Economics 6002
Final Examination

Dr. Noel Roy   Fall 2007 Semester

PART I (40 percent)

Explain whether FOUR of the following statements are true, false, or uncertain.

1.   In the regression equation

$$\hat{y} = \hat{\alpha} + \hat{\beta}_1 x_1 + \hat{\beta}_2 x_2$$

$\hat{\beta}_1$ measures the effect of x_1 on y. If it is not significantly different from zero, it means x_1 has no effect on y.

2.   Between the equations $y = \beta x + u$ and $y = \beta x + \gamma z + v$, we should always choose the one that maximizes $\bar{R}^2$ or minimizes $\hat{\sigma}^2$.

3.   Some simultaneous equations systems can be consistently estimated by OLS.

4.   In the regression model

$$y = \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + u.$$

If an irrelevant variable x_4 is included, the estimator $\hat{\beta}_1$ is still unbiased and its standard error is also correct. Thus superfluous explanatory variables cause no problems.

5.   The R^2 for an equation estimated by OLS is always higher than the R^2 from the equation estimated by 2SLS. Hence OLS is always better than 2SLS.

6.   Suppose that

$$y_t = \alpha + \beta y_{t-1} + u_t$$

where $u_t \sim iid\,(0, \sigma^2)$. Although the regressor y_{t-1} is stochastic, the OLS estimator of β is still unbiased because u_t and y_{t-1} are independent.

7.   We are always advised to correct for heteroskedasticity, even if we are unsure the

problem exists, since ordinary least squares is a special case of generalized least squares.

PART II (60 percent)

Answer FOUR questions.

8.   A friend for his econometrics project has regressed the log of the Newfoundland employment rate on the ratio of the Newfoundland minimum wage relative to Newfoundland average wages and on real (non-Newfoundland) Canadian GDP. The results are unsatisfactory — although the minimum wage variable is significant and the right sign, the GDP variable has the wrong sign and is insignificant. In desperation he begins throwing all sorts of variables into the regression to see if he could get better results, and, miraculously, finds that if he puts in a time trend as an extra regressor everything works out fine — both the minimum wage variable and GDP are significant with the right sign. A classmate throws some cold water on this by noting that a graph of the Newfoundland unemployment rate clearly contains no trend but yet his results have the time trend with a significant negative coefficient. How is he going to explain this in his writeup? And how is he going to interpret the other coefficients with that time trend in there? He comes to you in panic for advice. What advice would you offer?

9.   A classic study tests the hypothesis that heartbeat is a linear function of the difference between the lengths of an individual's legs rather than the length of either leg. This hypothesis can be tested by

$$\text{Equation 1: } H = \alpha_0 + \alpha_1 R + \alpha_2 L,$$
$$\text{or by}$$
$$\text{Equation 2: } H = \beta_0 + \beta_1 R + \beta_2 (L - R)$$

where H is heartbeat rate, R is length of the right leg, and L is length of the left leg. For an econometrics assignment a friend has chosen the second specification because (she says) it provides (a) a direct test of the hypothesis, and (b) a more powerful test of the hypothesis because it breaks the obvious collinearity between R and L. Before submitting her assignment she asks for your advice. What advice would you offer?

10.   Suppose you are investigating the impact of a school lunch program in student performance on a standardized test, using aggregate data from 500 schools. You regress school average test score on the fraction of students in the school benefiting from the lunch program but to your surprise get a negative slope coefficient. What is likely the cause of this? How would you deal with the problem?

11.   Professor Z is analysing how long it takes economics PhD students to complete their degree. Using data on a very large number of students who entered PhD studies in 1990, he regressed number of semesters to completion on several explanatory variables, including gender, age, marital status, prestige of school, various measures of financial

support, and various proxies for ability. Some observations were omitted because by 1999 they still hadn't graduated. What advice can you offer?

12   Suppose $y_1 = \alpha_0 + \alpha_1 y_2 + \alpha_2 x + \varepsilon_1$ and $y_2 = \beta_0 + \beta_1 y_1 + \varepsilon_2$, and the reduced form estimates are $y_1 = 2 + 4x$ and $y_2 = 1 + 8x$.
    a.   Estimate the identified structural coefficients.
    b.   Assume that $\alpha_1 = 0$ and estimate the identified structural coefficients.
    c.   Assume that $\alpha_0 = 0$ and estimate the identified structural coefficients.

13.   Comment on the following: The method of least squares does not require an assumption about the distribution of the error, whereas maximum likelihood does; thus, OLS estimates are preferred to MLEs.