

BINDURA UNIVERSITY OF SCIENCE EDUCATION

FACULTY OF COMMERCE

DEPARTMENT OF ECONOMICS

 JUN 2023

PROGRAMME: BSC ECONOMICS HONOURS DEGREE

EC206: INTRODUCTION TO ECONOMETRICS EXAMINATION

DURATION: 3 HOURS

INSTRUCTIONS:

- 1) Answer all questions.
- 2) Each question carries 25 marks.
- 3) Cell-phones are not allowed into the examination room.

MATERIALS ALLOWED:

- Calculator

QUESTION 1

- a) A University student built the following model with the intention of identifying desirable features University students consider when choosing an ideal study partner:

$$\Pi_i = \alpha + \beta_1 DH_i + \beta_2 IQ_i + \beta_3 MS_i + \beta_4 AD_i + u_i$$

where, Π_i is the outcome variable from being associated with the chosen partner,

DH_i is drinking habits of the partner,

IQ_i is the intelligent quotient of the partner,

MS_i is marital status of the partner,

AD_i is age difference with the partner, and

u_i is the stochastic error term.

- i) Specify Π_i to reflect any two possible outcome variables that can be influenced directly by the given exogenous variables and give any two associated problem statements. (6 marks)
- ii) Give any two hypotheses of your choice. (2 marks)
- iii) State any two more variables that can be included in this model. (2 marks)
- iv) How would you measure the two alternative outcome variables specified in (i) above?

(4 marks)

v) Explain the transmission mechanism between DH_i and Π_i and AD_i and Π_i , where

Π_i is any one of the outcome variables you specified.

(4 marks)

b) 'A mathematical model is inferior because of its exact or deterministic nature compared to an econometric model.' Justify this assertion.

(9 marks)

QUESTION 2

A researcher estimated the model; $Y_i = \beta_1 + \beta_2 X_i + u_i$, using two samples given below:

Sample 1

Y	102	118	109	111	126	124	130	116	119	128	109	113
X	87	92	68	75	89	91	98	86	88	102	96	67

Sample 2

Y	76	93	47	64	81	59	40	74	72	66	41	60
X	37	42	32	39	56	46	31	57	38	28	28	44

His colleague argued that using the unbiasedness property we can obtain better estimates of the parameters.

i) With the aid of a diagram(s), illustrate the colleague's conjecture.

(4 marks)

ii) Estimate β_1 and β_2 using the colleague's advice.

(13 marks)

iii) Test for individual significance of β_2 using Sample 1.

(8 marks)

QUESTION 3

Consider the standard simple regression model; $y = \alpha + \beta x + u$, under the Classical Linear Regression Model Assumptions.

a) Show that OLS estimator for α is linear and unbiased.

(8 marks)

b) Derive the OLS variance of β .

(7 marks)

c) Derive the MLE variance of the error term.

(7 marks)

d) Explain using a graph the efficiency property of OLS.

(3 marks)

QUESTION 4

- a) A multiple linear regression model is given in matrix form as $y = X\hat{\beta} + U$. Given that for a sample of 45 observations:

$$X'X = \begin{bmatrix} 45 & 1884 & 2365 \\ 1884 & 105148 & 122197 \\ 2365 & 122197 & 163265 \end{bmatrix} \text{ and } X'y = \begin{bmatrix} 2146 \\ 118229 \\ 147936 \end{bmatrix}$$

Estimate $\hat{\beta}$ s

(10 marks)

- b) Consider the following linear model in matrix notation: $Y = X\beta + U$.

i) Show that the OLS estimate for β is unbiased using matrices. **(4 marks)**

ii) Derive the OLS variance of β using matrices. **(6 marks)**

- c) Explain any three OLS assumptions. **(5 marks)**

END OF PAPER