

One important issue for portfolio planning is what you assume for the future equity risk premium for the market as a whole. Basically, how much extra return over a risk-free investment can you reasonably expect for buying equities and other risky asset classes? In a practical sense, I am talking about what you assume for the future average return and standard deviation in average return for the S&P500. This is an issue that gets a lot of attention in academic circles but is also critically important to the practical process of portfolio planning. Consider the following historical data:

	10 years	20 years	30 years	40 years	50 years
Average Annual Return	7.7%	9.4%	9.6%	7.9%	7.7%
Standard Deviation in Annual Return	15.6%	15.2%	14.8%	15.1%	14.4%

Historical performance data for the S&P500

The intuitive definition of the equity risk premium is simply how much return you will get from the market for bearing the risk of loss. For more information and background on how academics estimate the equity risk premium, you can find some articles at *Investopedia* (<http://www.investopedia.com/terms/e/equityriskpremium.asp>). Even without reading any articles, however, it is probably clear that if the market as a whole provides an average return of 7.9% per year with a standard deviation of 15.1% per year (as it has over the last forty years), your retirement will look a lot less rosy than if the future market tends to reflect the average conditions over the past twenty years, with an average annual return of 9.4% per year at an almost identical level of volatility (i.e. standard deviation in annual return shown above). Just how large an impact this can have on your future retirement will be made clear as we proceed.

Your assumptions about the future risk and return in the broader market are very important in how you build your portfolio and determining how much you need to save. Many investors have recently been shocked by the volatility in their portfolios in May-June 2006. This is not because recent volatility has been high by historical standards, but rather because many investors have been lulled into a false sense of security by the very

low market volatility that we have seen over the past three years. In the three years through May 2006, the standard deviation of the S&P500 has averaged 7.8% per year, about half of the long-term averages shown above. We have also seen very high average returns relative to this level of risk—a very high equity risk premium—over the past several years. The very high returns relative to risk cannot be sustained in the long haul. The challenge for most investors and their advisors is to plan with the long-term equity risk premium in mind rather than building more and more aggressive portfolios during periods of low market volatility. Unfortunately, many people have portfolios in the latter camp. When the volatility of the broader market is low, many investors take on riskier asset allocations and, in the short term, don't appear to pay a price for these more aggressive investments. When volatility returns—as it always does—many of these investors get clobbered because their portfolios are too risky for them in a higher volatility environment.

Quantext Portfolio Planner (QPP), our portfolio planning tool, allows the user to adjust the assumptions about the future average returns and volatility of the S&P500 and I tend to use a projected average return of 8.3% per year for the S&P500, with a standard deviation in return of 15%. Looking at the table above will demonstrate why this makes sense as a fairly reasonable assumption. There has been considerable research into the equity risk premium and a well known academic paper studying long-term global market data is available here (Dimson et al, 2002):

<http://faculty.london.edu/edimson/Jacfl.pdf>

The equity risk premium is defined as the average return that equities provide beyond the risk-free rate. The calculated historical risk-free rate varies somewhat depending upon what you assume for the risk-free asset (see the paper above). The risk-free rate of return is a function of the rate of inflation, so the equity risk premium is closely related to the 'real rate of return' which is defined as the return on equities beyond inflation. It must be understood that the risk free rate varies, so that a real investor will ultimately be concerned not with the equity risk premium, but rather with estimating the future total return for the assets in his/her portfolio. Ultimately, we must assume a total rate of return and a standard deviation in the total return for equities—and in light of analysis such as

that in the paper above, it makes the most sense to take conservative estimates from history—as in the table at the start of this article.

When you assume the average and standard deviation in annual returns for the broader market, these statistics have an important bearing upon what *all* assets and asset classes will return and their volatilities. One reason for this is Beta. Any asset class with a non-zero value of Beta will get more volatile if the S&P500 gets more volatile. On a more fundamental level, though, the essence of capital markets is to provide increased return as risk increases (measured by standard deviation in return). If the overall risk in the market increases relative to the average rate of return, it stands to reason that investors should expect higher risk relative to return across all asset classes. *Quantext Portfolio Planner* accounts for both of these effects.

Given the uncertainties as to the future risk premiums that equities will provide, it is of interest to look at portfolio projections in QPP and how these change as we change our risk/return assumptions about the long-term market as a whole. Let's start with a broad portfolio of equities and bonds. Our equity exposure is broadly spread across asset classes using ETF's:

Ticker	Type
IVV	S&P500 Index
IVE	S&P500 Value Index
IJR	Small Cap Index
IJS	Small Cap Value Index
EFA	MSCI EAFE Index
ICF	REIT Fund
VBIIX	Intermediate Bond Index
IDU	Utilities Index
IYH	Healthcare Index
ADRU	European Large Cap
ADRD	Global Large Cap

Portfolio components

I created a fairly aggressive and broadly diversified portfolio from these components to explore the issue of portfolio sensitivity to assumptions about the future market. To

simulate this portfolio, I have first assumed that the S&P500 will generate average returns and volatility equal to what we have seen over the last ten years (average return of 7.7% per year with a standard deviation of 15.6%). When I ran this portfolio through QPP, I obtained the following:

