2022

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 what you understand by panel data using an example.

    (b) State the Gauss-Markov theorem.

    (c) Suppose that you have estimated the regression equation of aggregate consumption expenditure on national income of India using the data for the period 1981-2020. Which assumption of CLRM is likely to be violated here? Which test can be used to examine it?

    (d) Consider the following estimated regression equation :

    $$\hat{Y} = 2.5 + 0.25X$$

    If all observations on X are increased by 2, what will be the new estimated equation?

    (e) State the assumptions of the classical linear regression model.

    (f) Does a strong statistical relationship always imply causation.

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

        (i) R^2 cannot be less that $\bar{R}^2$.

        (ii) Dummy variables are needed to proxy for unobservable variables.

        (iii) RESET is used to detect presence of omitted variable error in a regression model.

        (iv) The OLS estimator of regression coefficient follows t distribution in a CLNRM.

    (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 multiple correlation coefficient $R_{1.23}$.

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

Please Turn Over

(j) Consider the following regression equation to explain consumption of ice-creams :

ice-cream $= \beta_0 + \beta_1$ income $+ \beta_2$ price $+ u$

How do you interpret the coefficients β_1 and β_2?

(k) What is meant by variance inflationary factor (VIF)?

(l) For three variables X_1, X_2 and X_3 when is it possible that $r_{12.3} = r_{12}$? What does it mean?

(m) What is the null hypothesis of Jarque-Bera Test? Which distribution is followed by the test statistic under this null hypothesis? Is this test applicable for a small sample?

(n) Briefly state how you would estimate the parameters of the model : $Y = \alpha X^\beta$.

(o) What do you mean by forecast error?

Group - B

Answer *any three* questions.

2. Show that the OLS estimator of the slope coefficient in a simple two variable regression model is an unbiased estimator. 5

3. Suppose that we have estimated the consumption function

$$C_t = \alpha_0 + \alpha_1 Y_t + u_t$$

and the savings function

$$S_t = \beta_0 + \beta_1 Y_t + v_t$$

where C, S, Y are consumption, savings and income respectively, and $C + S = Y$ holds. What is the relation between α_1 and β_1? Will the residual sum of squares be the same for the two models? Explain. 1+4

4. Briefly state how the Durbin-Watson Test helps in detecting the presence of autocorrelation in data. 5

5. A multiple regression model includes two regressors :

$$Y_i = \alpha + \beta_1 X_{1i} + \beta_2 X_{2i} + U_i$$

(a) What is the expected change in Y when X_1 increases by 9 units and X_2 is unchanged?

(b) What is the expected change in Y when X_2 decreases by 5 units?

(c) What is the expected change in Y if X_1 increases by 8 units and X_2 decreases by 3 units?

(d) If there are 490 observations what are the degrees of freedom due to regression? 1+1+2+1

6. What do you mean by a dummy variable trap? 5

(3) X(4th Sm.)-Economics-H/CC-10/CBCS

Group - C

Answer *any three* questions.

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

The OLS estimator of the regression coefficient is biased if there is measurement error in the explanatory variable.

(b) Consider the following regression result :

$$\widehat{Y}_i = 50 - 2978.5 X_i \quad r^2 = 0.6149$$

se   629.3

Find the sample size underlying this result. Also interpret the regression result.

Given that

Degrees of freedom	.05	.025	.01	.005
14	1.761	2.145	2.624	2.977
15	1.753	2.131	2.602	2.947
16	1.746	2.120	2.583	2.921

The first column shows the degrees of freedom and the headings of other columns give the probabilities for t to exceed the entry value.   5+(2+3)

8. (a) How would you test statistical significance of individual regression coefficients in a multiple regression model?

(b) Your friend has given you the following results of two different regression models. In which case could you be sure that an error has been committed? Explain.

(i) $R^2_{Y.1} = 0.96$ $R^2_{Y.12} = 0.94$

(ii) $\overline{R}^2_{Y.1} = 0.93$ $\overline{R}^2_{Y.12} = 0.90$ 6+4

9. (a) What will be the problem in a regression model if the error term does not follow normal distribution?

(b) Consider the following regression result :

$$\widehat{Y}_i = 2.20 + 0.104 X_{1i} + 3.48 X_{2i}$$

p-value 0.000   0.001   0.044

ESS = 112.5 RSS = 19.5 n = 10

(i) Which of the estimated slope coefficients are statistically significant at 1% level of significance?

(ii) Calculate the values of R^2 and adjusted-R^2.

(iii) Calculate the F statistic and interpret it.

Given that $F_{.01, 2, 7} = 9.55$ $F_{.01, 7, 2} = 99.36$ 5+(2+3)

Please Turn Over

10. (a) Suppose that we have increased the number of explanatory variables in a multiple linear regression model. What will be its impact on the values of R^2 and adjusted-R^2?

(b) Consider the following regression results :

$$\hat{Y}_i = -261.09 + 0.2453X_i$$

se   (31.3)   (?)

t   (?)   (16.6) $r^2 = ?$ $n = 10$

(i) Fill in the missing numbers.

(ii) Would you reject the null hypothesis that the true slope coefficient is zero at 1% level of significance?

Given that

$P(t_8 > 3.355) = .005$

$P(t_9 > 3.250) = .005$

$P(t_{10} > 3.169) = .005$

(iii) What proportion of variation in Y in explained by X?   4+(3+2+1)

11. (a) Examine the consequences of inclusion of an irrelevant explanatory variable on the estimated regression coefficients in an econometric model.

(b) Consider the following regression model :

$$health_i = \alpha_0 + \alpha_1 income_i + \alpha_2 urban_i + error_i, \ i = 1,2,......,n$$

where $health_i$ and $income_i$ the annual expenditure on health care and annual income of family i, and $urban_i$ takes the value one if family i belongs to urban area and zero if family i belongs to rural area. Interpret the meanings of the coefficients in the above model. How would you test, in terms of the above model, whether there is any difference between the health care expenditures of the families from rural and urban areas?   5+(2+3)

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