BINDURA UNIVERSITY OF SCIENCE EDUCATION

FACULTY OF COMMERCE

DEPARTMENT OF ECONOMICS

PROGRAMME: BSC ECONOMICS HONOURS DEGREE

EC420: ECONOMETRICS II EXAMINATION

DURATION: 3 HOURS   MAR 2023

INSTRUCTIONS:

1) Answer question one and any other three questions.

2) Each question carries 25 marks.

3) Cell-phones are not allowed into the examination room.

QUESTION 1 (COMPULSORY)

Consider the following production function, known in the literature as the transcendental production function (TPF):

$$Q_i = \beta_1 L_i^{\beta_2} K_i^{\beta_3} e^{\beta_4 L_i + \beta_5 K_i}$$

where Q, L, and K represent output, labour, and capital, respectively.

a) Linearise this TPF function given above.   **(3 marks)**

b) Assuming that estimating the linearised model produces coefficient estimates of 12.4 for β_2, 0.62 for β_3, 2.87 for β_4 and 0.96 for β_5. Interpret the various coefficients in the TPF.   **(8 marks)**

c) How would you compute the output-labour and output-capital elasticities for this model? Are they constant or variable?   **(6 marks)**

d) Re-interpret the results given in (b) above assuming the model was a linear model.   **(6 marks)**

e) Describe the situation that suits usage of the TPF.   **(2 marks)**

QUESTION 2

a) Explain the causes and consequences of multi-collinearity in regression analysis.   **(12 marks)**

b) Examine the normality assumption under Classical Linear Regression.   **(6 marks)**

c) Suggest any method that you can use to correct for heteroscedasticity and explain the mechanics of performing the test. **(7 marks)**

QUESTION 3

Suppose you collect data from a survey on wages, education, experience, and gender. In addition, you ask for information about marijuana usage. The original question is: "On how many separate occasions last month did you smoke marijuana?"

a) Write an equation that would allow you to estimate the effects of marijuana usage on wage, while controlling for other factors, measuring marijuana usage as:

    i.   A discrete variable. **(3 marks)**

    ii.   A binary variable. **(3 marks)**

b) Write a model that would allow you to test whether drug usage has different effects on wages for men and women and explain how the hypothesis can be tested. **(5 marks)**

c) Suppose you think it is better to measure marijuana usage by putting people into one of four categories: nonuser, light user (1 to 5 times per month), moderate user (6 to 10 times per month), and heavy user (more than 10 times per month). Now write a model that allows you to estimate the effects of marijuana usage on wage. **(5 marks)**

d) Using the model in part (c), explain in detail how to test the null hypothesis that marijuana usage has no effect on wage. Be very specific and include a careful listing of degrees of freedom. **(4 marks)**

(e) What are some potential problems with drawing causal inference using the survey data that you collected? **(5 marks)**

QUESTION 4

a) Which of the equations in the following equation systems are simultaneous, and which are recursive? Explain your reasoning and be sure to specify which variables are endogenous and which are predetermined: **(10 marks)**

i.
$$Y_{1t} = \beta_0 + \beta_1 Y_{2t} + \beta_2 X_{1t} + \beta_3 X_{2t-1} + e_{1t}$$
$$Y_{2t} = \eta_0 + \eta_1 Y_{3t} + \eta_2 Y_{1t} + \eta_3 X_{4t} + e_{2t}$$
$$Y_{3t} = \omega_0 + \omega_1 X_{2t} + \omega_2 X_{1t-1} + \omega_3 X_{4t-1} + e_{3t}$$

ii.
$$Z_t = \beta_0 + \beta_1 X_t + \beta_2 Y_t + \beta_3 H_t + e_{1t}$$
$$X_t = \eta_0 + \eta_1 Z_t + \eta_2 P_{t-1} + e_{2t}$$
$$H_t = \omega_0 + \omega_1 X_{2t} + \omega_2 G_t + \omega_3 CS_t + \omega_4 D_t + e_{3t}$$

iii.
$$Y_{1t} = \beta_0 + \beta_1 Y_{2t} + \beta_2 X_{1t} + \beta_3 X_{2t} + e_{1t}$$
$$Y_{2t} = \eta_0 + \eta_1 Y_{3t} + \eta_2 X_{5t} + e_{2t}$$

b) Obtain the reduced form regressions for the equations that are simultaneous.

(6 marks)

c) Determine whether the equations that are simultaneous in (a) above are identified or not using both the rank and order conditions. **(7 marks)**

d) If an equation is exactly identified, which method would you use to obtain the structural coefficients? **(2 marks)**

QUESTION 5

a) i.   How is the form of the functional relationship decided in regression analysis?

(4 marks)

  ii. Explain any three functional forms used in regression analysis suggesting economic relationships that are appropriate for each. **(9 marks)**

b) i. Why might economic time series be heteroscedastic? **(8 marks)**

  ii. Suggest any method that is used to test for the presence of multicollinearity in regression analysis. **(4 marks)**

QUESTION 6

a) Describe the Dickey-Fuller method of testing for stationarity. **(8 marks)**

b) What are the likely consequences of ignoring a unit root in time series regression?

(5 marks)

c) Explain briefly the meaning of the following concepts in time-series analysis:

  i) Covariance stationary **(4 marks)**

  ii) Asymptotically uncorrelated series. **(4 marks)**

  iii) Integrated of order three I(3) **(4 marks)**

END OF PAPER