Intro to Econometric Theory
Heinz School, Carnegie Mellon University
90-906, Spring 2004-5

Homework #2, due Friday, March 18, 2005

1. You may recall that, in the bivariate regression model,

$$Y = \beta_1 + \beta_2 X_2 + \epsilon \tag{1}$$

the OLS estimate of β_2 is $\hat{\beta}_{2,OLS} = \frac{\widehat{Cov}(Y,X_2)}{\widehat{V(X_2)}}$. This means that if the correlation (or covariance) between Y and X_2 is positive, then $\hat{\beta}_2$ is positive. Consider now a slightly more complex model:

$$Y = \beta_1 X_1 + \beta_2 X_2 + \epsilon \tag{2}$$

Let's suppose that $\overline{Y} = \overline{X_1} = \overline{X_2} = 0$. Please calculate an expression for $\hat{\beta}_{1,OLS}$ and $\hat{\beta}_{2,OLS}$ in terms of the variances and covariances of Y, X_1, X_2. Using your formula, discuss whether or not it can happen that $\widehat{Cov}(Y, X_1) > 0$ while $\hat{\beta}_{1,OLS} < 0$. If it cannot, why not? If it can, then how? Your goal is both to construct a correct argument and to explain in *intuitive* English why your result holds.

2. Do problem 9 on page 115 of Greene

3. Do problem 10 on page 115 of Greene