Econ 82100 Econometrics I
Homework 5
(due 11/28)

1. Consider a model of quarterly unemployment rates in the U.S. We run the model of the form and get the coefficients:

$UNEMP_t = 5.15^* - 0.435^* GROW_t - 0.059t + 0.004^* t^2 + \epsilon_t$

where $UNEMP_t$ is the unemployment rate in quarter t, $GROW_t$ is the rate of growth in GDP over the previous quarter, and t and t^2 are included to allow for time trends, and "*" indicates that the coefficient is significantly different from 0 at the 1 percent level according to a standard t-test.

We now want to test for first-order serial correlation in ϵ_t, that is, for a relation $\epsilon_t = \rho\epsilon_{t-1} + u_t$. The null hypothesis is that $\rho = 0$.

To conduct the test we estimate an auxiliary regression, with the following result:

$e_t = -0.26 + 0.909^* e_{t-1} + 0.291^* GROW_t + 0.002t - 0.001t^2$

where e_t is the least square residual taken from the unemployment regression above and e_{t-1} is the lagged residual. The sample size for this regression is 152. The sum of squares of the dependent variable e_t, or $e\prime e$, is 197.3.

Let $\widehat{e}_t$ denote the predicted value of e_t calculated from the auxiliary regression. Its sum of square $\widehat{e}'\widehat{e} = 146.2$.

Calculate the LM test statistic for the null hypothesis $\rho = 0$ and test its significance.

2. (True or false, and explain your answer shortly) In a model with measurement errors, OLS estimator would still be consistent.

3. In the simultaneous equation models of the following:

Demand equation: $q_i = \alpha_0 + \alpha_1 p_i + \alpha_2 x_i + u_i$

Supply equation: $q_i = \beta_0 + \beta_1 p_i + v_i$

where $E(u_i) = 0$, $E(v_i) = 0$, $cov(u_i, v_i) = 0$, q_i is quantity demanded or supplied, p_i is the price, and x_i is income, $cov(x_i, v_i) = 0$, $cov(x_i, u_i) = 0$

a) Solve for p_i and q_i from the two equations.

b) Is the demand equation identified? Is the supply equation identified? Are they overidentified?

c) Derive the 2SLS estimator for α_1 or β_1 if they are identified. Is the 2SLS estimator consistent?

4. Let $(y_{i,}x_i)$ be a random sample with $E(Y|X) = X\beta$. Consider the Weighted Least Square (WLS) estimator of β, $\widehat{\beta} = (X'WX)^{-1}(X'WY)$ where $W = diag(w_1, ..., w_n)$ and $w_i = x_{ji}^{-2}$, where x_{ji} is one of the x_i.

a) In which context would $\widehat{\beta}$ be a good estimator?

b) Using your intuition, in which situation would you expect that $\widehat{\beta}$ would perform beter than OLS?