ECON 4360: Empirical Finance
Spring 2014
Homework 01
Due Wednesday 29 January 2014 by 1400

Instructions

Figure out how to use the diary command to capture the output in the MATLAB window to a text file, and create m-file scripts that answer the following questions. Turn in your output results and graphs along with any m-file scripts you created. Please make your graphs big to "fit the page" when you print it. Some questions should be done "by hand" or require an interpretation or response. Please type your responses to all questions - **final answers / output should all be typed and organized in order**. Please make this neat! If I can't figure out what you are doing, you won't get credit. Final answers/output with no supporting work (i.e., code) will receive no credit.

A general guideline for acceptable programming and formatting standards is that both the program and the output be "neat" and well-commented. You don't need to go crazy with your comments, but as a general rule of thumb, you should have enough comments that you are able to come back to a program years later and not have to spend much time figuring out what it does. Always include header lines at the top of your program that indicate (at a minimum) the file name, a brief description of what the program does, your name, and the date.

You may work in groups no larger than three for this assignment. If you choose to work in a group, please turn in only ONE copy of your group's assignment - just be sure to include the names of everyone in your group.

Questions

Practice with Utility Functions

1. We'll mostly use power utility in this class $u\left(c\right)=\frac{c^{1-\gamma}}{1-\gamma}$, and you've already become somewhat familiar with it from our practice in class. This homework is going to focus on another common utility function: quadratic utility. Quadratic utility $u\left(c\right)=-\frac{1}{2}\left(c^{*}-c\right)^{2}$ is sometimes used because it has the convenient property that marginal utility is linear.

   (a) What are the limits over which this is a vaguely sensible utility function? (I.e., what are $c_{\min}$ and $c_{\max}$ for $c\in\left(c_{\min},c_{\max}\right)$?) Why?

   (b) Plot utility and marginal utility on the same graph **over the range which makes sense** for $c^{*}=2$, being sure to clearly label your curves, axes, etc.

   (c) What is the formula for the coefficient of relative risk aversion for this utility function? Evaluate this formula for $c^{*}=2$ at the points $c=0,1,2,4$ and **explain** what is going on at each of those points.

Get to Know the Data

2. The file data.txt contains CRSP data (yearly, from 1926-2012) for the return on the value-weighted portfolio of all US stocks (NYSE, AMEX, and NASDAQ), the 90-day T-bill return, Dividend Growth, and the D/P ratio. Know the units you are working with: returns and growth rates here are net (i.e., a 10 percent return is 0.10) and D/P is a fraction (e.g., 10 percent is 0.10). (Be careful in the future that you know if you are using net returns, gross returns, log returns, or something else. And be careful with growth rates.) Load the data file into MATLAB.

   (a) Find the means and standard deviations for Stocks, Bonds, and Excess Returns (the stock return - T-bill returns). Report, e.g., a 20 percent return or standard deviation as "20", not 0.20. Use the "fprintf" command to display your results in the following format (2 decimal places):

$$\begin{aligned}
\text{Mean Stock Return} &= \text{xx.xx, with Standard Deviation} = \text{xx.xx}\\
\text{Mean Bond Return} &= \text{xx.xx, with Standard Deviation} = \text{xx.xx}\\
\text{Mean Excess Return} &= \text{xx.xx, with Standard Deviation} = \text{xx.xx}
\end{aligned}$$

(b) Get a sense of the size of these numbers (note: they are not adjusted for inflation). How would the means of each of these change, once you adjust for inflation? (Ball-park is fine.)

(c) The excess return is interesting - it tells you what you can get by borrowing a dollar and investing in the stock market. Is this an easy pay-day? Explain.

(d) Make one plot that displays both the stock return and T-bill return (being sure that you can tell which one is which). Display the year on the x-axis and percent return (e.g., 40 percent as 40) on the y-axis.

(e) Make another plot that displays the dividend-price ratio. Display the year on the x-axis and percent (e.g., 40 percent as 40) on the y-axis.

(f) From your plots in (d) and (e), do stocks look serially correlated over time? Bonds? D/P? (Eye-balling is fine here.)

(g) Run the following regressions for stocks, bonds, and excess returns:

$$R_{t+1} = a + bR_t + \varepsilon_t \text{ for } t = 1, 2, ..., T-1$$

Report the slope coefficient, its t-statistic, and the regression R^2 in the following format:

$$\begin{aligned}
\text{Stocks: b} &= \text{ xx.xx, t(b)} = \text{xx.xx, R2} = \text{xx.xx}\\
\text{Bonds: b} &= \text{ xx.xx, t(b)} = \text{xx.xx, R2} = \text{xx.xx}\\
\text{Excess: b} &= \text{ xx.xx, t(b)} = \text{xx.xx, R2} = \text{xx.xx}
\end{aligned}$$

(You can use the 'regstats' function in MATLAB here - see the help file for the syntax.)

(h) What do you learn about return predictability in (g)? Does it support your answer for (c)?

(i) Now regress the excess return on the D/P ratio (this is a forecasting regression):

$$R^e_{t+1} = a + b\,(D/P)_t + \varepsilon_t \text{ for } t = 1, 2, ..., T-1$$

Report the slope coefficient, its t-statistic, and the regression R^2 in the following format:

$$\text{Excess: b} = \text{ xx.xx, t(b)} = \text{xx.xx, R2} = \text{xx.xx}$$

(j) Provide an interpretation for the b coefficient and the R^2 of the regression.

(k) For the regression you were working with in (i), also report $E\left(R^e\right)$ and $\sigma\left[E_t\left(R^e_{t+1}\right)\right]$ (this latter is $\sigma\left[E_t\left(R^m_{t+1} - R^f_{t+1}\right)\right] = \sigma\left(a + b\left(D/P_t\right)\right)$) in the following format:

$$\text{E(R)} = \text{xx.xx and sigma(E(R))} = \text{xx.xx}$$

(l) What do $E\left(R^e\right)$ and $\sigma\left[E_t\left(R^e_{t+1}\right)\right]$ together tell you about the equity premium?

(m) What can (i), (j), and (k) tell you about the "significance" of this regression?