BINDURA UNIVERSITY OF SCIENCE EDUCATION

FACULTY OF COMMERCE

DEPARTMENT OF ECONOMICS

OCT 2024

BSc ECONOMICS

ECONOMETRICS II EXAMINATION (EC 420) (2)

EXAMINATION DURATION: 3 HOURS TOTAL MARKS: 100

INSTRUCTIONS TO CANDIDATES

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)

The median starting salary for new Economics graduates is determined by:

$$\log sal = \beta_0 + \beta_1 ALvl + \beta_2 DC + \beta_3 \log(libvol) + \beta_4 \log(\cos t) + \beta_5 rank + u$$

where $ALvl$ is median 'A' Level points for the graduating class, DC is the median college Degree class for the class, libvol is the number of volumes in the Economics school library, cost is the annual cost of attending Economics school, and rank is a Economics school ranking (with $rank$ =1 being the best).

(i) Explain why we expect $\beta_5 \leq 0$. **(2 marks)**

(ii) What signs do you expect for the other slope parameters? Justify your answers. **(6 marks)**

(iii) Using the data for Zimbabwe Universities in 2012, the estimated equation is:

$$\log \hat{sal} = \underset{}{8.34} + \underset{(0.0001)}{0.005} ALvl + \underset{(0.056)}{0.248} DC + \underset{(0.00142)}{0.095} \log(libvol) + \underset{(0.00674)}{0.038} \log(\cos t) - \underset{0.00843)}{0.003} rank$$
$$\underset{(2.45)}{}$$

$$n = 136, R^2 = 0.842$$

Values in parentheses are P-Values

What is the predicted ceteris paribus difference in salary for schools with a median Degree Class different by one point? (Report your answer as a percent.) **(2 marks)**

(iv) Interpret the coefficient on the variable log(libvol). **(3 marks)**

(v) Would you say it is better to attend a higher ranked Economics school? How much is a difference in ranking of 20 worth in terms of predicted starting salary? **(4 marks)**

(vi) Examine the statistical significance of all the parameters. **(8 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

Consider the following model which is used to estimate the savings-income relation in Zimbabwe over the period 1990-2015 (n=26):

$$Y_t = \beta_1 + \beta_2 D_t + \beta_3 S_t + \beta_4 (S_t D_t) + u_t$$

where Y_t = annual disposable personal income ($'000)

S_t = annual personal savings

D_t = 1 for observations beginning in 2002

= 0 for observations starting from 1990 to 2001

and u_t is an error term.

The following OLS estimates were obtained (values in parentheses are standard errors):

$$\hat{Y}_t = 1.03 + 150.45 D_t + 0.09 S_t - 0.07 (S_t D_t)$$

(0.23) (20.52) (0.03) (0.01)

R^2=0.82

i. Explain why dummy variables were used in the savings-income model. **(7 marks)**

ii. Sketch a graph to illustrate the interpretation of the model parameters. **(3 marks)**

iii. Test whether the coefficient of the interaction term is significant at 5% level of significance. **(5 marks)**

iv. Derive the savings function for the periods 1990-2001 and 2002-2015 and interpret the results. **(10 marks)**

QUESTION 4

The structural equations below represent the behaviour of consumers and suppliers of chicken respectively:

$$Y_{1t} = \alpha_0 + \alpha_1 Y_{2t} + \alpha_2 X_{1t} + \alpha_3 X_{2t} + \in_{1t}$$
$$Y_{2t} = \beta_0 + \beta_1 Y_{1t} + \beta_2 X_{3t} + \beta_3 X_{2t} + \in_{2t}$$

Y_1 and Y_2 represent the quantity and price of chicken respectively, X_1 the income of the consumers, X_2 the price of beef (beef is a substitute for chicken in both consumption and production), and X_3 the price of chicken feed.

a) i. State the endogenous and exogenous variables for the structural equations. **(3 marks)**

ii. Derive the reduced form equations. **(8 marks)**

iii. Determine whether both the equations are exactly identified, under identified or over identified and explain the estimation method that you would use to estimate the parameters of each equation. **(8 marks)**

b) Explain the meaning and implications of simultaneity bias. **(6 marks)**

QUESTION 5

a) Suppose the true model is: $Y_t = \beta_0 + \beta_1 X_t + \beta_2 W_t + v_{1t}$, but we estimate: $Y_t = \alpha_0 + \alpha_1 X_t + v_{2t}$, what are the likely consequences of this error? **(5 marks)**

b) Heterogeneity of variables if not handled well in regression analysis may result in serious policy blunders. Discuss **(12 marks)**

c) Explain in detail how to perform the Durbin-Watson test. **(5 marks)**

d) How do you test for normality of variables? **(3 marks)**

QUESTION 6

a) Explain the circumstances that may give rise to dynamic models in econometrics. **(10 marks)**

b) Differentiate between the following concepts in time-series regression:

i) Integrated of order two I(2) vs Integrated of order zero I(0) **(5 marks)**

ii) Trend stationary vs Difference stationary series **(5 marks)**

iii) Autoregressive vs Distributed-lag model **(5 marks)**

END OF PAPER