Stock Market Perspective: Greek or Geek?

As anyone who studied Calculus has experienced, mathematics uses Greek letters in abundance. Quantitative economic and investment concepts being based on that type of math also typically use "the Greeks." Options price formulas are notable in this regard, including delta, gamma, theta, and vega. You likely have heard or read about beta being used as a relative volatility measure. Another one that is being talked about increasingly is "adding alpha" or having "positive alpha." I will discuss that one, which works in conjunction with beta, in what I hope are understandable terms. Although it may seem to be geeky, I hope you won't end up saying "it's all Greek to me."

You may have seen "adding alpha" as a claim for an investment. What is that, and how much attention should be paid to it?

The underlying concept is based on the statistical analysis technique of "linear regression." Given a set of data points, which are paired values of an "independent" variable, which in the investment context may be a market index, and a "dependent" variable, the performance of a mutual fund or investment technique, linear regression finds the best straight line[1] relating the two variables. For example, the independent variable could be the monthly percent changes of the S&P 500 over a period and the dependent variable could be the monthly percent changes of a mutual fund over the same period.

In our context, the formula for the line that estimates of the values of the dependent variable is given by:

alpha + (beta)(independent variable)

Alpha is the "y-intercept" of the line, the value when the independent variable has a (possibly hypothetical) value of 0. Beta is the "slope" of the line, a measure of how steeply the line rises.

Beta is frequently used as a measure of relative risk. For example, if a mutual fund or index has a beta of 1.5 relative to the S&P 500, it typically fluctuates 50% more than the S&P so it is considered to be riskier than that index. Similarly, if the beta is 0.75, it is considered to be less risky since it is expected to have 25% less volatility.

If alpha is a positive number, then there is "excess return" over what would be expected solely from the fluctuations in the independent variable index, which is typically the S&P 500. If alpha is close to zero, then the variations in the dependent variable are due essentially to changes in the S&P 500 if it is the independent variable. A negative alpha is a poor sign since it indicates doing worse than volatility driven changes.

A fairly recent buzzword in investment promotions is talking about techniques that have positive alpha or add alpha to a broad market index. Hedge funds often make the claim that they can produce positive alpha relative to some index.

It sounds impressive, and some would have you think it is a breakthrough concept. However, alpha and the associated beta are primarily another way of presenting risk-adjusted returns. If alpha is positive, it means the investment is providing returns greater than would be expected from the level of risk involved. I will provide a specific illustration later. Adding alpha means increasing investment returns relative to the risk. Like other risk-adjusted measures, it should be applied to investments measured against the same benchmark and should be viewed in conjunction with the associated beta.

[1] The best fit line is the one that minimizes the sum of the squares of the vertical distances between the points on the line and the values of the dependent variable. There is a unique line with this property.

Some cautions are in order. The underlying assumption in calculating the alpha and beta is that the relationship between the two variables is close to linear. That may not be the case. A graph of the two variables can provide a quick visual evaluation of the linearity of the relationship. Quantitatively, the strength of the relationship is measured by "r-squared," which is the percentage in the variation of the dependent variable that is explained by the regression line.

Another potential problem is that the linear regression process that calculates the alpha and beta can be influenced significantly by extreme values, so-called "outliers." There are sophisticated techniques to identify if that is the case and to ameliorate the effects, but they are not usually applied in investment analysis.

The basic thing to keep in mind is that alpha and beta, like other measures of investment performance, are not the be all and end all of evaluation techniques. They should be used in conjunction with other methods to get an overall picture of the potential risks and rewards.

To illustrate I will use the performance of the stock trading model, called Triple-40, that is one aspect of my Tactical Asset Allocation managed accounts. The model signals when funds related to the S&P 500 index should be bought and sold. The independent variable here will be either the yearly or monthly percent changes in the S&P with dividends reinvested. The dependent variable will be the percent changes in the performance of the model trading the same index.

The data available enables testing the model starting in 1963, so we have 45 years of data through the end of 2007. That is enough[2] for regression analysis. Over that period the index has had a compounded annual return of 10.7%, and the model trading the index and a money market fund when not in the market has had a 10.8% rate of return. The alpha for the model based on the annual percent changes is 5.9% and the beta is 0.450. Since the rates of return are almost the same and the model has less than half the volatility of the index, the alpha has to positive. It is saying the model adds value by reducing volatility (i.e. risk) while achieving the same rate of return. Note that the positive alpha does not imply a higher rate of return. Typical promotional materials often give that impression.

To see what this tells us about the "secular" periods, I will look at the calculations for 1966-81, the last complete secular bear market by whole years, 1982-99, the secular bull market, and 2000-2007, the current secular bear market. To get enough data points, I used monthly percent changes.

	Annualized Rates of Return		Based on monthly percent changes	
	index	model	alpha	beta
1963-2007:	10.7%	10.8%	0.57%	0.344
1966-81:	5.9%	10.9%	0.76%	0.206
1982-99:	18.5%	14.6%	0.40%	0.520
2000-07:	2.8%	4.6%	0.29%	0.224

Since the risk levels are greatly reduced in all periods, we get positive alpha. In 1982-99 the model trailed the index as it will do in strong stock markets, so once again we see that positive alpha is not the same as relative returns. It is interesting to note that the alpha in the current secular bear market is far less than it was in the 1966-81 one. Since I did not develop the model, I do not know what period was used in that process, but I suspect a lot or possibly all of the 1966-81 years were involved, so it is not surprising the model performs particularly well then. I think the model was formulated using data before 2000, so the current period is "out-of-sample."

I have discussed the model and its performance in prior issues and have focused on how it greatly reduces the risk by several measures. Now we have another way of illustrating how well the model serves that purpose.

[2] In general, it is a good idea to have at least 30 data points for linear regression analysis.