

Econometrics 2 (Fall 2020)

Homework 5: Ordered Probit.

Due Wednesday on Oct. 7, 2020.

This code estimates, using maximum likelihood, the latent variable model

$$y_i = \beta_1 x_i + u_i ,$$
$$z_i = \begin{cases} 0 & \text{if } y_i < \gamma_0 \\ 1 & \text{if } \gamma_0 \leq y_i < \gamma_1 , \\ 2 & \text{if } y_i \geq \gamma_1 \end{cases}$$

where z_i is observed and y_i is latent with $\gamma_0 < \gamma_1$, $u_i \sim NID(0, \sigma^2)$ and $\sigma = 1$.

Set the parameters.

There are 50 simulations with 300 observations per simulation. Set $\beta_0 = 0.5$ and $\beta_1 = 3$.

Maximum Likelihood Estimation.

In each simulation, draw the error terms, U , from the standard normal distribution and generate the data, X , Y and Z . Estimate the model using maximum likelihood and record the estimates.

Display the results of the last simulation.

The estimate and standard error (in parenthesis) of β_1 in the last simulation is:

The estimate and standard error (in parenthesis) of γ_0 in the last simulation is:

The estimate and standard error (in parenthesis) of γ_1 in the last simulation is:

Empirical results.

The average and standard deviation (in parenthesis) of β_1 is:

The average and standard deviation (in parenthesis) of γ_0 is:

The average and standard deviation (in parenthesis) of γ_1 is:

Plot the estimated coefficients from all simulations.

Plot a histogram of β_1 .

Plot a histogram of γ_0 .

Plot a histogram of γ_1 .