ECO 530 - Introduction to Econometrics

Fall 2023

Exercise 3

50 points

Due Date: Friday, October 6

Instructions

Complete the exercises below using the Nicaragua Rural Business Development Data (NicaRBD.RData). Be sure to show all of your work. For this assignment, you can submit:

- A PDF containing your written answers, tables, and figures along with the R script that generates them
- A PDF document containing your written answers with the R code embedded in the document.

Q1

In this assignment, we are going to explore the relationship between technical efficiency in maize production (*te_maize*) and food expenditure (*food.expend*). We will also consider the relationships between access to credit (*couldgetloan*), holding formal land title (*writtentitle*) and food expenditure.

Begin by creating a dataframe for which there are no missing observations in the variables on which we will base our analysis (*te_maize*,*food.expend*,*couldgetloan*,*writtentitle*)

Now, summarize the technical efficiency and food expenditure variables for me. You should do this in the form of a paragraph. Please also present a table or figure. Your table or figure should treat each variable separately.

After you have summarized each variable separately, create a scatter plot depicting the relationship between technical efficiency in maize production and food expenditure. Describe any relationship visible in your plot in a few sentences.

Q2

We want to study:

$$E[f_i|te_i] = \beta_0 + \beta_1 te_i$$

Where, f_i is food expenditure for individual i and te_i is the technical efficiency measure for individual i. Building off our usual model:

$$f_i = E[f_i|te_i] + \epsilon_i$$

$$f_i = \beta_0 + \beta_1 te_i + \epsilon_i \tag{1}$$

Using Ordinary Least Squares, estimate Equation 1. Interpret your estimate of $\hat{\beta}_1$ in words. Present your results in both a table and using a coefficient plot. In your table, please limit the "statistics" reported at the bottom to only the number of observations (N).

Q3

Estimate the following two relationships separately.

- How does having credit access (couldgetloan=1) relate to food expenditure?
- How does having formal title to your land (writtentitle=1) relate to food expenditure?
- Caution: You will need to make some changes to the writtentitle variable prior to running your regression.

Present the results of both specifications in either a table or a coefficient plot. Discuss both estimates. Which is associated with a larger change in food expenditure?

Q4

Use Ordinary Least Squares to estimate the relationship depicted below:

$$te_i = \gamma_0 + \gamma_1 loan_i + v_i$$

Where te_i is the technical efficiency in maize production for individual i and $loan_i$ is equal to one if individual i could obtain a formal loan.

Present and discuss your results.

Q5

One way to represent the relationship you estimated in Q4 is as

$$\gamma_1 = E[te_i|loan_i = 1] - E[te_i|loan_i = 0]$$

Do you think the $\hat{\gamma}_1$ you obtained in $Q4$ is a good estimate of the relationship between credit access and technical efficiency? Draw a DAG to support your position.