Applied Econometrics Exam 2005

2 hours

Answer 2 questions

Question 1

Consider the model:

$$y_{it} = x_{it}^{'}\beta + \varepsilon_{it}$$

where the index *i* refers to the country and *t* to time, with:

$$\varepsilon_{it} = \alpha_i + \eta_{it}$$

where α is a country specific error term and cov(η,*x*)=0 for all *i*,*t*.

a) Explain the problems of estimating this model as OLS. (25%)
b) Consider the assumptions that α is uncorrelated with the regressors and that α is an industry-specific stochastic disturbance, independent of time, and assumed to be uncorrelated across industries, or with the η term. What models do these imply and what are their statistical properties. (25%)
c) The following results are from Dunne and Perlo-Freeman. They are for a growth model estimated using panel data for 98 countries 1981-97, where the dependent variable is log of military burden.

TABLE I Regression Results for Fixed Effects Model

Variable	*Model 1 Coefficient*	*Model 2 Coefficient*
External War	0.60 (8.8)	0.60 (8.8)
Civil War	0.11 (9.4)	0.11 (9.4)
Great Power Enemy	0.089 (1.0)	0.12 (1.4)
Democracy	–0.014 (–5.5)	–0.014 (–5.6)
log Population	–0.33 (–4.9)	–0.31 (–4.7)
log Trade	–0.036 (–1.9)	–0.043 (–2.2)
log GNP	–0.000 (–0.0)	–0.011 (–0.3)
log Security Web milex	–0.027 (–1.5)	
Log Potential Enemies milex	0.041 (7.9)	0.044 (8.0)
Log Others milex		0.032 (2.4)
R_2	0.86	0.86
Standard Error	0.34	0.34
Log Likelihood	–453	–451
Estimated autocorrelation	0.67	0.67

Notes: t ratios in parentheses

These results are for the fixed effects model. Explain how they would have been estimated and briefly discuss what the results tell you. (30%)

d) Explain what a random effects model, why this might be of interest an how you could test it against the fixed effects. (20%)

Question 2

a) Briefly explain what a VAR model is and how it can be developed to take account of possible cointegration. (50%)

b) Dunne, Nikolaidou and Smith (2002) estimate an arms race model using Cointegrating VAR methods. They get a cointegrating relation of the following form:

$MG_t = 4.01\ MT_t + 0.70\ YG_t - 1.38\ YT_t$
plus trend and a dummy variable for the invasion of Cyprus.
MG is Greek military spending, MT is Turkish military spending, YG is Greek GDP and YT is Turkish GDP.

The ECM estimates for the just identified system (t ratios in brackets) are:

$$\Delta MG_t = \underset{(2.74)}{2.42} + \underset{(0.55)}{0.10}\,\Delta MG_{t-1} - \underset{(0.39)}{0.06}\Delta MT_{t-1} - \underset{(2.17)}{0.58}\,\Delta YG_{t-1} - \underset{(1.36)}{0.26}\Delta YT_{t-1} + \underset{(2.68)}{0.10}\,Z_{t-1} + \underset{(2.10)}{0.12}\,CD_t$$

R^2 =0.29; SER=0.09

$$\Delta MT_t = \underset{(6.83)}{5.10} - \underset{(1.86)}{0.27}\Delta MG_{t-1} + \underset{(2.64)}{0.37}\Delta MT_{t-1} - \underset{(2.61)}{0.59}\Delta YG_{t-1} - \underset{(3.80)}{0.62}\,\Delta YT_{t-1} + \underset{(6.76)}{0.21}\,Z_{t-1} + \underset{(4.91)}{0.24}\,CD_t$$

R^2 =0.69; SER=0.07

CD is a dummy variable for the Turkish invasion of Cyprus and Z is the error correction term. There are also equations for GDP which are not reported.

i. Explain what they have done. (25%)
ii. Interpret and critically evaluate the results (25%)

Question 3

Consider the following Almost Ideal Demand System for good i

$$w_{it} = \alpha_{I0} + \Sigma_j \gamma_{ij} \ln P_{jt} + \beta_i (\ln X_t - \ln P_t^*) + u_{it}$$

where $w_{it} = P_{jt} Q_{it} / X_{it}$

X_{it} the total expenditure and P_{it} the price of the ith good.

$\ln P_t^* = \Sigma_I w_{it} \ln P_{it}$ the Stone price index

a. Explain how this system can be estimated by Ordinary Least Squares and the theoretical restrictions on the parameters that will hold *per se*. (25%)
b. Explain how you would test the theoretical restrictions of homogeneity and symmetry (20%)
c. Consider whether this static model is likely to be correctly specified and suggest other specifications that might be used. Discuss any problems likely to be involved in estimating these specifications. (30%)
d. Discuss briefly how you would estimate the system using the correct price index for the system:

$$\ln P_t^* = \alpha_0 + \Sigma_k \alpha_k \ln P_{kt} + 1/2\, \Sigma_j \Sigma_k \ln P_{jt} \ln P_{kt}$$

rather than the Stone price index. (25%)

Question 4.

a) Explain the law of proportionate effects and discuss how you would test it. (40%)

b) Dunne and Hughes (1992) estimate a 'law of proportionate effect' model on data on UK quoted companies and find

$$\log S_{it} = 1.20 + 0.95 \log S_{it-1} + e_i$$
$$(0.27)$$
$R^2 = 0.81$ White F = 10.41

$$\log S_{it} = 1.68 + 0.95 \log S_{it-1} - 0.12 \log A_i + e_i$$
$$(0.28) \qquad (0.03)$$
$R^2 = 0.82$ White F = 4.64

White standard errors in brackets

S_{it} is size of company i in 1985
S_{it-1} is size of company i in 1980
A_i is age of company i in 1980

i) Test the ' law of proportionate effects'. (15%)
ii) Interpret the results and explain why the White F has changed. (15%)

c) Explain how you could deal with problems of sample attrition bias. (30%)

Question 6

a) Interpret the following production functions and derive their marginal productivity equations.

$$Q_t = AK_t^{\alpha} L_t^{\beta}$$

$$Q_t = \gamma \left[\delta K_t^{-\theta} + (1-\delta) L_t^{-\theta} \right]^{-\nu/\theta}$$

Under what conditions will they be identical. (40%)

b) Show how you would estimate these equations using time series data. (20%)

c) Explain how you would use these models to analyse the relationship between military spending and growth, by direct OLS estimation and using cointegrating VAR methods. (40%)