

Introduction to Econometrics

Fall 2004

Assignment 8

Today's Date: 11/15/2004

Due Date: 11/22/2004

Please show all of your work and clearly indicate your final response to each question.

1. Consider the following "Tobit" type model. Specify the (latent) linear regression model

$$y^* = \beta_0 + \beta_1 x + \varepsilon,$$

where ε is a independently and identically distributed as a normal random variable in the population with mean 0 and variance σ_ε^2 , x is an observable characteristic of the population member *that only takes positive values*, and β_0 and β_1 are unknown parameters. You have access to a random sample of N individuals from this population. You observe x_i for each sample member, as well as y_i , where

$$y_i = \begin{cases} y_i^* & \text{if } y_i^* > 0 \\ 0 & \text{if } y_i^* \leq 0 \end{cases} .$$

1. Derive the log likelihood function for this problem.
 2. Derive the maximum likelihood estimators of β and σ_ε^2 .
 3. Say that you have a sample of $N = 10$ observations, and that in this sample all individuals have a value of y equal to 0. Is the maximum likelihood estimator well-defined for this sample?
 4. Instead of the situation described in (c), assume that all 10 individuals have a value y that is greater than 0. Is the maximum likelihood estimator well-defined in this case?
 5. Describe in words the reason for the difference in the performance of the MLE in the two situations described in (c) and (d).
 6. Are the problems you encounter in (c) likely to persist as you increase the sample size?
2. W 10.1
 3. W 10.2
 4. W 10.6