

Decide Allocation on Volatility or Probability?

Financial Planning Errors

The average couple at age sixty two will have at least one of them living another thirty years. That means half will have one of them living longer than that.

There is a common belief that one should move more into bonds and “safer” investments as one gets older. A lot of people will not have enough, no matter how they invest because they haven’t been investing enough. This number will go up as the defined benefits or guaranteed monthly payments from the corporate or public sectors go down.

A lot of other people will have far more than the habits of their lifestyle will ever permit them to consume. Assume a chart with two lines for the situation of families having more than enough. One line shows withdrawal requirements over time and the other line shows net worth over time. The withdrawal line is not going to come close to the net worth line regardless of market fluctuations. The chart is like the fish in Lake Superior not having to worry about water to swim in no matter how choppy the waves are on the surface. For these people, most of their assets will go to heirs, charities or estate taxes; their age my direct investments towards uniform donor trusts or long-term investments to benefit from a stepped up basis, but does not direct investments towards income in contrast to gains.

The middle group needs to invest prudently in order to finance an adequate lifestyle after they no longer have sizeable work-related income. This analysis is to help you decide how to balance fixed income and equity investing so as to be most certain of a planned lifestyle.

In planning for the future, protecting the current nest egg is not nearly as important as the degree of certainty that one will have the required or desired assets at given time points in the future. In going from my house to your house, to go straight “as the crow flies” is not nearly as important or practical as the easiest way to get there with the greatest degree of certainty. In investing, the variation of returns along the way is not nearly as important as the degree of certainty in reaching the destination.

Too many financial projections are built using a constant annual rate of return. While equities might have returned an average of 10% annually over the last many years, it is almost a certainty that it will not return 10% in each of the years going forward. The market returns will vary widely, even more widely than the normal statistical distribution of a bell curve, which is the statistical foundation for many Monte Carlo calculations. This paper presents an alternative Monte Carlo for looking at the probabilities of future returns.

Most people either under-plan or over-plan for their financial future. The under-planners don’t have a clue. They procrastinate and say that they just don’t like doing that kind of thing. The over-planners often have plans with more complexity and unknown assumptions than anyone can understand. The over-planners, often with professional help, try to be overly precise in predicting an unknowable future.

Especially with the uncertainty surrounding both governmental and private pension programs, it is very important for everyone to have a general but realistic picture of different probabilities for their financial future. In summary, I believe that the most common errors are:

1. Not having any kind of financial plan that covers multiple years and includes variables such as varying income, investment returns, inflation and expenses.

2. Trying to plan with too much detail and too precisely for the future, and then consequently being anxious when things do not unfold that way.
3. Leaving the planning to someone else and not having a thoroughly understood plan that fits.
4. Doing plans with fixed average annual rates for things such as inflation and investment returns. The concepts of risk and variation need to be taken beyond abstract numbers accompanied by fear and anxiety to some concrete pictures that can be understood.

How to Decide Between Equities and Bonds

One of the most basic investment planning decisions is to decide between bonds or fixed income and equities such as stocks and mutual funds. The primary purpose of this paper is to provide data and context for making this decision with the maximum amount of certainty in order to achieve required investment returns.

Shiller Historical Data

To get a relatively simple but realistic picture, let us assume that in our planning scenario we withdraw five percent of our investment assets the first year of our planned withdrawal to supplement Social Security and other income. To give specific numbers, investment assets of \$800,000 would give a \$40,000 annual supplement to other income. Let us assume the amount of the withdrawal does not vary based on the value or return on the investments, but changes with inflation or the Consumer Price Index (CPI).

We will also assume that money spends the same whether it is from interest, gains in the price of bonds, gains in the price of equities or dividends from equities. We will invest for maximum certainty and returns, assuming that we can manage cash flow to support withdrawals by a combination of interest, dividends or normal turnover in the sale of bonds or equities. Needing a regular income is not a reason to invest for interest or dividends.

Next, for each of the years going forward let us assume that the returns on fixed income and on equities match those of a randomly selected year since 1871, since 1920 or since 1960. Returns and CPI data for applying the returns from randomly selected past years to future years were found at <http://www.econ.yale.edu/~shiller/data.htm>, a website sponsored by Robert Shiller of the International Center for Finance at Yale University. The data are updates for the data used in his 2001 book *Irrational Exuberance*. The annual data covered equities, one-year Treasuries, long-term bond yields and the Consumer Price Index. An Excel worksheet was set up (and is available) that runs this scenario of randomly assigning past returns to the next thirty years one hundred times. Pressing the recalculation key runs it another hundred times, so it is easy to get a sense of how numbers vary over hundreds of simulations.

