OLS and Discrete Choice

February 1, 2019

Exercise 1   Data creation

After setting a seed, construct the following objects

- X1: vector of 10,000 draws from a uniform distribution with range 1:3.

- X2: vector of 10,000 draws from a gamma distribution with shape 3 and scale 2

- X3: vector of 10,000 draws from a binomial distribution with probability 0.3

- eps: vector of 10,000 draws from a normal distribution with mean 2 and sd 1.

Create the variables

- Y = 0.5 + 1.2 X1 + -0.9 X2 + 0.1 X3 + eps

- $ydum = \begin{cases} 1, & \text{if } Y > mean(Y) \\ 0, & \text{otherwise} \end{cases}$

Exercise 2   OLS

- Calculate the correlation between Y and X1. How different is it from 1.2?

- We are interested in the outcome of the regression of Y on X where X = (1,X1,X2,X3).

- Calculate the coefficients on this regression.

- Calculate the standard errors

    - Using the standard formulas of the OLS.

    - Using bootstrap with 49 and 499 replications respectively.

Exercise 3   Numerical Optimization

We consider the probit estimation of ydum on X.

- Write a function that returns the likelihood of the probit.

- Implement the steepest ascent optimization algorithm to maximize that likelihood.

- How different are the parameters from the true parameters?

Exercise 4   Discrete choice

We consider the determinants of ydum.

- Write and optimize the probit, logit, and the linear probability model. You can use pre-programmed optimization packages.

- Interpret and compare the estimated coefficients. How significant are they?

Exercise 5   Marginal Effects

We consider the determinants of ydum.

- Compute the marginal effect of X on Y according to the probit and logit models.

- Compute the standard deviations using

    - The delta method

    - Bootstrap