Problem Set 5

Due in class on Thursday, May 19, 2011.

Problem 1. Consider the regression model $Y = X\beta + \varepsilon$ where $Y$ and $\varepsilon$ are $8 \times 1$ vectors, $X$ is an $8 \times 3$ matrix, and $\beta$ is a $3 \times 1$ vector of unknown parameters. We want to test hypotheses about the elements of $\beta$, which we write as $\beta_1$, $\beta_2$, $\beta_3$. The data are given by

$$
X'X = \begin{bmatrix}
2 & 0 & 0 \\
0 & 3 & 1 \\
0 & 1 & 3 \\
\end{bmatrix}, \quad X'Y = \begin{bmatrix}
4 \\
5 \\
3 \\
\end{bmatrix}, \quad Y'Y = 22.
$$

a. Test the null hypothesis of $\beta_2 = \beta_1$ against the alternative hypothesis of $\beta_2 > \beta_1$ at the 5% significance level.

b. Test the null hypothesis of $\beta_1 = \beta_2 = \beta_3$ at the 5% significance level. Explicitly state the alternative hypothesis.

Problem 2. Suppose that price and quantity are determined by the intersection of the linear demand and supply curves

$$
Q = \alpha_0 + \alpha_1 P + \alpha_2 Y + \varepsilon_1,
$$

$$
Q = \beta_0 + \beta_1 P + \beta_2 W + \varepsilon_2,
$$

respectively, where income ($Y$) and wage ($W$) are determined outside the market. In this model, are the parameters identified?

Problem 3. This is a continuation of Problem 3 from the previous problem set.

a. Test for the endogeneity of EDUC. Clearly state the null hypothesis and the alternative hypothesis. Explain clearly why your testing procedure is valid.

b. Use an overidentification test to test for the validity of the instruments SIBS, FEDUC, and MEDUC. Clearly state the null hypothesis and the alternative hypothesis.