Alpha Found Video 5

Jensen's Alpha

Welcome back to part 5 of Alpha Found.

At the 26th annual meeting of the American Finance Association, held December 28-30, 1967, Michael Jensen introduced the idea of including the intercept in the regression equation as a method of evaluating investment performance. The intercept is called alpha, and so alpha was born. This is where all the current excitement about alpha stems from.

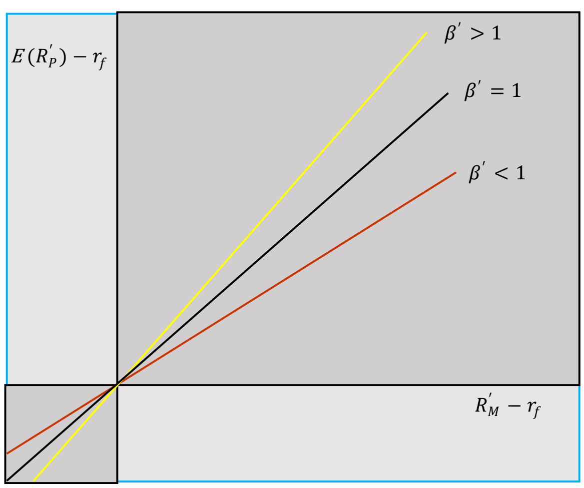
In Jensen's paper from the meeting proceedings, published in the Journal of Finance, May 1968, use of the intercept was spelled out for those who did not attend the meeting. Notice the very uninteresting title. *The Performance of Mutual Funds in the Period 1945 – 1964* (Journal of Finance, Volume 23 No. 2, Pgs. 389-416).

Here is the first page.

The big breakthrough is highlighted here in equation 8. The intercept of a regression line is called alpha. Alpha can be positive or negative, but the market has a zero alpha. Investors want a positive alpha, not just alpha generically. Alpha is interpreted as excess return after adjusting for systematic risk.

From the point of view of more than 50 years later, it seems obvious. Sharpe and Jensen made it obvious. It was not obvious at the time. And ever since, for more than 50 years, investors have been seeking positive alpha. As a result of all the talk of alpha, now when people discuss CAPM it includes alpha, though it wasn't there initially.

Here is a graph of Sharpe's original idea of CAPM.

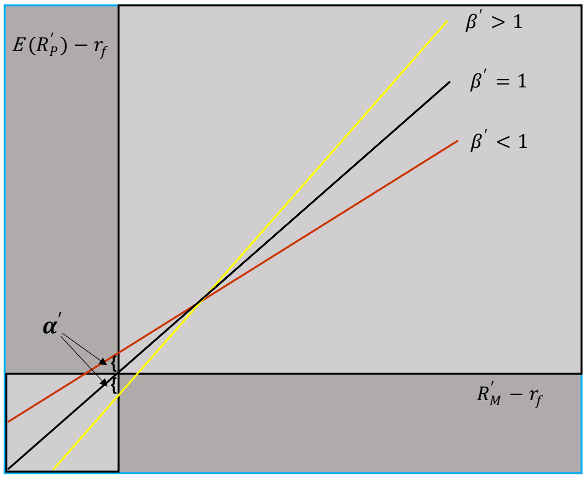


$E(R_P')$ = *expected return of a portfolio*

r_f = *risk-free rate of return*

$R_M' - r_f$ = *excess returns*

Here's what it looks like with alpha, using notation α'. Alpha is the intercept.



$E(R_P^{'})$ = *expected return of a portfolio*

r_f = *risk-free rate of return*

$R_M^{'} - r_f$ = *excess returns*

$\alpha^{'}$ = *intercept of a regression line*

Now the equation for the capital asset pricing model looks like this

$$R'_{at} - r_f = \hat{\alpha}'_a + \hat{\beta}'_a \left(R'_{Mt} - r_f\right) + \hat{\varepsilon}'_{at} \tag{5.1}$$

$$E(R'_{at}) - r_f = E(\hat{\alpha}'_a) + \beta'_a \left(R'_{Mt} - r_f\right) \tag{5.2}$$

$$E(\bar{R}'_a) - r_f = E(\alpha'_a) + \beta'_a \left(\bar{R}'_M - r_f\right) \tag{5.3}$$

With the usual components plus the addition of a term called $\hat{\alpha}'_a$, which is the estimated excess return after adjusting for systematic risk.

