Final Examination

Introduction to Econometrics (Spring, 2010)
Time allowed: 2 hours

1. Discuss the validity of the following statements.

   (a) (10 points) Convergence in mean square implies convergence in probability.

   (b) (10 points) Regardless of the functional forms of the null hypothesis, Wald tests bring the same inferential results as long as the functional forms are factually equivalent.

   (c) (10 points) To calculate Breush and Pagan's test for heteroskedasticity, we have to estimate the variances of the error terms.

   (d) (10 points) When the dependent variable is subject to measurement error, the OLS estimator of the slope coefficient is consistent.

   (e) (10 points) The first-differencing estimator is more efficient than the Within-OLS estimator.

   (f) (10 points) The well known inequality $LM \leq LR \leq W$ implies that the Wald test is more powerful than the others in finite samples.

   (g) (10 points) The feasible GLS estimator is more efficient than the OLS estimator whatever the sample size is.

2. (20 points) Consider the linear regression

$$y_t = \beta' x_t + \varepsilon_t,$$

   where

$$\varepsilon_t = \rho\varepsilon_{t-1} + u_t,\ u_t \sim iid\left(0, \sigma^2\right),\ \ |\rho| < 1.$$

   (a) What are the variance and autocovariances of ε_t?

   (b) Explain how we can test the null hypothesis $\beta = \beta^0$ by using the GLS method along with the Wald principle.

3. (20 points) For the linear regression model

$$\begin{aligned} y_t &= \beta' x_t + \gamma_1' z_t + \varepsilon_t,\ (t = 1, ..., T_1)\,; \\ y_t &= \beta' x_t + \gamma_2' z_t + \varepsilon_t,\ (t = T_1 + 1, ..., T)\,, \end{aligned}$$

   how can we test the null hypothesis $\gamma_1 + \gamma_2 = 0$ by using the Wald principle? What is its limiting distribution? Assume $\varepsilon_t \sim iid(0, \sigma^2)$.

4. (30 points) Consider the panel data model

$$\begin{aligned} y_{it} &= \alpha + x_{it}'\beta + u_{it},\ (i = 1, ..., N,\ t = 1, ..., T) \qquad (1) \\ u_{it} &= \mu_i + \nu_{it},\ v_{it} \sim iid(0, \sigma_v^2). \end{aligned}$$

(a) Suppose that T is fixed. Under what conditions is the Within-OLS estimator of β consistent.

(b) Suppose that T is fixed. Under what conditions is the first-differencing estimator of β consistent.

(c) Devise an unbiased estimator of σ_v^2 by using the Within-OLS estimator of β.