

Economics 8205-8206: Applied Econometrics I

Instructor: Professor Gautam Gowrisankaran
Teaching Assistant: Mehmet Ozhabes
University of Minnesota, Fall Semester 2000

Assignment 5

Handed out: November 14, 2000

Due: November 30, 2000

Non-computer problem

1) (From Greene, Chapter 19, p. 895, problem 7.)

Consider a model $y_t = \{\alpha + \beta x_t + u\}$ and data that contains $n = n_1 + n_2 + n_3$ observations on y and x . For the first n_1 observations, $y=1$ and $x=1$. For the next n_2 observations, $y=0$ and $x=1$. For the last n_3 observations, $y=0$ and $x=0$. Prove that the FOCs for both the logit and the probit models do not have a solution. Explain the intuition of why this is the case.

2) Chamberlain's logit.

Consider a binary choice model with individuals i observed over two time periods, $t = 1, 2$. Suppose that the latent utility $u_{it} = x_{it}\beta + \alpha_i + \varepsilon_{it}$, where $\varepsilon_{it} \sim \text{iid logit}$, (i.e. the difference of two Type I extreme value draws) and that the observed $y_{it} = \{u_{it} > 0\}$. The only special feature is the addition of new parameters α_i , one for each individual. Write the conditional density, $\Pr(y_{i1}, y_{i2} | y_{i1} + y_{i2}, x_{i1}, x_{i2}, \beta)$ and show that this does not depend on α_i . Explain how this can be used to construct a tractable conditional likelihood estimator for β .

Computer problems: turn in your source code and results

3) Generalized least squares estimation: Use data set `assig5_pr3` for this problem.

You will be sent a Matlab data set that contains 50 time series observations and 5 regressors plus a dependent variable. Suppose that the errors are generated from an AR(1) process, so that $u_t = \rho u_{t-1} + \alpha_t$ where $\alpha_t \underset{\text{iid}}{\sim} N(0, \sigma^2)$ where σ^2 is unknown.

Estimate the model using OLS and FGLS. Find standard errors for your coefficients under both models.

(over...)

4) Maximum likelihood estimation of a tobit model. Use data set assign5_pr4 for this problem.

You will be sent a Matlab data set that contains 50 time series observations and 4 regressors plus a dependent variable. The dependent variable follows a tobit structure:

$$y_t^* = X_t\beta + u_t, y_t = \begin{cases} y_t^*, & \text{if } y_t^* > 0 \\ 0, & \text{otherwise} \end{cases}, u_t \sim N(0, \sigma^2) \text{ where } \sigma^2 \text{ is unknown.}$$

Write down the log likelihood function $\ln L(y|\beta, \sigma^2, X)$ and the derivative of this function for this tobit model. Estimate the parameters using a non-linear maximization algorithm. Find approximate standard errors for the parameters using the information matrix equality.