R'_{at} = the return of an asset in period t

r_f = the risk-free rate of return

$\hat{\alpha}'_a$ = estimated excess return after adjusting for systematic risk. “alpha”

$\hat{\beta}'_a$ = an asset’s estimated sensitivity to excess returns

R'_{Mt} = Return of the market index in period t.

$\hat{\varepsilon}'_{at}$ = the estimated return not explained by the model, called idiosyncratic return

In addition to expected returns, we can look at risk. To find the risk of a portfolio, find the variance of the ex-post CAPM equation, including the intercept. So, we need to take the variance of both sides of equation 5.1.

$$var\left(R'_a - r_f\right) = var\left(\hat{\alpha}'_a + \hat{\beta}'_a \left(R'_M - r_f\right) + \hat{\varepsilon}'_a\right)$$

Isolated constants drop out of variance calculations, and constant coefficients get pulled out and squared.

$$var(R'_a) = var\left(\hat{\beta}'_a (R'_M) + \hat{\varepsilon}'_a\right) = \hat{\beta}'^2_a var(R'_M) + var(\hat{\varepsilon}'_a)$$

The right-most term is called idiosyncratic risk. Much more on that to come. This assumes that idiosyncratic risk is independent from systematic risk.

And finally, with a change in notation we have equation 5.4.

$$\hat{\sigma}_a'^2 = \hat{\beta}_a'^2 \sigma_M'^2 + \hat{\sigma}_{a\varepsilon}'^2 \quad (5.4)$$

Equation 5.4 is the equation for the ex-post variance of a portfolio using CAPM regression components.

You'll have to excuse the change in notation. Some notation is easier to work with and other notation is easier to look at.

Diversification within CAPM means trying to minimize idiosyncratic risk for a given portfolio β_P'.

Alpha measures the return that does not come from systematic risk. If it doesn't come from systematic risk, where does it come from? The big idea is that alpha, positive alpha, reflects skill in selecting investments. It's a measure of value added.

The theory behind alpha is that the expected alpha of any investment is zero.

$$E(\hat{\alpha}_a') = 0 \quad (5.5)$$

Randomness in investment returns means that some stocks will have positive alpha, some negative, but in either case it is a result of randomness in the outcomes, not skill. The weighted sum of all alphas is necessarily 0 in CAPM because the market regressed against itself will have a zero intercept, which is zero alpha.

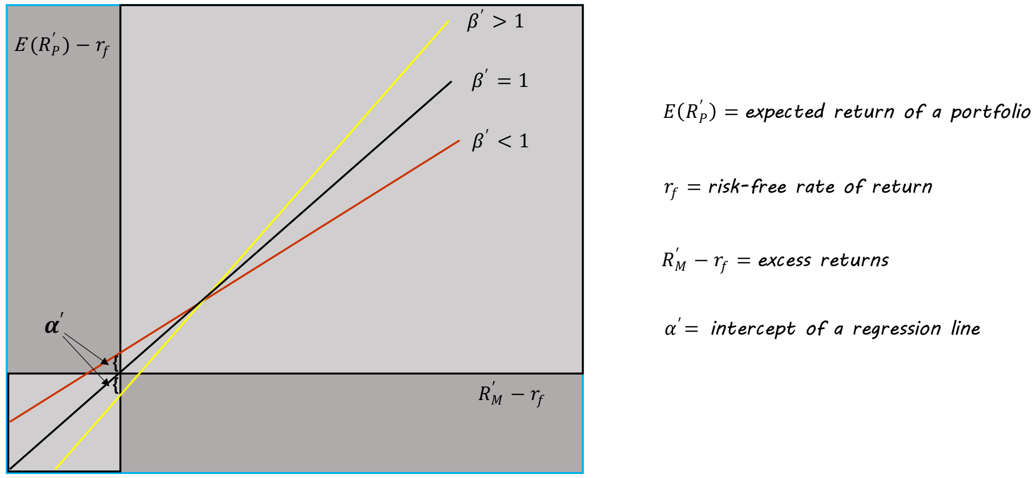
There is a hypothesis called the joint hypothesis which states that capital markets are efficient, and the capital asset pricing model is the correct model for measuring efficiency. If the joint hypothesis is true, then alpha is random and centered on zero.

