

2015

ECONOMICS

Paper : 2.4

( Elements of Econometrics )

Full Marks : 80

Time : 3 hours

*The figures in the margin indicate full marks  
for the questions*

1. Answer the following : 2×4=8

(a) If  $g$  and  $h$  are both unbiased estimators of  $\theta$ , on what basis will you select one from the two estimators?

(b) How is an interval prediction different from a point prediction?

(c) How is the  $t$ -distribution related to standard normal and chi-square distributions?

(d) How is heteroscedasticity different from serial correlation?

2. Answer any *three* of the following :  $8 \times 3 = 24$

(a) Define the method of moments as a principle of estimation. Obtain the standard error of the sample mean, as an estimator of the population mean.  $3+5$

(b) Outline the theoretical procedure underlying statistical inference.  $8$

(c) Define the coefficient of determination and explain how its value is to be interpreted. When is it more relevant to consult the adjusted value of the coefficient of determination? Explain.  $2+2+4$

(d) In a given regression model

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + u$$

how will you test whether  $X_1$  significantly influence  $Y$ ? If both  $X_1$  and  $X_2$  are statistically significant, how would you find which one is more significant?  $5+3$

(e) Distinguish between perfect and near perfect multicollinearity. What are the implications of near perfect multicollinearity?  $3+5$

3. Answer any *three* of the following :  $16 \times 3 = 48$

(a) Explain the ideas of a population, a sample, an estimator and an estimate. Explain the concepts and usefulness of the properties of unbiasedness, efficiency and consistency of an estimator.  $8+8$

(b) Explain how a chi-square test can be carried out to test for independence of two attributes. In a random sample of 200 adult males, 80 were from urban areas and 120 were from rural areas. While as many as 50% of the urban units were diabetic, 40% of units were diabetic in the whole sample. Complete the contingency table for the two attribute locations and incidence of diabetes. Do the data testify significantly higher incidence of diabetes in urban areas?  $6+4+6$

(c) Write down the general linear regression model with the classical least square assumption going with it. Explain how the parameters are estimated by OLS and maximum likelihood methods. Prove that under the classical assumptions, the OLS estimators are linear and unbiased.  $4+8+4$

(d) Explain how the estimate of a linear regression model is used for generating a point prediction. What is the point prediction conditional upon? Derive the variance of the prediction error and the 95% confidence interval for the prediction.  $5+3+4+4$

(e) Explain how the influence of a qualitative explanatory factor can be incorporated in a regression model. In a regression of grade points secured by student ( $Y$ ) on  $X$  (average hours of study) and  $G$  ( $= 1$  for girls and  $0$  for boys), the following results were obtained :

$$Y = 2.15 + 0.75X + 1.1G$$

Give interpretations of the three estimated parameters. Draw the two estimated regression lines for boys and girls separately. 8+5+3

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