The “Beta” of a Stock

The expected return* on a risky investment, R, must exceed the return on a safe, or risk-free investment, R_f.

According to the capital asset pricing model (CAPM), the expected excess return on an asset, R- R_f, is proportional to the expected excess return on a portfolio of all available assets (the “market portfolio”).

That is,

$$[R - R_f] = \beta[R_M - R_f],$$

where R_M is the expected return on the market portfolio and β is the coeficiente in the population regression of $[R\text{-}R_f]$ on $[R_M - R_f]$.

A stock with a $\beta<1$ has less risk than the market portfolio and therefore has a lower expected excess return than the market portfolio. In contrast a stock with $\beta>1$ is riskier than the market portfolio and thus comands a higher expected excess return.

* The return on an investment is the change in its price plus any payout (dividend) from the investment as a percentage of its inicial price.

CAPM Betas

In more detail, the Capital Asset Pricing Model ("CAPM")

$$[R_s - R_f] = \beta_0 + \beta_1 [R_M - R_f] + e$$

- People commonly refer to the β_0 in this model as the stock's "alpha" and the β_1 is simply called "beta."
- "*R*" stands for return. The subscript "*s*" indicates that the model is for stock "s" (e.g., Microsoft). The subscript "*f*" stands for the risk-free security (e.g., a 30-day Treasury bill). The subscript "*M*" stands for the stock market.
- $[R_s - R_f]$ is the risk premium of a stock; $[R_M - R_f]$ is the risk premium of the market.
- The "*e*" designates the error term.
- If you work with monthly data, all your returns should be monthly returns and you are calculating the stock's monthly beta.

CAPM Betas (continued)

From earlier slide, the Capital Asset Pricing Model ("CAPM") is:

$$[\, R_s - R_f \,] = \beta_0 + \beta_1 [\, R_M - R_f \,] + e$$

To estimate b_0 ("alpha") and the β_1 (CAPM "beta"), you estimate the model (i.e., perform the OLS regression):

$$y = \beta_0 + \beta_1 x + e$$

Note that $[\, R_s - R_f \,]$ is "y" and $[\, R_M - R_f \,]$ is "x". Don't reverse them!