The purpose of this exercise is to get our eyes off the events of each month or year and develop a trust that will permit us to let the laws of large numbers work for us. If you are a conservative investor, you need to know these probabilities just like insurance companies – generally considered to be conservative – run their whole business on the laws of large numbers as calculated by their actuaries. The other environment where the laws of large numbers are very evident is in Las Vegas. While I haven't done a survey of people boarding their planes to go home, judging from the scale and opulence of the many hotels, I would judge that the laws of large numbers work very well for the gaming industry. A payout does not change their business plan, but is seen as merely an enticement to get more business. If the laws of large numbers are supporting the investor, downward volatility is not a loss over which to panic but merely a buying opportunity.

Results

Chart 1 shows the dollar difference after five, ten, twenty and thirty years between investing in the stock market with its gains, losses and dividends, and investing in one-year Treasuries. Since equities are more volatile, the longer time periods result in more extreme results at the tails of the distribution. Using data from the last 133 years, one-year Treasuries did better than equities about 31% of the time over a five or ten year period, and about 24% of the time over a twenty or thirty year period. As you

can see in the charts, not only did equities do better most of the time, but they did much better when they did better than the Treasuries did when they did better.

Chart 2 and Chart 3 give the same picture, but drawing randomly selected years only since 1920 or since 1960. Equities since 1920 have done better relative to Treasuries than since 1872. Since 1960, Treasuries exceeded equities for a five-year period 34% of the time, while exceeding equities for a thirty year period only 20% of the time.