The pressing question concerns the randomness of alpha. If an investor (or algorithm for that matter) can generate positive alpha such that alpha is statistically significant, then that statistical significance stands as evidence of investor skill. Since under CAPM, the total alpha is zero by construction, the real question is not whether it is centered on zero, but is it random? (Do the component alphas deviate randomly from zero?)

Although a few people quickly wrote papers testing alpha, the first comprehensive paper was by Fisher Black, Michael Jensen, and Myron Scholes, a paper now referred to as Black, Jensen, and Scholes, or BJS. The formal title of BJS is *The Capital Asset Pricing Model: Some Empirical Tests*, published in a 1972 book titled *Studies in the Theory of Capital Markets* (MC Jensen, Ed.).

BJS found unambiguously that positive alpha is associated with low CAPM beta, and negative alpha is associated with high CAPM beta. This isn't lock-step certainty, but a statistical tendency. Importantly, they eliminated ex-post selection bias as an explanation. That is, it is not only true when looking back in time after we have the answers. It's also predictive.

Another look at this graph shows the effect, where $\beta' < 1$ implies $E(\alpha') > 0$; and $\beta' > 1$ implies $E(\alpha') < 0$.



Certain aspects of BJS will be looked at closely in a later video, but for now the important part is the conclusion that positive alpha and low CAPM beta are closely associated. The relationship shows up in every decade since the 1940s, long before there was a model to measure it. According to BJS, the 1930s did not have the relationship, but the time period covered was during the great depression when stock price movements were unusual and large. How is this possible?

After BJS the next big paper is usually called Fama McBeth published in 1973, meaning Eugene Fama and James McBeth. The actual title is *Risk, Return, and Equilibrium: Empirical Tests* (Journal of Political Economy, Volume 81, May-June 1973, Pgs. 607-636). And then there was Haugen & Heins published in 1975, meaning Robert A. Haugen and A. James Heins. They wrote *Risk and the Rate of Return on Financial Assets: Some Old Wine in New Bottles* (Journal of Financial and Quantitative Analysis, Volume 10, December 1975, Pgs. 775-784).

There were many other lesser known but important papers written at this time. In addition to the authors already mentioned, George Douglas, Marshall Blume, and Irwin Friend are significant, as well as others.

Markowitz, Sharpe, Scholes, and Fama, among others we will run across later, received Nobel Prizes for their work on capital market theory. Samuelson, also received a Nobel Prize in economics, but not for his contributions to capital market theory, although his contributions were significant. Fisher Black would have also been included on the list, but he passed away before his collaborator, Myron Scholes, was awarded the prize.

Every once in a while, I run into someone who thinks it is easy to get outsized investment returns. The fact that so many people were awarded Nobel Prizes for their work on capital markets stands as testimony that the issues involved are complex and deep.

The idea that low CAPM beta is associated with positive alpha is so thoroughly documented in the academic literature that I am going to assume that the relationship exists and that it is durable over time.

There is no use trying to prove what is not in doubt, but this fact really makes very little sense at the level of economic theory. Economic theory would tell us that what generates returns is systematic risk, yet the positive alpha low CAPM beta association stands in contrast to this.

So we have found alpha in low CAPM beta stocks. The big question is why is it found there? There aren't that many possibilities available. Either CAPM or its assumptions is wrong (some might say misspecified), or the model is right but the parameter estimation method for alpha and CAPM beta is wrong, or markets are not efficient, or some combination of these three.