2021

ECONOMICS — HONOURS

Paper : CC-10

(Introductory Econometrics)

Full Marks : 65

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Group - A

1. Answer ***any ten*** questions : 2×10

(a) Clarify the ideas of cross-section and time series data using examples.

(b) What do you mean by an econometric model?

(c) Why do we include the disturbance term in an econometric model?

(d) What do you mean by a population regression function and a sample regression function?

(e) What is a classical linear regression model?

(f) Mention the assumptions of a CLRM necessary to show that OLS estimator of regression coefficient is an unbiased estimator.

(g) Which of the following statement(s) is (are) false?

(i) In a model without intercept term the ratio of ESS to TSS need not lie within (0, 1) range.

(ii) $\overline{R}^2$ can be negative.

(iii) After the estimation of parameters in SLRM we get the population regression line.

(iv) The OLS estimator of regression eoefficient is linear in the dependent variables.

(h) In a three-variable model it is found that $r_{12} = 0.41$, $r_{13} = 0.71$ and $r_{23} = 0.5$. Obtain the partial correlation coefficient $r_{13.2}$.

(i) What do you mean by heteroscedasticity and autocorrelation?

(j) Consider the following regression equation to explain consumption of sweets :

Sweet = $\beta_0 + \beta_1$ income + β_2 price + u

E(u/income, price) = 0

Var (u/income, price) = σ^2income^2

Write the transformed equation that has a homoscedastic error term.

(k) What is meant by a first-order autoregressive model?

(l) Why can not we estimate the regression coefficients when there is perfect multicollinearity among the regressors?

(m) What is the best approach to avoid the problem of inclusion of irrelevant variable in a regression model?

(n) Suppose that you have included two attributes in a regression model where the first attribute consists of three categories and the second attribute consists of two categories. How many dummy variables are to be included in the model?

(o) What do you mean by ex ante forecast and ex post forecast?

Group - B

Answer ***any three*** questions.

2. Is it justified to apply ordinary least squares technique to estimate regression coefficient in the presence of heteroscedasticity? Why? 5

3. Explain mathematically and intuitively what would happen if you tried to fit a regression equation when all the values of the explanatory variable in the sample are same. 5

4. In a three-variable model, explain what you understand by partial correlation coefficient and multiple correlation coefficient. 5

5. Considering a two-variable CLRM, show that $\sum_{i=1}^{n} e_i = 0$ and $\sum_{i=1}^{n} X_i e_i = 0.$ 5

6. What are the shortcomings of Durbin-Watson test for detecting autocorrelation? 5

Group - C

Answer ***any three*** questions.

7. (a) Examine the validity of the following statement :

If we include more explanatory variables in the model, then ESS never decreases. Hence, it is always better to include more explanatory variables in an econometric model.

(b) Consider the following estimated two-variable CLRM :

Y_i = constant + 0.5 $X_i + e_i$ where $n = 22$, $\overline{X} = 10$, $\overline{Y} = 25$, $\sum X_i^2 = 2201$, $\sum Y_i^2 = 13790.$

Obtain the estimated regression coefficient when X is regressed on Y. 5+5

8. (a) Consider the following partial result which is obtained using STATA statistical package

$$\widehat{\log wage_i} = 4.8868 + 0.1615 \text{ educ} + 0.0287 \text{ age}$$

$$\text{se} = \quad (0.0467) \quad (0.0034) \quad (0.0011)$$

TSS = 4341.5392 ESS = 1929.7403 N = 3962

(i) Interpret the regression coefficients.

(ii) Compute R^2 and interpret the result.

(iii) Test the null hypothesis that all coefficients are individually zero against the alternatives that they are not equal to zero.

(iv) Test the null hypothesis that all slope coefficients are simultaneously zero against the alternative that they are not simultaneously zero. (Give $F_{0.01}$ (2, 3959) = 3.82)

(b) Why is adjusted R^2 useful in a regression model with multiple regressors? (2+2+2+2)+2

9. (a) In the regression model $Y = \beta_1 + \beta_2 X + u$, suppose that we multiply each X value by a constant 2. Examine whether it will change the residuals and fitted values of Y.

(b) Suppose that we want to examine whether rent rates are influenced by the population in a city. Let rent be the average monthly rent paid on rental units in the city. Let pop denote total city population, and avginc denote average city income. The estimated model to test the relationship is

$$\widehat{\log(rent)} = .043 + .066\log(pop) + .507\log(avginc)$$

$$(.844) \quad (.039) \quad (.081) \quad n = 64 \quad R^2 = .458$$

What is wrong with the statement : 'A 10% increase in population is associated with about a 6.6% increase in rent'? How do you interpret the estimated coefficient of log(avginc) and the value R^2? 5+(2+3)

10. (a) In a two-variable CLRM, show that the total sum of squares is equal to the sum of explained sum of squares and residual sum of squares.

(b) A researcher with a sample of 25 individuals with similar education but differing amount of training hypothesizes that hourly earnings, EARNINGS, may be related to hours of training, TRAINING, according to the relationship

EARNINGS = $\beta_1 + \beta_2$TRAINING + u

He is prepared to test H_0: $\beta_2 = 0$ ag H_1: $\beta_2 \neq 0$ at 5% level. What should he report if

$\widehat{\beta_2} = 0.3$ and est se $\widehat{\beta_2} = 0.12$?

[Given $t_{.05,24} = 1.711$ $t_{.05,25} = 1.708$ $t_{.025,24} = 2.064$ $t_{.025,25} = 2.060$] 5+5

11. (a) Show the consequences of omission of a relevant explanatory variable on the estimated regression coefficients in an econometric model.

(b) Given the estimated regression equation as $Y = a + 1.5X + e$, estimated se of b as 0.5,

$r^2 = 0.5$, $\overline{X} = 10$, $\overline{Y} = 15$ and $\sum Y^2 = 6895$, find the sample size and RSS. 6+4

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