Chart 1. Randomly Selected Years Since 1872

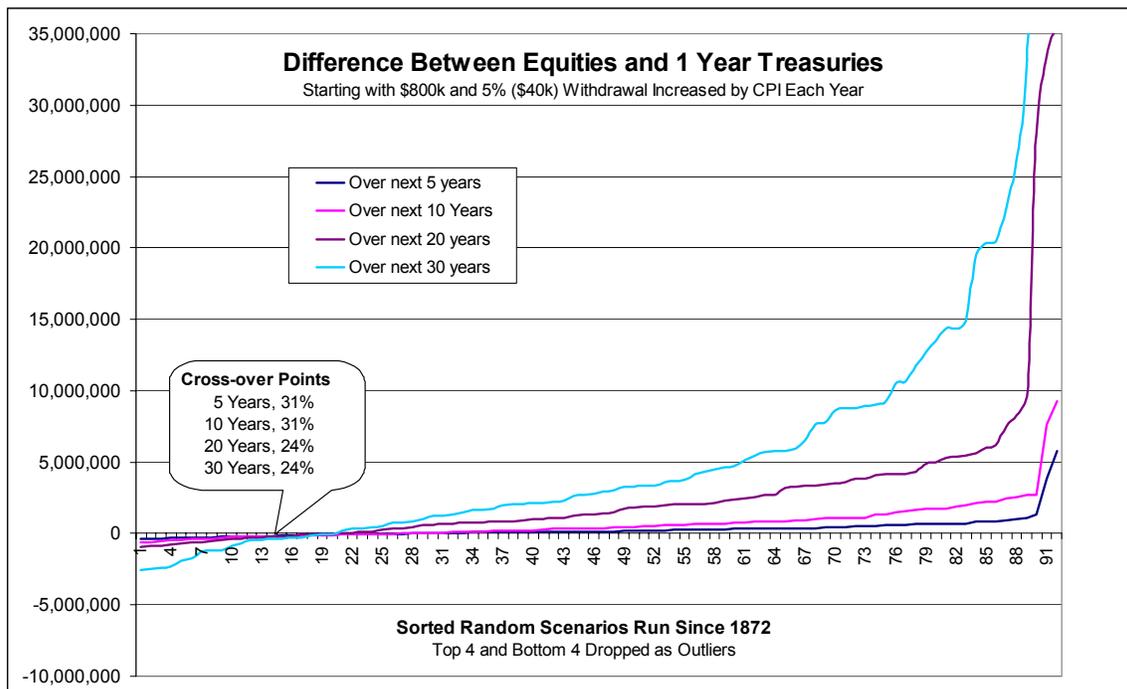


Chart 2. Randomly Selected Years Since 1920

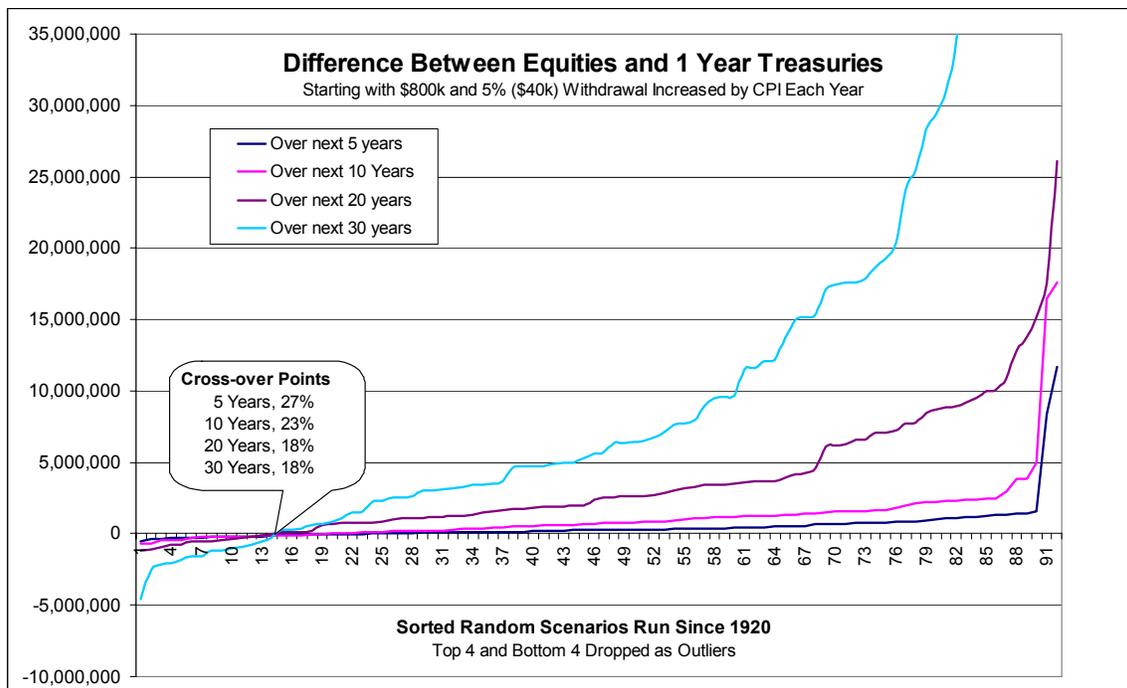
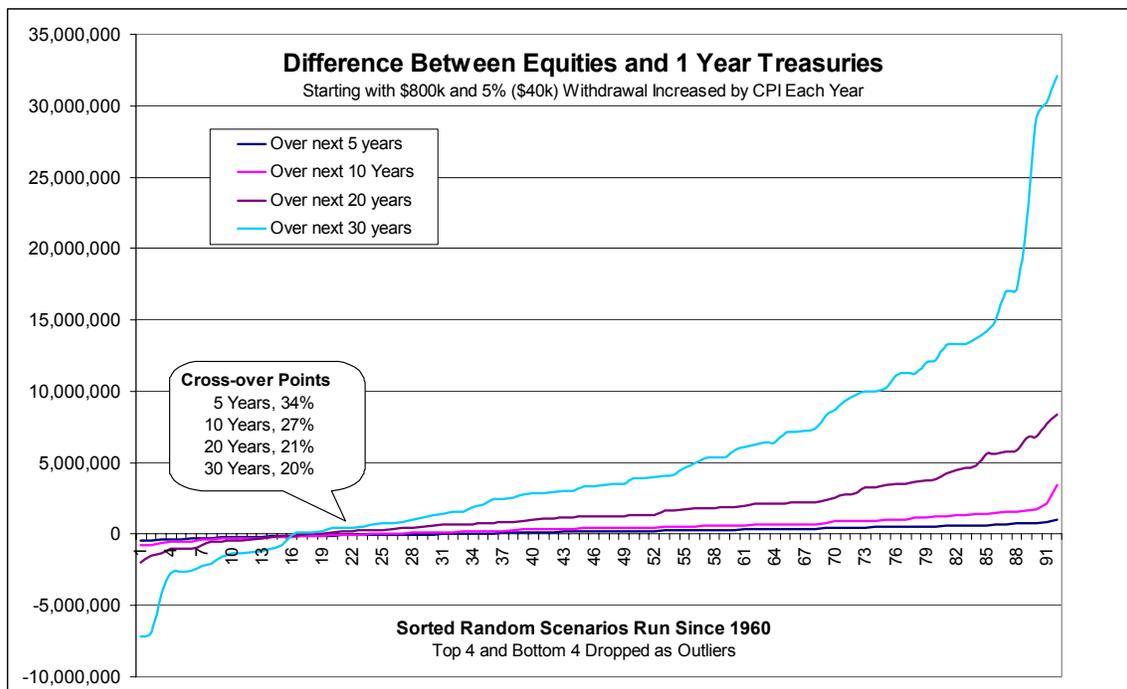


Chart 3. Randomly Selected Years Since 1960



What is important with all these data is to accept the general trends and results while not expecting too much precision. For example, the results are based on the S&P Composite Stock Price. Using another index would give somewhat different results, as described in an earlier study reported below. Also, each investor will do better or worse than the market average used in these calculations. Over four years Wenzel Analytics' returns are about three times the market return. Obviously, if such numbers continue and were inserted into the calculations, equities would fare much better relative to Treasuries.

