

**Econ 512**  
*Fall 2018*

Homework 1 – Introduction/Review of Matlab Basics  
Due 9/5/2018

Write and execute a matlab program (m-file) that will make and print the following calculations. Turn in your program and file containing the results. Read about the “diary” command for producing your results file. Please carefully comment your files so I can easily read your answers.

1. Given the following vector of values  $X = [1, 1.5, 3, 4, 5, 7, 9, 10]$  construct the values of the functions

$$Y1 = -2 + .5X$$

and

$$Y2 = -2 + .5X^2$$

and plot  $Y1$  and  $Y2$  against  $X$  in a single graph.

2. Create a 200x1 vector  $X$  containing evenly-spaced numbers between  $[-10, 20]$  and calculate the sum of the elements of the vector.

3. Given a matrix  $A = \begin{bmatrix} 2 & 4 & 6 \\ 1 & 7 & 5 \\ 3 & 12 & 4 \end{bmatrix}$  and vector  $b = \begin{bmatrix} -2 \\ 3 \\ 10 \end{bmatrix}$ . Calculate  $C = A'b$ ,  $D = (A'A)^{-1}b$ ,  $E = \sum_i \sum_j [a_{ij}b_i]$ , and  $F =$  matrix  $A$  with the 2nd row and 3rd column deleted. Solve the system of linear equations  $Ax = b$  for the vector  $x$ .

4. Using the matrix  $A$  in problem 3, create a 15x15 block diagonal matrix  $B = \begin{bmatrix} A & 0 & 0 & 0 & 0 \\ 0 & A & 0 & 0 & 0 \\ 0 & 0 & A & 0 & 0 \\ 0 & 0 & 0 & A & 0 \\ 0 & 0 & 0 & 0 & A \end{bmatrix}$  where

$0$  is a 3x3 matrix of zeros.

5. Create a 5x3 matrix of random draws from a normal distribution with mean= 10 and standard deviation=5. Call it  $A$ . Convert  $A$  to a matrix of zeros and ones where the element of the new matrix is 0 if  $a_{ij} < 10$  and 1 if  $a_{ij} \geq 10$ .

6. In the github repository **Homework1** for the class, you will find the file **datahw1.csv** that is a comma-delimited spreadsheet file that you will use to answer this question. The dataset constrains 4392 firm/year observations for Taiwanese manufacturing firms. The columns of the data matrix are (in order): (1) firm id, (2) year, (3) dummy variable equal to one if the firm is an exporter (Export), (4) dummy variable equal to one if the firm conducts R&D (RD), (5) productivity index (prod), (6) capital stock (cap). Construct the OLS estimator for the regression equation:

$$prod_{it} = \beta_0 + \beta_1 Export_{it} + \beta_2 RD_{it} + \beta_3 cap_{it} + \varepsilon_{it}$$

Report the point estimates and standard errors.