portfolios are qualitative, but Monte Carlo simulations allow us to determine exactly how the portfolios have performed in the past and are likely to perform in the future. The components of these portfolios include the usual common style elements, such as large cap, mid cap, international funds, and bonds. The portfolio also includes some focused fund for U.S. healthcare, commodities, precious metals, and energy. Quantext's paper that discusses the analysis of these three portfolios using Monte Carlo simulation is available at:

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

Quantext's Monte Carlo portfolio tools project future performance for these three portfolios:

### ***Agile Portfolio Performance***

	Projected Annual Return	Projected Annual Standard Deviation in Return
Conservative Growth	7.24%	8.26%
Moderate Growth	8.39%	10.34%
Aggressive Growth	9.45%	12.71%
S&P500	8.30%	15.07%

The table above shows the projected future average annual return for each portfolio, assuming annual re-balancing, and the projected standard deviation in annual returns (the standard measure of volatility). The projected values assumed for the S&P500 are shown in the last line of the table for reference. These results show that the three portfolios range in risk and return, with the expected changes from portfolio to portfolio. The

*Conservative* portfolio shows the lowest risk and lowest return and the *Aggressive* portfolio shows the highest risk and highest projected return, etc.

In this paper, we are going to examine the implications for an individual who selects one of these portfolios over another. Is the investor who properly follows the *Aggressive Growth* portfolio going to be more of a risk taker than the investor who chooses the *Conservative Growth* portfolio? What do these qualitative descriptions and risk numbers really mean for an investor? Portfolios can be too conservative. After all, we invest in stocks because we want to harness the higher growth potential of equities. How much is enough? How can we determine if a portfolio is too conservative for any given person? In other words, for whom is the *Aggressive* portfolio really aggressive, and vice versa? Unfortunately, most investors cannot answer these basic questions. A typical investor may look at these allocations and then classify him or herself into one of these three groups, but such a qualitative categorization can lead to major mistakes.

### ***What Does Risk Mean?***

The *standard deviation in annual return* is a common measure of investment risk for a portfolio or for individual assets. Standard Deviation (SD) is a statistical measure of variability and in investing theory, SD is discussed for returns—percentage change in prices over some period of time. If we say that the average return for the S&P500 is 8.3% with SD=15%, this means that you should expect returns of 8.3% $\pm$ 15% for most years (around 2/3 of years will have return in this range). You will see returns within two standard deviations (8.3% $\pm$ 30%) in 95 out of 100 years. What does this mean for any given investor? Obviously the *Aggressive* portfolio has a substantially higher standard deviation in returns than the *Conservative* portfolio. In the short-term, that means that you will expect to see higher levels of fluctuations in return. On longer time horizons, short-term fluctuations tend to be diversified away. The balance of short-term volatility with diversification in time is an important factor in choosing your portfolio allocation.

I and many other people feel that the average return and SD of return are hard for people to get a feel for. A much more intuitive measure of a portfolio is to project through retirement and look at the probability that you will run out of money by a certain age. What are the chances that you will run out of money by age 75? To me, and to most people, this is a good measure of *risk*. If you are investing for future income, you will be less concerned with short-term volatility and more concerned with ensuring a stable income in future years. This is where Monte Carlo analysis can be very helpful.

Consider the case of John Doe. John is 40 years old, has a portfolio worth \$150,000, and he is adding \$18,000 per year. John wants to retire at age 65 and thereafter to draw \$65,000 per year in income (in 2005 dollars) from his portfolio:

***Summary for John Doe***

Current Age	40
Date of Retirement	2031
Age at Retirement	65
Annual Contribution (2005 Dollars)	\$18,000
Current Portfolio Value	\$150,000
Inflate Contributions at inflation?	Yes
Inflate Income Draw?	Yes
Income in Retirement (2005 Dollars)	\$65,000

***Monte Carlo Analysis***

The best way to examine the probable success of an asset allocation strategy is using a good portfolio Monte Carlo model. Quantext’s portfolio Monte Carlo tools were used to analyze the three Agile Investing portfolios in a recent paper and they allow us to examine John Doe’s likelihood of being able to fund his retirement.

Let's start by imagining that John took a big hit during the bubble and that he's feeling pretty conservative, so he figures that a good place to start is with the **Conservative** portfolio. When we project John's scenario forward, we can calculate the probability that he will run out of money by a certain age and we also do the calculations for a draw of 10% less income (which comes out to \$58,500 per year). How do things look?

