Problem Set 1
Econ 40357 Financial Econometrics
University of Notre Dame
Professor Nelson Mark
Fall 2019

Problem sets should be typed to the maximum extent possible and and presentable. Don't restate the questions in your write-ups. One main document per work group plus an appendix showing each person's Eviews work. Give each person a section heading. No explanations needed in the appendix.

1. Write out all the terms in the following and evaluate them
   (a) $\sum_{j=1}^{3} j$
   (b) $\sum_{i=1}^{n} x$ with $n = 4$ and $x = 3$
   (c) $\Pi_{j=1}^{3} x$ with $x = 2$

2. Consider the following matrices,

$$A = \begin{pmatrix} 1 & 6 \\ -2 & 4 \end{pmatrix}, B = \begin{pmatrix} -3 & -8 \\ 6 & 4 \end{pmatrix}, C = \begin{pmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{pmatrix}, D = \begin{pmatrix} 6 & -2 \\ 0 & -1 \\ 3 & 0 \end{pmatrix}$$

   (a) Which pairs of matrices can be multiplied together?
   (b) For those pairs that can be multiplied, perform the multiplications.
   (c) Calculate 2A
   (d) Calculate Tr(A)
   (e) Calculate $A + B$
   (f) Calculte $B - A$

3. If $A = \begin{pmatrix} 3 & -1 \\ -4 & 2 \end{pmatrix}$, find A^{-1}. $\begin{pmatrix} 3 & -1 \\ -4 & 2 \end{pmatrix}^{-1}$.

   Download the Excel file PS01_2020.xlsx from the course website. These are annual historical prices and dividends for the S&P index, the CPI, one-year and ten-year treasury yields. Load the data into an Eviews workfile and name it PS01.wf1.

4. Using the stock price, dividends, and CPI, construct the real S&P real rate of return. Plot the rate of return series.

5. Compute the real yield on the one-year and on the 10-year bonds. Plot the yields in a single graph.

6. Report the descriptive statistics for all three series, and for the S&P excess return and the 10-year treasury excess return (i.e., over the 1-year treasury).

7. Now, for the S&P, construct the real gross return. Suppose you invest one dollar in the S&P index in 1970, and let it accrue to 2015. No further investments. How much is does the investment accrue to (in real terms) in 2015? (Hint: @cumprod(x), where x is the series name).

8. Construct the real (with dividend) price of the S&P index, and plot it over the entire sample period. Identify periods when the stock market performed badly and when it performed nicely.

9. Regress the one-year ahead S&P real return on the current-year dividend yield and a constant. Report the coefficient estimates, the 'regular' t-ratios and the Newey-West t-ratios.