Volatility versus Certainty

Obviously, Treasuries have more stable returns for the short-term, while the probabilities of better returns are with the equities even over a period as brief as five years. Once the data were assembled, it wasn't that difficult to get a couple charts to show the relative returns and volatility of the various data. Moving averages were used to smooth the lines.

Chart 4. Ten-Year Moving Averages

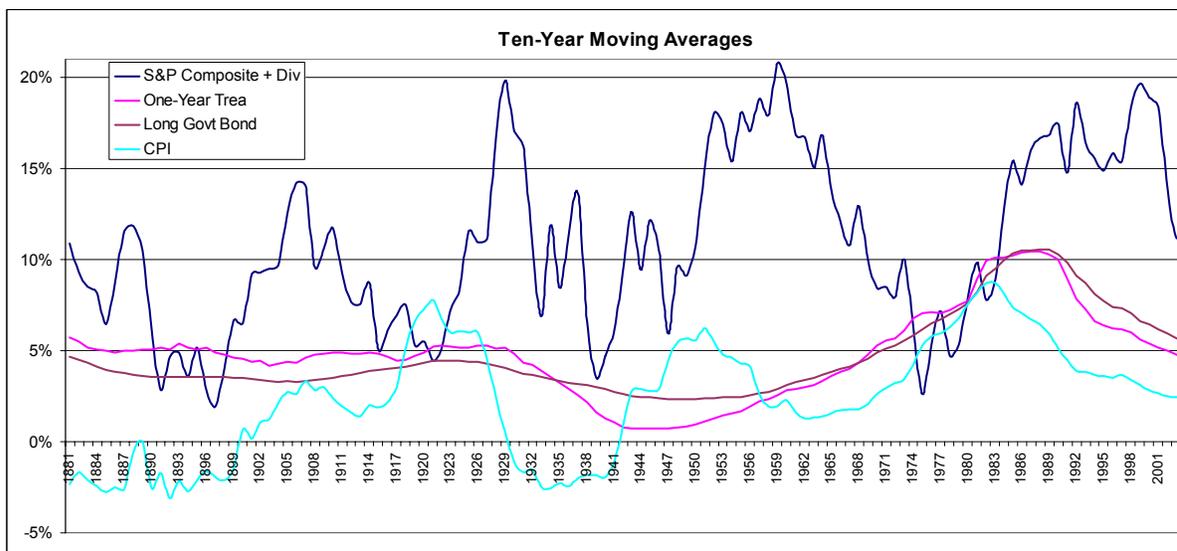
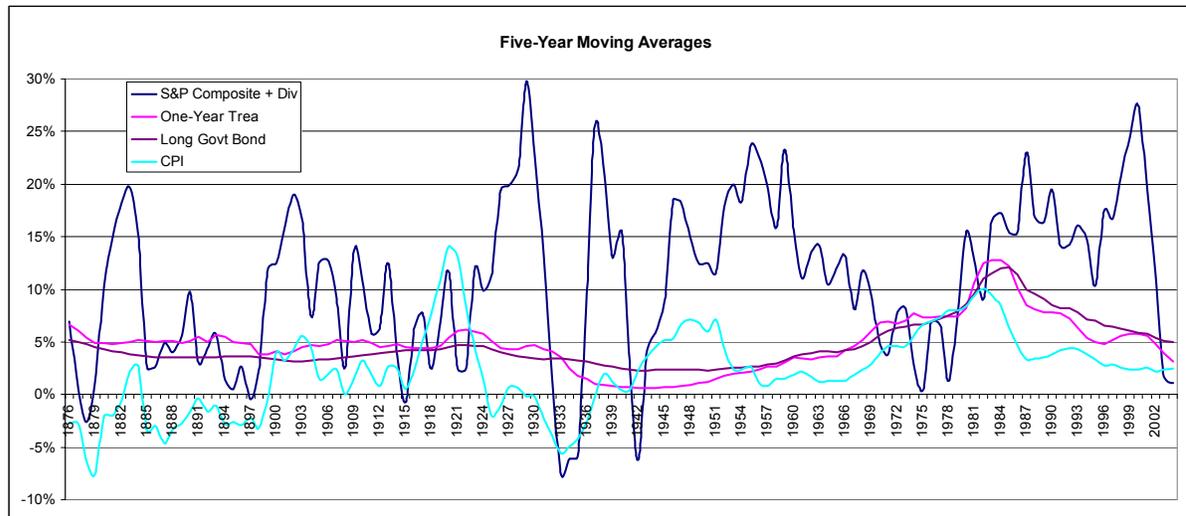
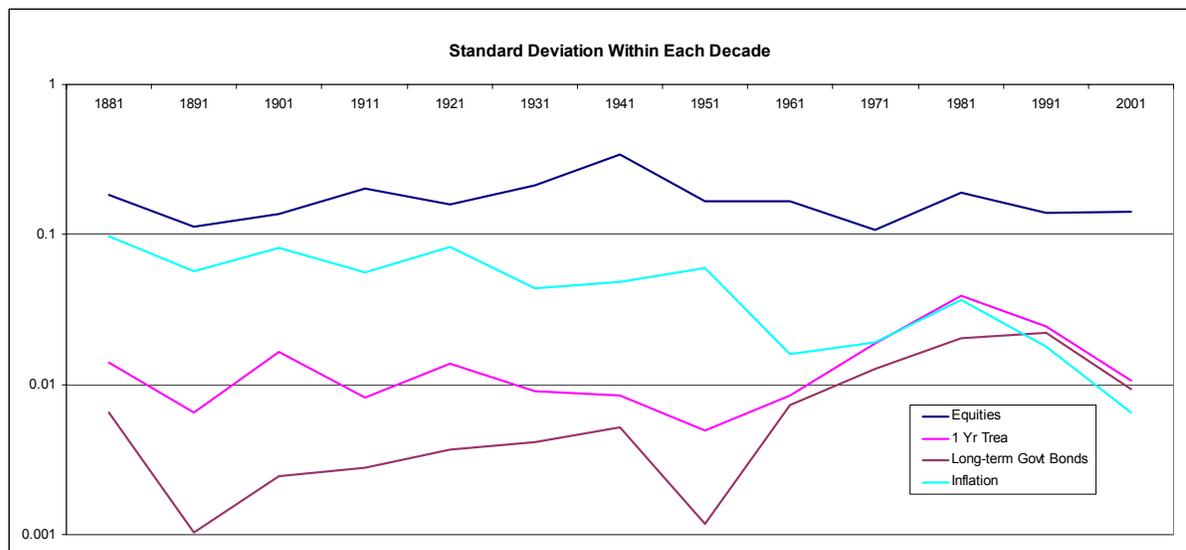


