Midterm, March 9 2010

Answer questions concisely. Only give derivations if I ask for them.

Problem 1 (10 points each) We have data on a cross-section of randomly selected firms in the US. For each firm we observe the value of production and labor input (measured as hours of work).

  a. If the dependent variable is the value of output and the independent variables are labor hours and its square, what is the estimate of the average marginal productivity of labor? For the rest of this problem we drop the squared labor input.

  b. Besides labor input there are other factors of production like capital (buildings, machines etc.). Does its omission from the relation bias the OLS estimates of the regression coefficients? Speculate about the sign of the bias and argue the suggested sign.

We observe the (average) wage rate paid by each firm in the sample.

  c. Is the firm wage rate an instrumental variable or a proxy variable? Why?

  d. Under what assumptions can you use this variable to eliminate the bias in the OLS estimator? Do you think that these assumptions can hold?

  e. Describe the estimation procedure that will give a consistent estimator of the regression coefficient on labor input under assumption in d. What does it mean for an estimator to be consistent?

We assume that capital input does not change much in a T year time interval and we collect data on firm output and labor input in these T years.

  f. Specify a linear regression model for the relation between output and labor and capital inputs in the T years.

g. Describe an estimation procedure that will give a consistent estimator of the regression coefficient on labor input.

h. Which assumptions are needed for the estimator in g. to be consistent?

Problem 2 (20 points each) Consider a linear regression model

$$y_i = \beta_1 + \beta_2 x_{i2} + \beta_3 x_{i3} + \varepsilon_i$$

with y_i miles driven by household i in a particular month, x_{i2} the average price of gasoline in the county of residence (dollars per gallon) and x_{i3} monthly household income (in thousands of dollars).

a. It is proposed to have a 20% national tax on gasoline, but to compensate the households they will receive 40$ per month. What is the change in miles driven by the average household due to this policy?

b. Transform the independent variables such that the change in a. is the coefficient on a single independent variable.

c. If the coefficient is -20.55 with a standard deviation of 3.75 and we have 5000 observations, give a 95% confidence interval for the change.