Introduction to Finance - II
Quiz on CAPM and cost of equity capital

Read the questions carefully. Don't make them harder than they are! Answer succinctly and precisely. Show all of your work.

1. Because I cannot administer a quiz on Excel, I ask you to describe the steps you take in Excel to obtain the relevant object. The idea is to demonstrate that you understand the concepts well enough to instruct someone how to do this. In this case that someone is Excel. This also helps to highlight the intuition behind the constructs as we build the intermediate steps in Excel (typically as additional time-series columns).

   First, we compute the mean return for each series. We have to create a column with the monthly deviations from the mean for each return series. We should check that the sum of this series is 0 in all cases. Next, we need the variance of both series, which we get by creating a new column that contains the monthly deviations from the mean squared. The mean of this column is the variance. Next we create a column with the monthly deviations from the mean on LRCX times the monthly deviation from the mean on the S&P 500. The mean of this column is the covariance between Lam (LRCX) and the S&P 500. We estimate the beta of LRCX by dividing this covariance by the variance of the returns on the S&P 500.

2. Here we apply the capital asset pricing model (or CAPM). It solves for the expected return on an asset:

$$E(r_i) = r_f + \beta_i \cdot [E(r_m) - r_f]$$

   where $E(r_i)$ is the expected return on asset i; r_f is the yield on the US Treasury bond (i.e., the risk-free rate); $[E(r_m) - r_f]$ is the risk premium on the market; and $beta_i$ is the exposure of asset i to the risk premium on the market. Note that this is consistent with our discussions of bond yields. If a bond (such as a catastrophe bond) has a 0 beta, then its yield-to-maturity will equal the risk-free rate plus the hazard rate, so that its expected return is the risk-free rate. premium.

   So in this case, Lam's expected return is: $.04 + 1.45 \cdot .045 = 10.525\%$. This is Lam's cost of equity capital.

3. A fundamental concept in finance is that an investor will not be compensated for risk that can be diversified. So a stock's total variability is not an appropriate measure of the risk for which investors will be compensated. It may be true that the standard deviation of Intel's returns is higher than that of Lam's, but that is not an appropriate measure of *systematic* risk. Beta is the appropriate measure of systematic risk. If Intel uses a cost of equity of 8.5%, then we can infer that they are using the CAPM and believe that they have a beta of 1.0. This makes sense, as Intel is an established company which is a bell-weather of the information economy.

4. Continuing the assumptions from above, we infer that Lam's pre-tax cost of debt capital is 4% plus 150 basis points, which is 5.50%. Its after-tax cost of debt is therefore $0.77 \cdot .055 = 4.235\%$. The capital weightings are: $w_D = \frac{2.5}{27.5}$ and $w_E = \frac{25}{27.5}$. So the firm's weighted average cost of capital is: $(0.0909)(.04235) + (0.9091)(.10525) = 9.9532\%$.