ECON 626: Empirical Microeconomics

Tobit

Department of Economics
University of Maryland
Fall 2019

1. **Ordinary Least Squares.**

   (a) Generate a sample of 1000 observations where outcome $y = 2 + w + x + e$ for standard normal random variables w, x, and e.

   (b) Regress y on w and x

   (c) Use the program below to estimate the OLS coefficients via maximum likelihood:

```
capture program drop myols
program myols
args lnf beta sigma
quietly replace ‘lnf’=log((1/‘sigma’)*normalden(($ML_y1-‘beta’)/‘sigma’))
*quietly replace ‘lnf’=log((1/‘sigma’)*normalden($ML_y1,‘beta’,‘sigma’))
end

ml model lf myols (beta: y = w x) /sigma
ml maximize

ml model lf myols (beta: y = w x) ()
ml maximize
```

2. Censor y so that it is only observed if it is positive. Estimate a tobit regression of y on w and x that adjusts for censoring. Compare your tobit results to OLS estimates.

3. Modify your likelihood program to estimate the censored regression of y on w and x via maximum likelihood.

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Estimating CRRA Coefficients

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1. **Estimating CRRA Coefficients without Censoring.**

   (a) Simulate the investment decisions of 1000 risk averse decision makers with a CRRA coefficient of 0.75 given a budget size of 10. The decision maker decides how much of her budget to invest in a risky security that yields a 600 percent return with probability one half and a loss of the investment otherwise. Assume the amount invested includes an additive error term where the error is standard normal. Censor the decisions: the amount investment must be in the interval $[0, 10]$.

   (b) Estimate the CRRA coefficient via non-linear least squares using Stata's `nl` command

   (c) Estimate the CRRA coefficient via ML by completing the program below. How do the ML estimates compare to the NLS estimates?

2. Redo the problem above with a CRRA coefficient of 0.1.

   (a) How do the estimated NLS and ML coefficients compare to the true values?

   (b) Adjust the likelihood function to correct for censoring (as needed). Compare your censored ML parameter estimate to the true parameter value.

3. Generate a treatment that increases the CRRA coefficient from 0.2 to 0.4 in a sample of 10,000 observations. (Set tretament to one for the first 5000 of 10000 observations (or for 5000 randomly chosen observations.) Estimate the impact of treatment on the CRRA coefficient via NLS, uncensored ML, and censored ML.