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PG Even Semester (CBCS) Exam., May—2018

ECONOMICS

(2nd Semester)

Course No. : ECOCC-205

(Basic Econometrics)

Full Marks : 70

Pass Marks : 28

Time : 3 hours

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

Answer **five** questions, taking **one** from each Unit

UNIT—I

1. (a) State the normality assumption of a two-variable linear regression model.
- (b) Define standard error of regression. Show that $\text{cov}(\hat{\beta}_1, \hat{\beta}_2) = -\bar{X} \text{var}(\hat{\beta}_1)$ in case of a two-variable linear regression model.

- (c) For a two-variable linear regression model, show that

$$\frac{ESS}{TSS} + \frac{RSS}{TSS} = 1$$

- (d) An estimated regression equation is given as follows :

$$\hat{Y}_i = 0.0144 + 0.7241X_i$$

$$SE(\hat{\beta}_1) = 0.0695$$

where

X_i level of education

Y_i average hourly earnings

Calculate the values of F and r^2 .

$$2 + (2+2) + 4 + 4 = 14$$

2. (a) State the reason for inserting random disturbance term in a classical linear regression model.

- (b) Let X denotes labour-hours of work and Y denotes output. Now on the basis of the following information :

$$\begin{array}{ccc} X & 80 & Y & 96 & X^2 & 28 \\ XY & 21 & Y^2 & 30 & 4 & n & 10 \end{array}$$

- (i) Estimate marginal productivity of labour and interpret the result.
- (ii) Test the null hypothesis that $H_0: \beta_1 = 0$ at 5% level of significance.

(3)

- (c) Calculate the value of r^2 and state about the goodness of fit of the estimated model. $4+(3+4)+3=14$

UNIT—II

3. (a) Obtain the OLS estimators of a three-variable linear regression model.
- (b) Are the following two models comparable on the basis of the value of R^2 ?

$$\ln Y_i = \beta_1 + \beta_2 X_{2i} + \beta_3 X_{3i} + u_i$$

$$Y_i = \beta_1 + \beta_2 X_{2i} + \beta_3 X_{3i} + u_i$$

where $n = 100$ for both the models.

- (c) Show that

$$\bar{R}^2 = 1 - (1 - R^2) \frac{n-1}{n-3}$$

for a three-variable linear regression model. Why is \bar{R}^2 considered as a better measure of goodness of fit as compared to R^2 ? $8+2+(2+2)=14$

4. (a) Discuss the ANOVA approach for testing the overall significance of a three-variable linear regression model.

(4)

- (b) A researcher has obtained the following results by regressing Child Mortality Rate (CMR) on per capita GNP and the Female Literacy Rate (FLR) for a sample of 10 countries :

$$\widehat{CMR}_i = 263.64 - 0.0056 PGNP_i + 2.234 FLR_i$$

$$SE(\hat{\beta}_1) = 11.59 \quad SE(\hat{\beta}_2) = 0.0019$$

$$SE(\hat{\beta}_3) = 0.2099$$

$$R^2 = 0.7077 \quad \bar{R}^2 = 0.6981$$

Based on these information—

(i) interpret the estimated slope coefficients;

(ii) test the null hypothesis that $H_0: \beta_2 = \beta_3 = 0$;

at 5% level of significance.

Given that $F_{0.05}(2, 7) = 4.74$. $8+(2+4)=14$

UNIT—III

5. Indicate whether the following statements are true (T), false (F) or uncertain (U) and give a brief explanation for each : $4+5+5=14$

(a) Multicollinearity makes the standard errors of estimated coefficients small.

(5)

- (b) The OLS estimators become biased and inefficient when there is autocorrelation.
- (c) Heteroscedasticity in the error leads to biased estimates of the regression coefficients.
6. (a) Describe the steps involved in the Goldfeld-Quandt test for detecting heteroscedasticity. What are the limitations of this test?
- (b) What are the sources of autocorrelation problem?
- (c) Suppose you obtained the following results from a multiple regression :
- $$\hat{Y}_t = 5.2 + 0.45X_t - 0.78Y_{t-1}$$
- $$SE : (0.6) (0.04) (0.05)$$
- $$R^2 = 0.99 \quad DW = 1.98$$
- Are you fully satisfied with the results where R^2 is exceptionally high and the value of Durbin-Watson d -statistic is very close to 2? If not, why? 6+3+5=14

(6)

UNIT—IV

7. (a) What is meant by the spurious regression problem? When does such problem arise?
- (b) Distinguish between difference stationary and trend stationary.
- (c) Write a short note on Dickey-Fuller test. 4+4+6=14
8. Indicate whether the following statements are true (T), false (F) or uncertain (U) and give a brief explanation for each : 6+5+3=14
- (a) The mean of the random walk series without drift changes over time.
- (b) Non-stationarity of a series may arise due to structural break in the series.
- (c) The trend in a non-stationary series is constant.

UNIT—V

9. (a) Define the following :
- (i) Structural coefficients
- (ii) Reduced-form coefficients
- (iii) Simultaneous equations bias

(7)

(b) Consider the following structural model :

$$\begin{aligned} Y_{1i} &= 3Y_{2i} - 2X_{1i} + X_{2i} + u_{1i} \\ Y_{2i} &= Y_{3i} + X_{3i} + u_{2i} \\ Y_{3i} &= Y_{1i} + Y_{2i} - 2X_{3i} + u_{3i} \end{aligned}$$

where Y 's are endogenous variables and X 's are predetermined variables. Determine the identification status of the equations. $(2+2+2)+8=14$

10. Indicate whether the following statements are true (T), false (F) or uncertain (U) and give a brief explanation for each : $5+4+5=14$

- (a) We can apply OLS to estimate an equation that belongs to a simultaneous equations system.
- (b) In simultaneous equations system, the greater the number of exogenous variables the better.
- (c) Identification problem only arises in a simultaneous equations system.
