

## Linear Algebra and Econometric Review: Problems

Consider the following matrices:

$$A = \begin{bmatrix} 3 & 9 \\ 1 & 4 \end{bmatrix} \quad B = \begin{bmatrix} 4 & 1 \\ 1 & 4 \\ 5 & 3 \end{bmatrix} \quad C = \begin{bmatrix} 2 & 0 & 7 \\ 0 & 1 & 3 \end{bmatrix}$$

1. Calculate the following:

a.  $CB$

b.  $BC$

c.  $A + (CB)$

d.  $A + (BC)$

e.  $A^{-1}$

f.  $Det(A)$

g.  $C^{-1}$

h. the eigenvalues and eigenvectors of  $CB$

i. the eigenvalues and eigenvectors of  $C$

j.  $B^{-1}$

2. Consider the following model:

$$y_t + \alpha\pi_t = e_t \tag{1}$$

$$\pi_t = u_t \tag{2}$$

where  $y_t$  is output and  $\pi_t$  is inflation, both endogenous variables, and  $e_t$  and  $u_t$  are exogenous shocks so that:

$$Dx_t = \mu_t \tag{3}$$

- a. Write (1) and (2) as a single matrix equation with endogenous variables on the left hand side and shocks on the right hand side.
- b. Solve for (using matrix algebra) the endogenous variables as a function of the shocks.
3. Suppose that your regression specification included the dollar/yen, dollar/euro, and yen/euro exchange rates as independent variables. What econometric problems would this cause and how would you propose fixing them?
4. Are all econometric models misspecified? If so, is econometrics still useful?
5. Intuitively, why do most time series exhibit autocorrelated error terms?
6. Suppose that your dependent variable is a firm's stock price while a key independent variable is that same firm's profits. If both are measured in period  $t$ , will this specification likely yield unbiased results (assuming that appropriate controls are included)? If not, how might you fix the problem?
7. True or False?  $R^2$  is an information criterion?
8. Should the Commons continue keeping Thanksgiving type turkey and the taco bar on the same day to create a Super Lunch. Or should they be split up the more evenly distribute the glory across days.