Economics 421/521
Winter 2012
Midterm

Answer the following questions (20 points each):

1. Given the following estimated model (standard errors in parentheses):

$$\hat{Y}_i = 2.67 + .71 * X_{2i} + 7.00 * X_{3i} - 1.44 * X_{4i} + u_i$$
$$\quad (1.03)\ (.12) \qquad (3.00) \qquad (6.31)$$
$$N = 17,\ R^2 = .38,\ RSS = 189$$

(a) Form the t-statistic to test the hypothesis that the coefficient on X_3 equals 1.0, i.e. $H_0 : \beta_3 = 1.0$ versus $H_1 : \beta_3 \neq 1.0$. Find the t-statistic in the attached table (use a 5% level of significance), and conduct the test. (b) In the model

$$Y_i = \beta_1 + \beta_2 X_{i2} + \beta_3 X_{i3} + \beta_4 X_{i4} + u_i$$

describe in detail how to test the hypothesis that $H_0 : \beta_2 = \beta_3 = 2.0$ versus H_1 : at least one not equal to 2.0.

2. (a) What are the consequences of estimating a heteroskedastic model with OLS? (b) Suppose that

$$Y_i = \beta_1 + \beta_2 X_{2i} + \beta_3 X_{3i} + u_i$$

and that you suspect heteroskedasticity of the form:

$$\sigma_i^2 = \alpha_1 + \alpha_2 X_{2i} + \alpha_3 X_{3i}$$

(b) Describe how to conduct an LM test for the presence of heteroskedasticity and, if heteroskedasticity is present, how to correct the problem.

3. (a) What is the difference between bias and consistency? (b) Explain the consequences of estimating the following model with OLS:

$$Y_t = \alpha Y_{t-1} + \beta_1 + \beta_2 X_{2t} + \beta_3 X_{3t} + u_t, \quad u_t = \rho u_{t-1} + e_t$$

(c) Explain why the Durbin-Watson test fails for this model. What test should be used instead of the Durbin-Watson?

4. (a) Describe White's test for heteroskedasticity. (b) Give a step by step description of how to conduct a Breusch-Pagan test for higher order serial correlation in the following model:

$$Y_t = \beta_1 + \beta_2 X_{2t} + \beta_3 X_{3t} + u_t, \quad u_t = \rho_1 u_{t-1} + \rho_2 u_{t-2} + \rho_3 u_{t-3} + \rho_4 u_{t-4} + e_t$$

5. For the following errors in variable model, show that the OLS estimate of β_2 is biased and inconsistent:

$$Y_i = \beta_1 + \beta_2 V_i + u_i, \text{ where } X_i = V_i + e_i$$

In this model, V_i is unobservable. However, X_i is observable and it is used instead of V_i in the OLS regression. Assume that all random variables in the model, i.e. u_i and e_i, are independent.