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

10/4/2023

For 1st semester:

1. In multiple regression analysis, what are the relationships between ***t***- and ***F***-tests? (15%)

2. (a) Explain what is meant by (i) an omitted variable and (ii) an irrelevant variable. (5%)
   (b) Explain the consequences of omitted and irrelevant variables for the properties of the least squares estimator. (10%)

3. When using N = 50 observations to estimate the model $Y_i = \beta_1 + \beta_2 X_i + \beta_3 Z_i + e_i$, you obtain SSE = 2132.65 and $s_y = 9.8355$.

   (a) Find R^2. (5%)
   (b) Find the value of the F-statistic for testing $H_0 : \beta_2 = 0, \beta_3 = 0$. Do you reject or fail to reject H_0 at a 5% level of significance? (5%)

4. Please describe the method of testing the equivalence of two regression equations. (Hint: Chow test) (10%)

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For 2nd semester:

1. Consider a model for the health of an individual:

$$health = \beta_0 + \beta_1 age + \beta_2 weight + \beta_3 height + \beta_4 male + \beta_5 work + \beta_6 exercise + u$$

where *health* is some quantitative measure of the person's health, *age, weight, height*, and *male* are self-explanatory, *work* is weekly hours worked, and *exercise* is the hours of exercise per week.

(a) Why might you be concerned about *exercise* being correlated with the error term u? (5%)

(b) Suppose you can collect data on two additional variables, *disthome* and *distwork*, the distances from home and from work to the nearest health club or gym. Discuss whether these are likely to be uncorrelated with u. (5%)

2. Please describe a test for the existence of correlation between the error term and the explanatory variables in a model, explaining the null and alternative hypotheses, and the consequences of rejecting the null hypothesis. (15%)

3. Please explain (a) why lags are important in models that use time-series data, and (b) the ways in which lags can be included in dynamic econometric models. (15%)

4. Please describe the two-stage least squares estimation procedure for estimating an equation in a simultaneous equations model, and explain how it resolves the estimation problem for least squares. (10%)