Qualification Test for Ph.D. Program in Business
Research Methods

4/24/2020

For 1st semester:

1. An economics department at a large state university keeps track of its majors' starting salaries. Does taking econometrics affect starting salary? Let *SAL* = salary in dollar, *GPA* = grade point average on a 4.0 scale, *METRICS* = 1 if student took econometrics, and *METRICS* = 0 otherwise. Using the data containing information on 50 recent graduates, we obtain the estimated regression

   $\widehat{SAL} = 24200 + 1643GPA + 5033METRICS \quad R^2 = 0.74$

   (se) (1078) (352) (456)

   (a) Interpret the estimated equation. (5%)
   (b) How would you modify the equation to see whether women had lower starting salaries than men? (10%)
   (c) How would you modify the equation to see if the value of econometrics was the same for men and women? (10%)

2. Please describe the method of testing the equivalence of two regression equations. (Hint: Chow test) (15%)

3. (a) Explain what is meant by (i) an omitted variable and (ii) an irrelevant variable. (10%)
   (b) Explain the consequences of omitted and irrelevant variables for the properties of the least squares estimator. (10%)

4. Consider the following estimated regression equation (standard errors in parentheses):

   $\hat{y} = 5.83 + 0.869x \quad R^2 = 0.756$
   (se) (1.23) (0.117)

   Rewrite the estimated equation that would result if
   (a) All values of x were divided by 20 before estimation (10%)
   (b) All values of y were divided by 50 before estimation (10%)

5. In multiple regression analysis, what are the relationships between ***t***- and ***F***-tests? (10%)

6. Suppose from a sample of **51** observations, the least squares estimates and the corresponding estimated covariance matrix are given by

$$\begin{bmatrix} b_1 \\ b_2 \\ b_3 \end{bmatrix} = \begin{bmatrix} 2 \\ 3 \\ -1 \end{bmatrix}, \quad \widehat{\text{cov}(\text{b})} = \begin{bmatrix} 3 & -2 & 1 \\ -2 & 4 & 0 \\ 1 & 0 & 3 \end{bmatrix}$$

Test each of the following hypotheses and state the conclusion:

(a) $\beta_1 + 3\beta_2 = 5$ (5%)

(b) $\beta_1 - \beta_2 + 2\beta_3 = 4$ (5%)