ECO 6375 Prof. T. Fomby
Applied Econometrics Spring 2012

EXERCISE 2

Unbalanced Time Series Regressions

Purpose: To come to understand what is meant by the phenomenon of **Unbalanced Equations** and the danger of interpreting regression results that come from such equations.

Consider the SAS program spurious2.sas that you have been provided. The program generates two regression results for 20 separate samples of size 100, one from the incorrectly specified regression

$$Y_t = \beta_0 + \beta_1 X_t + \nu_t \qquad (1)$$

and one from the correctly specified equation

$$Y_t = \beta_0 + \beta_1 \Delta X_{t-1} + u_t \qquad (2)$$

where in equation (1), $\nu_t = -\beta_1 X_{t-1} + u_t$. Obviously, equation (1) is **unbalanced** in the sense that the dependent variable Y_t is I(0) while the explanatory variable X_t is I(1) resulting in an error ν_t being I(1). Thus, equation (1) and its equation will produce an ordinary least squares estimator, say $\tilde{\beta}_1$, that will have the property that $p\lim(\tilde{\beta}_1) = 0$ and the corresponding t-statistic will be inconsistent and will tend to indicate statistical insignificance. In contrast, equation (2) is **balanced** in that the dependent variable Y_t is I(0) and the explanatory variable ΔX_t is also I(0). The ordinary least squares estimator of β_1 in equation (2), say $\hat{\beta}_1$, will have the property that $p\lim(\hat{\beta}_1) = \beta_1$ and the t-statistic for $\hat{\beta}_1$ will be consistent resulting in proper inference. In a manner similar to Exercise 1, I want you to score the two regressions (1) and (2) and record the significances of the respective coefficient estimates of β_1 in the two equations using S to denote if the coefficient is statistically significant at the 5% level and NS otherwise.

Data Set	Unbalanced Regression (1)	Balanced Regression (2)
1	_____	_____
2	_____	_____
3	_____	_____
4	_____	_____
5	_____	_____
6	_____	_____
7	_____	_____

8	_____	_____
9	_____	_____
10	_____	_____
12	_____	_____
13	_____	_____
14	_____	_____
15	_____	_____
16	_____	_____
17	_____	_____
18	_____	_____
19	_____	_____
20	_____	_____

Consider the SAS program spurious3.sas that can be found on my webpage under class Eco 6375. The program generates two regression results for 20 separate samples of size 100, one from the incorrectly specified regression

$$Y_t = \beta_0 + \beta_1 X_t + \nu_t \qquad (1)$$

and one from the correctly specified equation

$$\Delta Y_t = \beta_0 + \beta_1 X_{t-1} + u_t \qquad (2)$$

where in equation (1), $\nu_t = Y_{t-1} + u_t$. Obviously, equation (1) is **unbalanced** in the sense that the dependent variable Y_t is I(1) whereas the explanatory variable X_t is I(0). This leads to the error term of the regression (1), ν_t, being I(1). Thus the equation will produce an ordinary least squares estimator, say $\tilde{\beta}_1$, that will have the property that $p\lim(\tilde{\beta}_1) = 0$ and the corresponding t-statistic will be inconsistent and will tend to indicate statistical insignificance. In contrast, equation (2) is balanced in that the dependent variable ΔY_t is I(0) and the explanatory variable X_t is also I(0). The ordinary least squares estimator of β_1 in equation (2), say $\hat{\beta}_1$, will have the property that $p\lim(\hat{\beta}_1) = \beta_1$ and the t-statistic for $\hat{\beta}_1$ will be consistent resulting in proper inference. As above, I want you to score the two regressions (1) and (2) and record the significances of the respective coefficient estimates of β_1 in the two equations using S to denote if the coefficient is statistically significant at the 5% level and NS otherwise.

Data Set	Unbalanced Regression (1)	Balanced Regression (2)
1	_____	_____
2	_____	_____
3	_____	_____
4	_____	_____
5	_____	_____

6	_____	_____
7	_____	_____
8	_____	_____
9	_____	_____
10	_____	_____
12	_____	_____
13	_____	_____
14	_____	_____
15	_____	_____
16	_____	_____
17	_____	_____
18	_____	_____
19	_____	_____
20	_____	_____

What conclusions do you draw from the results that you have generated through these two SAS programs?