ECN 301

Econometric Methods

Computer Lab Task #07
Spring Term 2022
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The study by O'Donnell and Griffiths (2006) uses a dataset consisting of information collected from 44 small-holder rice producers in the Tarlac region of the Philippines between 1990 and 1997[1]. The dataset is also used in the textbooks by Coelli, Rao, O'Donnell, and Battese (2005) and Hill, Griffiths, and Lim (2018) to illustrate estimation of production and cost functions. The dataset, called `rice2`, includes these variables:

```
------------------------------------------------------
Contains data from rice2.csv
------------------------------------------------------
Philippines Rice Data, IRRI
10 Oct 2013 11:04
------------------------------------------------------
  obs:           352
 vars:             6
------------------------------------------------------
variable name   variable label
------------------------------------------------------
farmid          Farm ID
year            Year
prod            Rice production (tonnes)
area            Area planted to rice (hectares)
labor           Labor (man-days of hired + family)
fert            Fertilizer applied (kilograms)
------------------------------------------------------
Sorted by:  farmid  year
------------------------------------------------------
```

Consider the following Cobb-Douglas production function specification:

$$\ln q_{it} = \alpha + \sum_{j=1}^{3} \beta_j \ln x_{jit} + \varepsilon_{it} \quad i = 1, \ldots, N \; t? = 1 \ldots, T. \tag{1}$$

where α represents the constant term and ε_{it} is the idiosyncratic error term. The output level (`prod`) is q_{it}, and the level of the factors of production are denoted x_{jit} for factor j for farmer i in year t. The three factors of production are land (`area`), `labor` and fertilizer (`fert`). The number of observations is NT.

1. Verify the number entities (farmers) and the number of time periods.

2. Create dummy variables for the years. Perform the estimation of the POLS (see below) both using explicit dummy variables and with year as a category variable.

3. The key task here is to use a variety of estimators for this data:

   (1) POLS
   (2) FE
   (3) RE
   (4) CRE

   And then provide a good argued answer to:

   (1) are there unobserved individual effects

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[1] This is panel data. However, here we will treat it as a random sample. I will revisit this dataset later in the course.

    (2) are there year specific effects

    (3) which estimator is valid/preferred and why

  4. Finally, is there constant returns-to-scale in rice farming?

References

COELLI, T. J., D. S. P. RAO, C. J. O'DONNELL, AND C. E. BATTESE (2005): *An Introduction to Efficiency and Productivity Analysis*. Springer-Verlag, New York, NY.

HILL, R. C., W. E. GRIFFITHS, AND G. C. LIM (2018): *Principles of Econometrics*. John Wiley and Sons, New York, NY.

O'DONNELL, C. J., AND W. E. GRIFFITHS (2006): "Estimating State Contingent Production Frontiers," *American Journal of Agricultural Economics*, 88(1), 249–266.