

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

10/2-3/2024

**For 1<sup>st</sup> semester:**

1. A large company is accused of gender discrimination in wages. The following model has been estimated from the company's human resource information

$$\ln(WAGE) = 1.439 + .0834 \text{ EDU} + .0512 \text{ EXPER} + .1932 \text{ MALE}$$

where *WAGE* is hourly wage, *EDU* is years of education, *EXPER* is years of relevant experience, and *MALE* indicates the employee is male.

- (a) What is the marginal effect of experience on wages? (10%)  
(b) How much more do men at the firm earn, on average? (5%)
2. What is the dilemma of choosing between generalized least squares (GLS) and ordinary least squares (OLS) with robust standard errors when heteroskedasticity is present? Under what circumstances would you choose to use robust standard errors? (15%)
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%)

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

10/2-3/2024

**For 2<sup>nd</sup> semester:**

1. The labor supply of married women has been a subject of a great deal of economic research. Consider the following supply equation specification

$$HOURS = \beta_1 + \beta_2 WAGE + \beta_3 EDUC + \beta_4 AGE + \beta_5 KIDSL6 + \beta_6 NWIFEINC + e$$

where *HOURS* is the supply of labor, *WAGE* is hourly wage, *EDUC* is years of education, *KIDSL6* is the number of children in the household who are less than 6 years old, and *NWIFEINC* is household income from sources other than the wife's employment.

- (a) Discuss the signs you expect for each of the coefficients. (5%)
- (b) Explain why this supply equation cannot be consistently estimated by OLS regression. (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%)