2021

ECONOMICS — HONOURS

Paper : DSE-A-1

(Applied Econometrics)

Full Marks : 50

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 five*** questions : 2×5

(a) The plot of data on the output (X) and the labour input (L) for a period of 20 years in a country exhibits a non-linear relationship where X has been rising faster than L.

Suggest a possible functional form of the relationship and transform it into a linear regression model.

(b) In the multiple linear regression model, what is meant by the following key assumption –

$E\ (u_i\ /\ x_1,\ x_2,\ .....,\ x_k) = 0$

(c) The following model, $y_i = \beta_1 + \beta_2\ x_i + u_i$
satisfies all the usual assumptions of the classical Linear Regression model except for the following :

$E(u_i^2) = \sigma^2\ x_i^2.$

Identify the problem and transform the original model so as to remove the problem.

(d) What are instrumental or proxy variables?

(e) What are the consequences of model specification error(s) when a relevant variable is omitted?

(f) How can you detect the presence of irrelevant variable in a regression model?

(g) What is non-stationary time series data?

(h) What are the assumptions of the fixed effect model?

Group - B

2. Answer ***any two*** questions :

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

(ii) The following results are obtained by OLS regression using quarterly data for 1960 to 1979 inclusive.

$$\hat{y}_t = 2{\cdot}20 + 0{\cdot}18x_{1t} + 2{\cdot}54\ x_{2t}$$

where the explained sum of squares = 112·5

and the residual sum of squares = 19·5

Compute R^2 and interpret the result. Find the value of $\bar{R}^2$. 2+2+1

(b) Consider the following model :

$C = \alpha + \beta Y + \gamma Y' + \delta P + u$

Where C = Consumption of a person

Y = Total income of the family

Y' = Income of that person

P = WPI.

Do you face any problem in estimating the parameters of the model? If any what are the consequences of the problem? 1½+3½

(c) Given the following estimated regression equation –

$\hat{y} = 2{\cdot}3 + 1{\cdot}5 \; X$

$(s.e = 0.5)$

where $r^2 = 0{\cdot}5$, $\bar{x} = 10$, $\bar{y} = 15$, $\Sigma y^2 = 6895$

Find the sample size and RSS. 5

(d) Two researchers fit two different models to the same set of 1095 observations –

$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + u$ .... Model 1

and $y = \alpha_0 + \alpha_1 x_1 + \alpha_2 x_2 + \nu$ ...... Model 2.

R^2 from Model 1 = 0·0387 and R^2 from Model 2 = 0·0364.

Using the above information, suggest an appropriate test to choose from the above models, explaining each step of the testing process. 5

given $F_{0{\cdot}05}$ (2, 1090) = 3·0

Group - C

3. Answer ***any three*** questions :

(a) The following data are obtained from 10 observations on y, x_1 and x_2

$\Sigma y = 20$; $\Sigma x_1 = 30$; $\Sigma x_2 = 40$

$\Sigma y^2 = 88{\cdot}2$; $\Sigma x_1^2 = 92$; $\Sigma x_2^2 = 163$

$\Sigma yx_1 = 59$; $\Sigma yx_2 = 88$; $\Sigma x_1 x_2 = 119$.

Estimate the regression of y on x_1 and x_2 and find R^2. 6+4

(b) (i) In the context of multiple linear regression model like $y_i = \alpha + \beta_1 x_{1i} + \beta_2 x_{2i} + u_i$

Distinguish between simple correlation coefficient and the partial correlation coefficients.

(ii) How do you reconcile the following results ?

(1) $r^2_{y1} = 0{\cdot}95$ and $r^2_{y2} = 0{\cdot}98$

but $r^2_{y1\cdot2} = 0{\cdot}12$ and $r^2_{y2\cdot1} = 0{\cdot}14$

and (2) $r_{y1} = 0$ but $r_{y1\cdot2} \neq 0$

where the notations have their usual meanings. 5+2½+2½

(c) (i) What are the common types of specification errors committed in developing an empirical model?

(ii) Do you think that examinations of residuals obtained from regression can guide us for model specification error?

(iii) Consider the model

$y_i = \beta_1 + \beta_2 x_i^* + u_i$

In practice, x_i^* is measured by x_i such that $x_i = x_i^* + \epsilon_i$

where ϵ_i is a purely random term with usual properties. How does it affect the estimates of β_1, and β_2? 2+3+5

(d) The following table shows the value of imports (Y) the level of GNP (X_1) measured in Rs. in lakhs and the price index of imported goods (X_3) over the 12 years for a certain country.

	2008	2009	2010	2011	2012	2013	2014	2015
Y :	57	43	73	37	64	48	56	50
X_1 :	220	215	250	241	305	258	354	321
X_2 :	125	147	118	100	128	149	145	150

	2016	2017	2018	2019
Y :	39	43	69	60
X_1 :	370	375	385	385
X_2 :	140	115	155	152

(i) Estimate the regression equation and what are the economic meaning of your estimates?

(ii) Compute R^2 and adjusted R^2. 6+4

(e) Fit a straight line trend to the following figures of consumption and Income :

Year	Consumption (1000 tonnes)	Income (₹. in Lakh)
1990	59.19	76.20
1991	65.49	91.70
1992	62.36	106.70
1993	64.70	111.60
1994	67.40	119.00
1995	64.44	129.20
1996	68.00	143.40
1997	72.40	159.60
1998	75.71	180.00
1999	70.68	193.00

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