Advanced Econometrics – Lab 02

1   Panel data models

Exercise 1
The dataset `traffic.csv` consists of 1982-1988 state-level data for 48 U.S. states on traffic fatality rate (deaths per 100,000). We model the highway fatality rates as a function of several common factors:[1]

- `beertax` – the tax on a case of beer;
- `spircons` – a measure of spirits consumption;
- `unrate` – the state unemployment rate;
- `perincK` – state per capita income, in thousands.

a) Estimate model for fatality rate using fixed effects estimator.

b) Interpret parameters of the model.

c) Are individual effects significant?

d) Is there autocorrelation in residuals?

e) Is there heteroskedasticity in residuals?

f) Apply robust variance-covariance matrix estimator.

Exercise 2
The file *rice.dat* contains 352 observations on 44 rice farmers in the Tarlac region of the Philippines for the 8 years 1990-1997. Variables in the data set are tonnes of freshly threshed rice ($PROD$), hectares planted ($AREA$), person-days of hired and family labour ($LABOR$), and kilograms of fertiliser ($FERT$).[2]

variable	variable label
firm	firm number = 1 to 44
year	year = 1990 to 1997
prod	Rice production (tonnes)
area	Area planted to rice (hectares)
labor	Hired + family labor (person days)
fert	Fertilizer applied (kilograms)

a) Estimate model for rice production using fixed effects estimator.

b) Interpret parameters of the model.

---

[1]Ch.F. Baum, *Introduction to Modern Econometrics Using Stata*, p. 222.

[2]Data source: These data were used by O'Donnell, C.J. and W.E. Griffiths (2006), Estimating State-Contingent Production Frontiers, American Journal of Agricultural Economics, 88(1), 249-266.

c) Test joint insignificance of all variables in the model.

d) Estimate model for rice production using random effects estimator.

e) Run and interpret Hausman test.

f) Are individual effects significant?

g) Is there autocorrelation in residuals?

h) Is there heteroskedasticity in residuals?

Exercise 3

The data set `dancingwiththestars.csv` consists of judges' ratings of professional dance competitors rose across 20 seasons of a popular television series. Set `team` and `time` as

variable	description
serial	observation number
season	1- 20 – the IV
episode	1-12 within each season (varies)
judgenum	judge number (judges 1-3 are permanent)
judgexp	number of episodes the judge have attended
dancenum	dance within each episode
score	the judge's evaluation of the performance – the DV
finalist	whether or not that team made the top 3 that season
teamID	initials of the performers
ppepisodexp	number of episodes the professional partner has been on the show

indices for the panel data model.

a) Decide which of POLS, FE and RE model is appropriate for `score`.

b) Create quality publication table on the basis of models' results.

Exercise 4

The factors affecting the investment behavior by firms were studied by Grunfeld[3] using a panel of data.

Investment demand is the purchase of durable goods by both households and firms. In terms of total spending, investment spending is the volatile component. Therefore, understanding what determines investment is crucial to understanding the sources of fluctuations in aggregate demand. In addition, a firm's net fixed investment, which is the flow of additions to capital stock or replacements for worn-out capital, is important because it determines the future value of the capital stock and thus affects future labor productivity and aggregate supply.

---

[3]Grunfled, Y. (1958) *The Determinants of Corporate Investment.* Unpublished Ph.D. thesis, Department of Economics, University of Chicago,. Grunfeld, Y. and Z. Griliches (1960) "Is Aggregation Necessarily Bad?" *Review of Economics and Statistics*, 42, 1-13.

There are several interesting and elaborate theories that seek to describe the determinants of the investment process for the firm. Most of these theories evolve to the conclusion that perceived profit opportunities (expected profits or present discounted value of future earnings) and desired capital stock are two important determinants of a firm's fixed business investment. Unfortunately, neither of these variables are directly observable. Therefore, in formulating our economic model, we use observable proxies for these variables instead.

In terms of expected profits, one alternative is to identify the present discounted value of future earnings as the market value of the firm's securities. The price of a firm's stock represents and contains information about these expected profits. Consequently, the stock market value of the firm at the beginning of the year, denoted for firm "i" in time period "t" as V_{it}, may be used as a proxy for expected profits.

In terms of desired capital stock, expectations play a definite role. To catch these expectations effects, one possibility is to use a model that recognizes that actual capital stock in any period is the sum of a large number of past desired capital stocks. Thus, we use the beginning of the year actual capital stock, denoted for the ith firm as K_{it}, as a proxy for permanent desired capital stock.

Focusing on these explanatory variables, an economic model for describing gross firm investment for the ith firm in the tth time period, denoted INV_{it}, may be expressed as

$$INV_{it} = f(V_{it}, K_{it}) \tag{1}$$

Our concern is how we might take this general economic model and specify an econometric model that adequately represents a panel of real-world data. The data consist of $T = 20$ years of data (1935–1954) for $N = 11$ large firms.[4]

```
---------------------------------------------------------------------------
var name       variable label
---------------------------------------------------------------------------
i              GM=1 USS=2 GE=3 Chr=4 Rich=5 IBM=6 UnOil=7 West=8 Goodyr=9 Match=10
t              year, t=1 is 1935; t=20 is 1954
inv            = gross investment in plant and equipment, millions of $1947
v              = value of common and preferred stock, millions of $1947
k              = stock of capital, millions of $1947
---------------------------------------------------------------------------
_dta:
  1.  Source is H. D. Vinod and A. Ullah, Recent Advances in Regression Models,
  Marcel Dekker, Inc., 1981, Table 10.1
```

a) Decide which one of POLS, FE and RE model is appropriate for `INV`. Explain your answer.

b) Create quality publication table on the basis of models' results.

c) Are the models balanced? Explain.

Exercise 5
The code in Exercise 5 section is the first few steps of the general-to-specific procedure. Try to complete the procedure.

---

[4]Principles of Econometrics, pages 384-385.