Homework

Econ 5243

March 4, 2011

Problem

Two models are considered below. The first is the classical linear regression model. Assume that u_t iid $N(0,1)$ and that $E(\underline{u}|X) = \underline{0}$. The least squares estimator is unbiased.

$$y_t = \beta_1 + \beta_2 x_t + u_t \qquad t = 1, 2, \ldots, n \tag{1}$$

The second model is a lagged dependent variable model. In this case u_t iid $N(0,1)$ and $E(u_t|y_{t-1}) = 0$. Though biased, least squares is consistent in this model.

$$y_t = \beta_1 + \beta_2 y_{t-1} + u_t \qquad t = 1, 2, \ldots, n \tag{2}$$

Design and carry out a simulation that verifies the properties of least squares. Start with samples of size 10 and then consider $n = 10^2$ and $n = 10^4$. The number of simulated should probably be at least 399, though you can use your own judgement on this. Increasing the number of simulated samples increases the precision of the Monte Carlo. The properties of least squares does not depend on the values of the parameters β_1 and β_2, which you can easily verify. For samples of x_t I'd suggest generating them yourself using random numbers. Remember, the more variation you have in x_t, the more precise least squares is other things being equal. See (Adkins 2011) for some gretl hints.

References

Adkins, Lee (2011), 'Monte carlo simulations using gretl: A primer', *http://www.learneconometrics.com/pdf/MCgretl/index.htm* .