**Comparing CAPM and Fama/French 3-Factor Expected Returns**

Instructions for Students

**Background Information**

We know that a stock’s expected return must be calculated by some asset pricing model. The two models that we are studying in detail in this course are the Capital Asset Pricing Model (CAPM) and the Fama/French 3-Factor Pricing Model (FF3). As we learned in class, these pricing models are as follows:

CAPM: E(R) = Rf + β(RM-Rf)

FF3 : E(R) = Rf + β1(RM-Rf) + β2(SMB) + β3(HML)

The CAPM is a one-factor model while FF3 is a three-factor model (with the first factor being the same factor as is in the CAPM). For each model, Rf is the current risk-free rate. Each factor risk premium (RM-Rf, SMB, and HML) is the additional return an investor requires for taking on that risk when the beta for that factor is one and the other factor-betas are zero. Each of the beta coefficients measures the sensitivity of the stock to that particular risk-factor.

The factor risk premiums cannot be known with certainty and in-fact probably change over time. Different analysts and researchers will assume different values for them, but they are often estimated as being the average realized risk premiums over a long period of time in the past. We will do that here with the data we have from July 1926 to the present.

Factor betas are also not constant over time. Since we are looking for the sensitivity of the stock’s excess returns to these factors *in the future*; we can only forecast these betas based on what they have been in the past. For this exercise, we will examine the most recent five years of monthly data that is available to us as well as the most recent two years of weekly data. Though there is no guarantee that a stock’s sensitivity to a factor in the future will be what it has been over the past 60 months or the past 104 weeks, these are the most commonly used estimates.

This exercise uses a spreadsheet which has been pre-populated with factor returns and risk-free rates from Ken French’s data library (https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data\_library.html). The spreadsheet also makes use of Excel 365’s StockHistory function which returns the closing prices (either monthly or weekly – adjusted for stock splits) for a stock. The spreadsheet has been constructed to calculate four different values for the required expected return for a stock. Two values will come from the Capital Asset Pricing Model (one using weekly data and one using monthly data) and two values will come from the Fama/French 3-Factor Pricing model (one using weekly data and one using monthly data). Which of the four (or combination of them) should an analyst use? That is for you to decide.

**What you will Find in the Spreadsheet**

1. There are two tabs on this spreadsheet you will be using. One is titled “Weekly” and the other is titled “Monthly”.
2. In the “Monthly” tab, Columns A-E of Rows 3 – 1185 have been pasted into the spreadsheet directly from a file obtained from Ken French’s website. In the “Weekly” tab, Columns A-E of Rows 2 – 5141 also came from French’s website.
3. In each tab, Columns F-I Convert French’s numbers to percentages so that Excel can read them correctly (i.e. “1.24” from French’s website actually means 1.24%).
4. In the two rows below the most recent data in each tab, The factor returns (since July 1926) have been averaged and annualized. We will use these annualized values as our risk-premiums for each factor.
5. In column I of each tab, a few rows below the most recent risk-free rate, that recent risk-free rate has been annualize. We will use it as the current risk-free rate in our calculations.
6. In column J of each tab, is the prices of the stock whose ticker symbol is entered in cell C1190 of the “Monthly” tab. For “Monthly”, there are 61 months of prices and for “Weekly”, there are 105 prices. These prices come from the StockHistory function in Excel 365.
7. Column K of each tab calculates simple (monthly or weekly) returns for the stock. This gives us 60 months (5 years) of monthly returns and 104 weeks (2 years) of weekly returns.
8. Column L subtracts the risk-free rate from the stock’s returns to give us that stock’s excess returns each month or week.
9. A few rows below the stock’s returns, the Linest function in Excel is used to calculate the three beta coefficients found in a linear regression in which the stock’s excess returns are used as the Y (dependent) variable and the three factors (Rm-Rf, SMB, and HML) are the X (independent) variables.
10. The Capital Asset Pricing Model (CAPM) is used to calculate the expected return for the stock in cell F1190 (Monthly data) and cell F1194 (Weekly data). Both are shown on the “Monthly” tab. As you can see (by looking at which cells are referenced in the formula), the current annualized risk free rate is used as is the CAPM beta (Beta1). Our market risk-premium is the average annualized excess return on the market over the past 99 years.
11. The Fama/French 3-Factor Model (FF3) is used to calculate the expected return for the stock in cell F1191 (Monthly data) and cell F1195 (Weekly data). Again, both are shown in the “Monthly” tab for easier reference. These expected returns use all three beta coefficients, with each multiplied by the average realized risk-premium over the life of the data (which we use as factor risk premiums).
12. Changing the ticker symbol in cell C1190 in the “Monthly” tab will automatically populate the spreadsheet with prices for the stock with that ticker symbol, resulting in that stock’s returns, beta estimates, and expected returns being calculated and shown for both weekly and monthly data

**To Do**

1. Select a stock of interest to you and enter its ticker symbol in cell C1190 of the “Monthly” tab. Make note of the monthly beta estimates (Monthly tab) and the weekly beta estimates (Weekly tab). Also make note of the four different expected returns that the data calculated
2. Pick a different stock if you want. Of course, once you input a different ticker symbol, the data from the prior stock is overwritten. You can do this with as many stocks as you want, but please choose just one from which to answer the following questions.

**Questions to Answer**

* 1. What is the name and the ticker symbol of the stock you selected?
  2. What is the estimate of the CAPM beta for your stock using monthly data?
  3. What is the estimate of the CAPM beta for your stock using weekly data?
  4. What are the estimates of the three Fama-French betas for your stock using monthly data?
  5. What are the estimates of the three Fama-French betas for your stock using weekly data?
  6. What is the expected return for your stock using:
     1. CAPM model with monthly returns
     2. FF3 model with monthly returns
     3. CAPM model with weekly returns
     4. FF3 model with weekly returns
  7. Tell me briefly, in your own words, how your stock (on average) reacts to movements in the market based on your CAPM monthly beta.
  8. Do you expect the CAPM beta you calculated today to be the same one that would be calculated five years from now? Why or why not?
  9. Based on the monthly data, would you say that your stock acts like a large-cap stock or a small-cap stock, and to what degree?
  10. Does your answer change based on weekly data?
  11. Based on monthly data, would you say that your stock acts like a value stock or a growth stock, and to what degree?
  12. Does your answer change based on weekly data?
  13. In the FF3 model (with monthly data), do investors require a higher expected return because of its beta coefficient for SMB, or will they accept a lower expected return? Why?
  14. In the FF3 model (with monthly data), do investors require a higher expected return because of its beta coefficient for HML, or will they accept a lower expected return? Why?
  15. Would you say that there is a substantial difference among the four expected returns that these models calculated? If so, why?
  16. What would you use as the required expected return for this stock (the value used to discount expected future cash flows to stockholders) if it was your job to come up with a value? Why? Note that you do not have to use any of the four of the values that your spreadsheet came up with, but you may. Just be sure to give your reasoning for whatever expected return you decide to use.