3. Which of the assumptions that are required for OLS to be BLUE is violated when the error term is heteroskedastic? What are the consequences of estimating a heteroskedastic model with OLS?

4. You need to test the following model for heteroskedasticity and, if it is found, correct for it:

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

Unfortunately, you do not have time to do it yourself so you will have to pass the task along to your assistant. Give an explicit set of instructions that your assistant, who does not know how to do these tests or corrections but does understand how to run regressions, can use to do the following:

(a) Test the model for heteroskedasticity using this model of the variance:

$$\sigma_i^2 = \alpha_1 + \alpha_2 X_{i2} + \alpha_3 X_{i3}$$

(b) If the test indicates heteroskedasticity is present, correct for it using the same model of the variance.

5. Which of the assumptions that are required for OLS to be BLUE is violated when autocorrelation is present in the error term? What are the consequences of using OLS to estimate a model with autocorrelated errors?

6. For the model

$$Y_i = \beta_1 + \beta_2 X_{i2} + u_i$$

(a) show that the OLS estimator of the coefficient on X_2 is unbiased. (b) Explain why the presence of a lagged dependent variable causes bias. (c) How does unbiasedness differ from consistency?

7. Once again, you are short on time but need to get some econometric work done, so you will have to leave instructions to your assistant. For the model:

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

give detailed instructions on how to test the null hypothesis that $\beta_2 - 2\beta_3 = 1$.

Economics 421/521
Winter 2008
Midterm 1

Answer SIX of the following questions (if you answer all seven, the score in the *middle* will be dropped):

1. What are the consequences of including an irrelevant variable in a regression model? What are the consequences of excluding a relevant variable? Which is likely to be the more severe problem?

2. Suppose you estimate the following model (standard errors in parentheses):

$$\hat{Y}_i = -2.89 + .77 * X_{2i} + 4.85 * X_{3i} - 1.64 * X_{4i} + u_i$$
$$\quad (1.24) \quad (.34) \qquad (1.17) \qquad (.41)$$
$$N = 40$$
$$R^2 = .47$$
$$RSS = 221$$

(a) Form the t-statistic to test the hypothesis that the coefficient on X_4 is significantly different from zero.
(b) Use the attached table of t-statistics to find the critical value for a two-sided test at the 5% level of significance.
(c) If the t-statistic in part (a) is larger than the value you chose in part (b), what do you conclude?
(d) Continuing, suppose you want to test the null hypothesis that X_3 and X_4 are jointly zero, so you estimate the restricted model:

$$\hat{Y}_i = -3.01 + .67 * X_{2i}$$
$$\quad (1.36) \quad (.32)$$
$$N = 40$$
$$R^2 = .41$$
$$RSS = 246$$

Form the appropriate statistic to test the hypothesis that X_3 and X_4 are jointly zero. Which F-statistic from the attached table is the appropriate critical value for this test? (The statistics are for a 5% level of significance.)

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