WRITTEN PAPER III (ECON 4135)

September 11, 2008

Auction theory predicts that the price of the object to be auctioned increases with the number of bidders in the auction. More bidders means more competition for the object and thus higher prices. The data we use here are from the Dutch flower auction. This auction is the largest flower auction in the world, comprising around 45% of all international trade in flowers and plants. Every morning growers bring theirs flowers to the auction. The auctioneers randomly place the flowers in the order in which they will be auctioned. The auctioning starts at 6.30 am and continues until all flowers have been auctioned.

The accompanying STATA file named "auction.dta", contains the data to be analyzed in this problem. The data set contains information on auctions of two types of Begonias. We are interested in explaining the price from the number of bidders, the type of the Begonia, and the day where the auction takes place. All the transactions take place on Monday-Thursday. A complete variable list is given in Table 1 below.

Table 1: **Variable list**

Variable name	**Description**
price	The price paid at the auction
bidders	The number of bidders present at the auction
time	*Seconds* after 6.30am where the auction takes place
*type*1	Dummy: =1 if the Begonia is of type 1 (different colors)
*type*2	Dummy: =1 if the Begonia is of type 2
monday	Dummy: =1 if the auction is on Monday
tuesday	Dummy: =1 if the auction is on Tuesday
wednesday	Dummy: =1 if the auction is on Wednesday
thursday	Dummy: =1 if the auction is on Thursday

1 . Estimate the following model by OLS

$$price = \beta_0 + \beta_1 bidders + \beta_2 type2 + \beta_3 tuesday + \beta_4 wednesday + \beta_5 thursday + u, \quad (1)$$

where u is the error term.

2. Our interest parameter is β_1 – the effect of the number of bidders on the price. However, there may be unobserved characteristics which both increase the price of the begonia (because they make it more attractive) but also attract more bidders. If so, could this lead to a biased (and inconsistent) OLS estimator of β_1? What sign (positive or negative) do you think the bias might have? Explain!

3. Assume now that *bidders* is an endogenous variable. What does this mean? State formally the requirements that some variable Z is a valid instrument for *bidders*.

4. Make a scatter plot with the variable *time* on the horizontal axis and *bidders* on the vertical axis. Give a brief description of the graph. Discuss, based on the graph and your own general knowledge about auctions, whether *time* could be a reasonable choice of instrument for *bidders*?

5. Use OLS to estimate the reduced form

$$bidders = \pi_0 + \pi_1 time + \pi_2 type2 + \pi_3 tuesday + \pi_4 wednesday + \pi_5 thursday + v. \quad (2)$$

Discuss, based on the results and an appropriate F-statistic, whether *time* is a strong or weak instrument for *bidders*.

6. Combine (1) and (2) to show that

$$\begin{aligned} price &= (\beta_0 + \beta_1\pi_0) + \beta_1\pi_1 time + (\beta_2 + \beta_1\pi_2) type2 + (\beta_3 + \beta_1\pi_3) tuesday \\ &\quad + (\beta_4 + \beta_1\pi_4) wednesday + (\beta_5 + \beta_1\pi_5) thursday + e \end{aligned} \quad (3)$$

What is the expression for the error term e (in terms of u and v)?

7. Regress *price* on the exogenous variables *time*, *type*2, *tuesday*, *wednesday* and *thursday* using OLS. *Use these OLS-estimates together with the estimates of* $\pi_0, \pi_1, ..., \pi_5$ *from (2)* to obtain an estimate of the interest parameter β_1. Use also the command *ivreg* in STATA to obtain the Two Stage Least Squares (TSLS) estimate of β_1. Compare the results and explain!

8. Compare the TSLS estimate of β_1 and compare with the OLS estimates in problem 1. What can you say about the *possible bias of the TSLS estimator relative to the bias in the OLS estimator*? (Hint: See Appendix 12.5 in Stock&Watson)