Chart 5. Five-Year Moving Averages

As you can see, the returns from equities are more volatile and usually higher than the fixed income returns. Naturally, the five-year moving averages are more volatile than the ten-year moving averages. The five-year moving average of (large-cap weighted) equity returns ending in 2004 are considerably below the middle of the equity returns at roughly 10%. There is a rather remarkable symmetry of patterns above the 10% line being followed by similar patterns below the line. Since the 1960's, the CPI has been a leading indicator for fixed income returns. Inflation is less volatile in recent years than its historic pattern. Maybe the increased expertise of economists and their improved access to data are having an impact. As shown in Chart 6, the volatility within each decade is down considerably for equities, fixed income returns and inflation.

Chart 6. Standard Deviation Within Each Decade

Standard deviation is the typical measurement used for investment risk and volatility. The problem in using standard deviation to measure risk is that price cannot go up without increasing the standard deviation. One adaptation is to measure the standard deviation per rise in price. Dividing standard deviation by average price gives a coefficient of variation which is a better comparison metric for risk. Better yet would be to measure the average distance of the time-price points from a linear regression line. One could then compare the slope of the linear regression and the variation from that line. Of course the slope of the line will be very dependent upon the beginning and ending of the time period selected.

Does volatility in the early years determine longer-term results?

While our focus has been on the allocation decision between equities and fixed income, looking at Charts 4 & 5 naturally precipitates the question of whether one should not move to Treasuries or cash when equity markets are heading down.

To answer the question about moving to Treasuries, or even using Treasuries to counter-balance equities in one's total allocation, I did a correlation between results from equities and from a fifty-fifty mix of one-year Treasuries and long-term government bonds. The data were from a random selection from the last 133 years and applied to each year for the next thirty years. Taking a hundred such simulations at a time, the average correlation is about .93, which explains about 80% of the variance. The predictiveness for a hundred simulations varied from about 75% to 84%. A common perception that stocks and bonds are inversely correlated was not found in these data.

The second question is whether one should at times move to cash. In an age of sophisticated science and data analysis, it would seem that such a fundamental question would not have adamant supporters on both sides of the question, each presenting their evidence.

The analysis here focused on the impact that results for the first five years have on results after ten years, twenty years or thirty years. The average correlations of a random hundred simulations are given in Table 1.