			Portfolio Stats	
Fund Name	Percentage of Funds	Average Annual Return	Average Annual Return	Standard Deviation(Annual)
IVV	5.0%	7.75%	10.24%	16.68%
IVE	5.0%	8.10%		
IJR	10.0%	11.48%		
IJS	10.0%	11.63%	Historical Data	
EFA	5.0%	8.47%	Start:	End:
ICF	15.0%	16.74%	6/1/2003	5/31/2006
VBIX	20.0%	5.80%	Average Annual Return	Standard Deviation (Annual)
IDU	10.0%	9.70%	15.50%	7.57%
IYH	5.0%	4.64%	Historical Beta: 77.51%	
ADRU	10.0%	14.58%	Historical Yield: 2.37%	
ADRD	5.0%	8.80%		
-	0.0%	-		

Sample portfolio projections using market risk/return balance from trailing 10 years

This portfolio has yielded an average return of 15.5%, with a standard deviation of 7.57% over the past three years (***Historical Data*** above). QPP projects that this portfolio will generate an average annual return of 10.24%, with a standard deviation of 16.68% per year (see ***Portfolio Stats***). To make this example really concrete, let's consider a Jane Doe. Jane Doe is 35 years old, with \$150K saved and with a savings rate of \$15K per year. She wishes to retire at age 65 with a draw of \$120K per year (in 2006 dollars).

Probability of Running Out of Money	Age
10%	73
15%	76
20%	78
25%	80
30%	83
35%	86
40%	89
45%	99

Jane Doe's Retirement Survival Rate

When I look at QPP's calculation for Jane Doe's retirement survival rate (above), the results suggest that Jane has a 25% chance of running out of funds by age 80 under this scenario.

Now, what happens if the market as a whole returns more like what we have seen over the past thirty years? The past 30 years have rewarded risk-tolerant investors very highly. If I assume that the average annual return for S&P500 is 9.6% per year, with SD of 14.8% (as in the last 30 years), QPP suggests that Jane's situation is vastly better:

			Portfolio Stats	
Fund Name	Percentage of Funds	Average Annual Return	Average Annual Return	Standard Deviation(Annual)
IVV	5.0%	9.64%	12.22%	15.85%
IVE	5.0%	9.98%		
IJR	10.0%	13.19%		
IJS	10.0%	13.33%	Historical Data	
EFA	5.0%	10.33%	Start:	End:
ICF	15.0%	18.19%	6/1/2003	5/31/2006
VBIX	20.0%	7.80%	Average Annual Return	Standard Deviation (Annual)
IDU	10.0%	11.50%	15.50%	7.57%
IYH	5.0%	10.76%	Historical Beta: 77.51%	
ADRU	10.0%	16.14%	Historical Yield: 2.37%	
ADRD	5.0%	10.65%		
-	0.0%	-		

Sample portfolio projections using market risk/return balance from trailing 30 years

Jane's portfolio in this market simulation will generate an additional 2% per year in average return with considerably less risk. The combination of both of these factors leads to a far rosier projected survival rate for her retirement plans:

Probability of Running Out of Money	Age
10%	85
15%	97
20%	100

Jane Doe's retirement survival rate for more generous market assumptions

Jane now has a 20% chance of running out of money by age 100 as compared with that same chance at age 78 (with the more conservative market assumptions). This is a huge difference in outlook.

What are we to make of the fact that we can end up with a range of twenty years in the projected safe retirement period just by changing input assumptions about the broader U.S. market—which is equivalent to making some assumptions about both inflation and the equity risk premium? The current consensus among theoretical types is that equity risk premiums will be lower than we have seen over the past thirty years and that we are likely to see long-term inflation rates of around 3%. That said, one of the more interesting points in the paper by Dimson et al (cited earlier) is that finance professors' outlooks on the equity risk premium are heavily conditioned by recent history and this paper came out in 2002—a period that had witnessed the collapse of an historically long bull market. While capital markets have richly rewarded investors for the risk that they bear over the past decades, there is no guarantee, nor even any assurance, that these patterns will continue. That said, there are reasonable assumptions that one can make. My standard assumption of 8.3% per year for the S&P500 lies within the range of historical results and it not inconsistent with the range of equity risk premiums projected by Dimson et al.

The point of this case study is not to identify a great portfolio for Jane Doe but simply to show how sensitive our portfolio projections can be to the basic assumption about the future risk/return balance of the broader market—even when a substantial fraction of the portfolio is not invested in the S&P500. In some sense, this is the 800lb gorilla sitting in the middle of financial planning. We can plan all we want, but we have a lot of uncertainty in our projections due to the uncertainty in the future reward that the markets pay for bearing risk. As for me, I believe that the best thing is to be conservative. Hope for the best and plan for the worst. While one might be able to justify an argument for an average return from the S&P500 of around 10% with a standard deviation of 15% (like the last 30 years), the best consensus is that the last 30 years have been something of an

anomaly. Over longer periods, something closer to 8-8.5% per year (with standard deviation of around 15%) is more reasonable for long-term planning.

When you are looking at a portfolio, it is of considerable value to be able to examine the impact of a reduced equity risk premium in the future. One of the attractive features of Monte Carlo simulations is to the ability to analyze how well your portfolio will meet your needs if the equity risk premium of the broader market changes. If current projections of the balance of risk and return in the broader market are too conservative, perhaps I will retire a decade early. The simple fact is that I would far prefer to err on this side of the balance than to assume an overly-generous equity risk premium and end up working far beyond my desired exit from the workforce.

More information on *Quantext Portfolio Planner* and a free trial are available at <http://www.quantext.com/gpage3.html>