***Monte Carlo Outcomes for Conservative Portfolio***

Annual Draw (2005 \$)	\$65,000	\$58,500
Probability of Running Out of Money	Age	Age
10%	81	83
15%	83	86
20%	85	88
25%	87	90
30%	88	92
35%	90	94
40%	92	97
45%	94	99
50%	96	103

In this investment case (above), John has a 25% chance of running out of money by age 87. In other words, John has a 3-in-4 chance of successfully funding his retirement at this level until age 87. As to whether that is certain enough depends on John's risk tolerance. Let's say that John knows that he is expected to live to age 87 (on an actuarial basis) and he figures that this risk is acceptable. Still, he'd really like to be able to draw more income, so he decides to look at the Moderate portfolio.

*Monte Carlo Outcomes from Moderate Portfolio*

Annual Draw (2005 \$)	\$65,000	\$58,500
Probability of Running Out of Money	Age	Age
10%	84	88
15%	89	93
20%	93	99
25%	96	Not Found
30%	101	Not Found
35%	104	Not Found
40%	Not Found	Not Found
45%	Not Found	Not Found
50%	Not Found	Not Found

I ran the moderate portfolio through the Monte Carlo portfolio (table above). With this allocation, but keeping all other variables the same, John now has a 25% chance of running out of money by age 96---which means a 3-in-4 probability of being able to fund his retirement at this level until age 96, nine years longer than with the conservative portfolio. By allocating his portfolio following the moderate portfolio rather than the conservative portfolio substantially increases John's income horizon. **A riskier portfolio, in this situation, actually reduces the risk that John will run out of money during retirement.**

**Monte Carlo Outcomes from Aggressive Portfolio**

Annual Draw (2005 \$)	\$65,000	\$58,500
Probability of Running Out of Money	Age	Age
10%	88	93
15%	94	101
20%	104	Not Found
25%	Not Found	Not Found
30%	Not Found	Not Found
35%	Not Found	Not Found
40%	Not Found	Not Found
45%	Not Found	Not Found
50%	Not Found	Not Found

If John uses the Aggressive portfolio allocation, his situation looks even better (above). The simulation only goes out until age 104 and John has an 8-out-of-10 probability of being able to fund his retirement until age 104 if he follows the *Aggressive* portfolio (i.e. the 20% probability above). This is even better than the moderate portfolio.

**When More Risk is Less Risky**

At first glance, these results may seem somewhat hard to understand. **A portfolio with a higher risk level (as measured by Beta or standard deviation) may make your future less risky, and vice versa.** There are, of course, limits. John Doe has a long investing future ahead of him and time helps to lessen the long-term impacts of short-term volatility. In this case, John Does might even reduce his risk of running out of money in retirement even more by further increasing the short-term risk in his portfolio. The *Conservative* portfolio is actually riskier in the long-term for John Doe than the *Aggressive* portfolio because the *Conservative* portfolio simply does not provide a high enough expected return to give John good odds of funding his future income.

Using the probability of running out of funds as a guide to determining the right level of risk and return to carry in a portfolio is a reasonable approach. Doing this kind of

analysis allows you to see the combined effects of your current portfolio, your planned contributions, portfolio risk, and your income requirements. Without considering all of these factors, an asset allocation plan is far more likely to miss the mark.

The real punch line here is that while the portfolios profiled here are well allocated to take advantage of diversification effects, it is unclear as to whether any of them are appropriate for any specific person without some additional work. The right balance of risk and return for each person is a function of all of the factors discussed above. This is one of the reasons why Monte Carlo simulation tools are important—they allow you to develop some idea as to whether a portfolio is appropriate for your specific situation. There will be people for whom the *Aggressive* portfolio profile here is more risky in an absolute sense than the other two portfolios. There will also be people (such as our John Doe) for whom the best way to ensure their future income is to build a portfolio with higher volatility and Beta. It must be kept in mind, of course, that strategic allocation is a critical issue in gaining return for the risk that you bear and this is why we started with three portfolios that we had already determined took good advantage of diversification effects.

More papers and discussions of Quantext's portfolio planning tools can be found at:

<http://www.quantext.com/gpage3.html>.