Table 1. Impact of First Five Years

	Correlations			Predictiveness		
	Since 1871	Since 1920	Since 1960	Since 1871	Since 1920	Since 1960
5 Yr to 10 Yr	0.981	0.998	0.986	81%	94%	84%
5 Yr to 20 Yr	0.987	0.992	0.984	84%	87%	82%
5 Yr to 30 Yr	0.995	0.997	0.983	90%	93%	81%

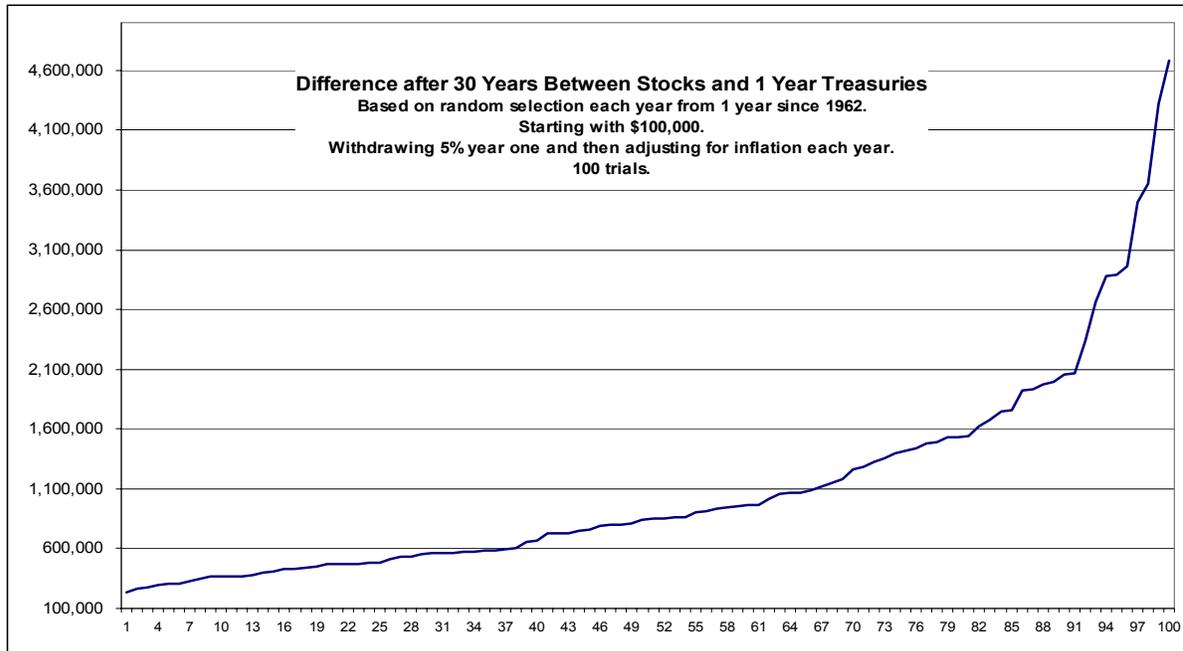
Since the equity returns after the first five years determine 80% or more of the probability of longer-term returns, it makes it fairly obvious that early returns are critical. My judgment is that a prudent investor cannot afford to ride such a market all the way down. Of course the mutual funds and financial institutions with an interest in maintaining account balances might give a different recommendation.

With proper diversification, any specific position can have enormous volatility as long as too many positions don't go up and down at the same time (systemic risk). With the first years being so critical to long-term results reveals the importance of not letting the total value of ones investments decline below a set limit. However, even if one does ride the market down, the long-term odds are better than investing in Treasuries.

An Earlier Study, Balancing Equities and Fixed Income

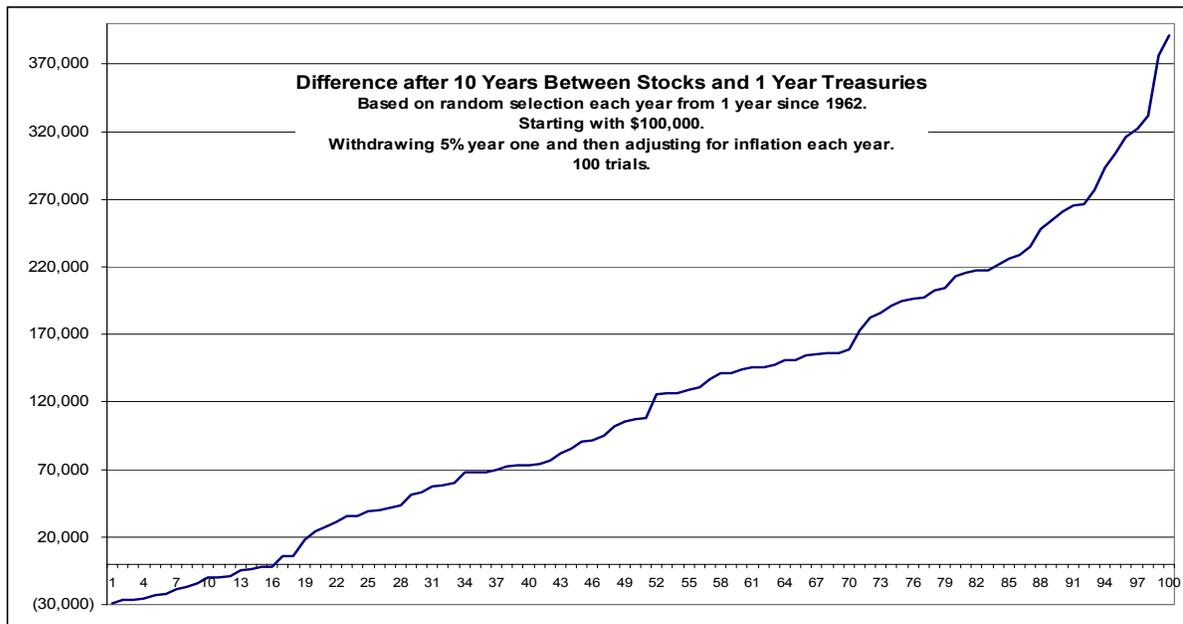
In a study I did a couple months ago I used data since 1962. In contrast to the S&P Composite data used above to represent equities, that study used the NYSE Composite. A comparison of the returns from the two sources shows significant differences for individual years. However, the data support a similar conclusion of equities reliably giving better long-term returns than Treasuries.

In the charts that follow, five percent of an initial \$100,000 was taken as a living allowance withdrawal prior to the beginning of the year. That amount was increased each year according to the inflation rate from the randomly selected year. I then set up the spreadsheet to run the random thirty-year simulation one hundred times, and sorted the results. Chart 7 shows the dollar difference after thirty years between investing in the stock market (dividends were not included, which are normally 43% of stock market returns) and investing in one-year Treasuries.

Chart 7. Thirty Years, Difference

Market returns for the thirty years exceeded interest returns for all of the 100 trials. The minimum difference was that the market exceeded the Treasuries by \$235,000. The maximum difference was \$4,678,000. Half the trials beat the interest returns by \$844,000 or more. Of the 3,000 years in the simulation (30 times 100), the Treasuries beat the market 5% of the time. I was surprised at the variation. Calculating with an average rate of return definitely does not give a realistic picture.

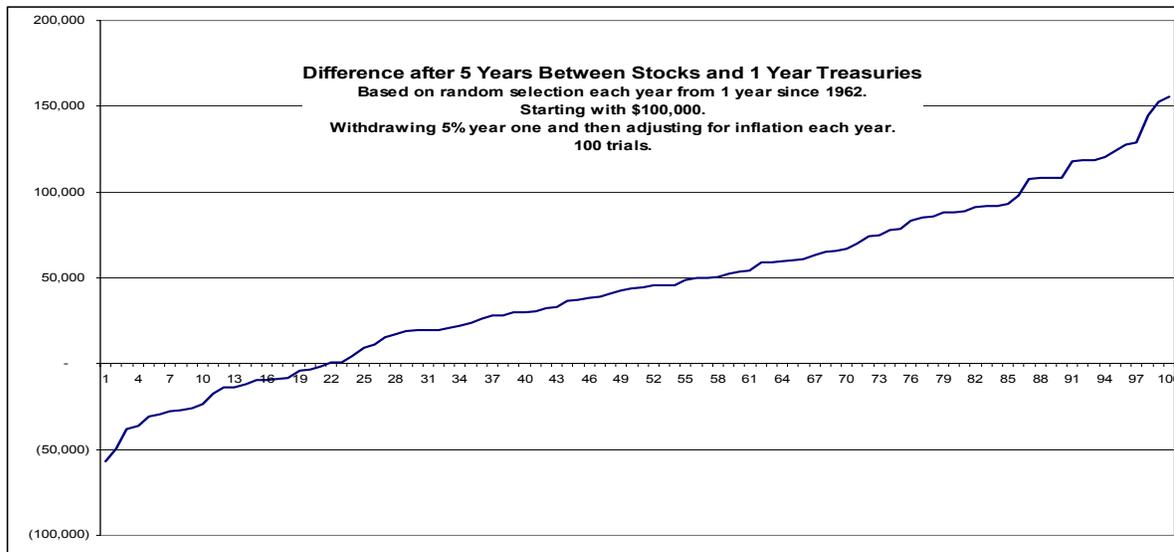
If you were playing with the spreadsheet, you could obviously adapt the numbers to fit your interest and situation. Your next question might be, "What are the probable outcomes after ten years?"

Chart 8. Ten Years, Difference

When looking at only a ten year time-span, in 16 out of 100 trials interest from Treasuries did better than the market. The range was from Treasuries exceeding the market after the specified withdrawals by \$29,000 to the market exceeding Treasuries by \$391,000. The median with half the trials on either side was a market advantage of \$107,400.

For only five years, in 21 out of 100 trials interest from Treasuries did better than the market. The reliability of equities surpassing Treasuries is less as the time period or time diversification lessons. The range was from Treasuries exceeding the market after the specified withdrawals by \$57,000 to the market exceeding Treasuries by \$156,000. The median for half the trials on either side was \$44,000. With the odds at roughly 80 to 20, which investment has the greater risk?

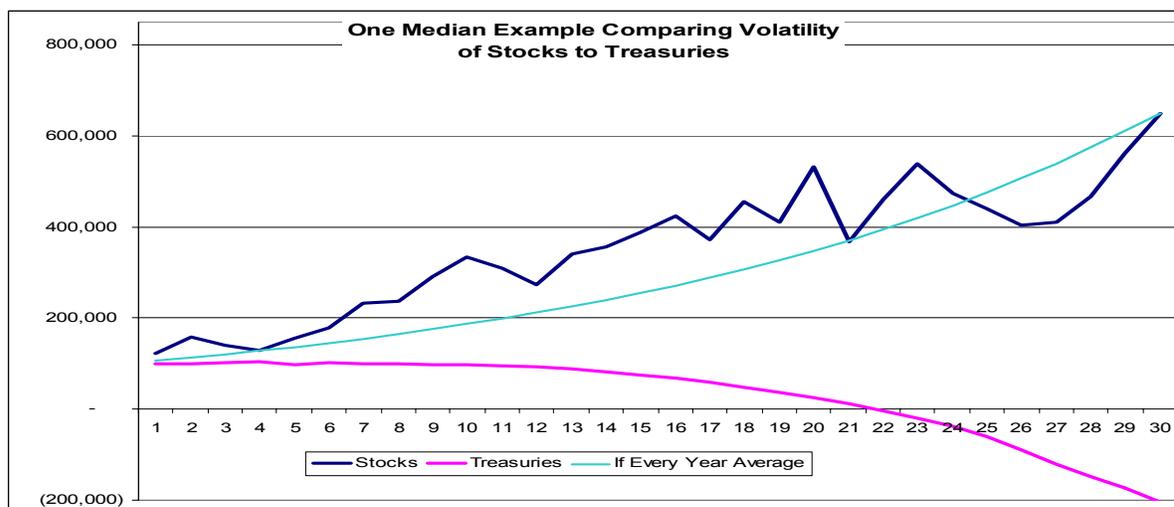
Chart 9. Five Years, Difference



Returns Along the Way

All of the above charts show the end result after five, ten or thirty years. They don't show anything about the ups and downs on the way to the end result, which is very different than if one took an average rate of return and applied it progressively each year. As you might expect from the charts above, each trial or random selection of returns from previous years is going to look very different. For Chart 10 I selected one that produced a result near the median. One cannot expect nice even returns such as represented by the teal-colored line. Nor can one expect to end up at either the median or the average.

Chart 10. Median Example.



Conclusion

Many people want to manage their investments so as to achieve a high degree of certainty in having money enough to support them through the years when they may not have sufficient work-related income. For the most part, their choices depend on:

1. Altering the withdrawal rate.
2. Altering the balance between fixed income and equities.
3. Altering the kinds of investments and expenses within fixed income and within equities.
4. Finding other asset classes in which to invest.
5. Buying an annuity that guarantees a withdrawal rate.
6. Expecting something else, such as winning the lottery, my widow marrying a rich guy, or my children supporting me by cashing in all their executive options.

The primary focus of this analysis was to assist in the decision of how to balance fixed income investments and equities.

Investing is a matter of probabilities. In order to not be surprised and disappointed at eventual results, one needs a good understanding of what those probabilities look like in concrete terms. Given the nature of probabilities, it is possible to have considerable volatility (risk) on the way towards a goal, but still have relative confidence in the probabilities that given sufficient time, the volatile results will exceed the consistent fixed returns.

Jeremy Siegel, a well-known economist, writes on March 9, 2006:

“Although stocks are indeed much riskier than bonds in the short run, in the long run they are safer. In fact my studies have shown that over periods 20 years or longer, a portfolio of diversified stocks has been more stable in purchasing power than a portfolio of long-term government bonds.... Long-term return on stocks after inflation is about 6% while it is 2% for bonds.

<http://finance.yahoo.com/columnist/article/futureinvest/2881>).

He also thinks that returns on stocks will outpace real estate returns for the next ten years.

If we stop to think about it, if more money were to be made in bonds than equities, companies would not sell bonds and convert the money to creating equity returns. Of course some companies are wrong some of the time, but if the average company deciding to sell a bond is wrong, we are really in trouble.

Making allocation decisions based on probabilities rather than volatility is a difficult shift for many people. However it is an important shift in thinking if indeed the degree of certainty for an end result is what is important.