2017/ODD/03/10/ECO–304/278

PG Odd Semester (CBCS) Exam., December—2017

ECONOMICS

(3rd Semester)

Course No. : ECOCC–304

(Advanced Econometrics—I)

Full Marks : 70
Pass Marks : 28

Time : 3 hours

The figures in the margin indicate full marks for the questions

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

UNIT—I

1. *(a)* Define the following terms :

(i) Standard error of estimator

(ii) Standard error of regression

(b) Prove that for a two-variable linear regression model, $F \quad t^2$. Also, state the relationship between F and r^2 in the context of two-variable linear regression.

(c) A sample of 20 observations corresponding to a two-variable linear model

$$Y_i \qquad X_i \quad u_i$$

where $u_i \sim N(0, \quad ^2)$ provided the following results :

$$X_i \quad 186 \ 2, \quad (X_i \quad \overline{X})^2 \quad 215 \ 4$$

$$Y_i \quad 21 \ 9, \quad (Y_i \quad \overline{Y})^2 \quad 86 \ 9$$

$$(X_i \quad \overline{X})(Y_i \quad \overline{Y}) \quad 106 \ 4$$

Estimate and and the variance of these estimators. Also, test the statistical significance of $\hat{}$. (2+2)+5+5=14

2. *(a)* Distinguish between—

(i) null hypothesis and alternative hypothesis;

(ii) explained sum of squares and residual sum of squares.

(b) What is reverse regression? Explain with an example. Also, determine the relationship between the two slope coefficients of the direct and reverse regression.

(c) The following ANOVA table is given on the basis of OLS regression of Y on X :

Sum of squares	*Value*	*d.f.*
ESS	5602	1
RSS	698	10
TSS	6300	11

Test the hypothesis that there is no relationship between Y and X in the regression.

(*Note* : At 5% level of significance $F_{(1,\ 10)}$ 4 96, $F_{(1,\ 11)}$ 4 84, $F_{(10,\ 11)}$ 2 85

(d) Write a short note on likelihood ratio test. (2+2)+3+4+3=14

UNIT—II

3. *(a)* Define the following :

(i) Restricted model

(ii) Unrestricted model

(b) Indicate whether the following statement is true, false or uncertain :

"The value of $\overline{R}^2$ always rises with addition of explanatory/independent variables in the model."

(c) The following estimated equation was obtained using OLS regression for data on 64 firms :

$$\hat{Y}_i \quad \underset{(3\ 4)}{2\ 20} \quad \underset{(0\ 005)}{0\ 104X_{1i}} \quad \underset{(2\ 2)}{3\ 48X_{2i}} \quad \underset{(0\ 15)}{0\ 34X_{3i}}$$

(Standard errors are in parenthesis.) The explained sum of squares was 112·5 and the residual sum of squares was 19·5. Now answer the following :

(i) Which of the slope coefficients are statistically significant at 5% level?

(ii) Calculate R^2 and $\overline{R}^2$.

(iii) Calculate F statistic and interpret.

(1+1)+2+(2×3)+2+2=14

4. *(a)* Define the following :

(i) Partial correlation coefficient

(ii) Multiple correlation coefficient

(b) Indicate whether the following statement is true, false or uncertain :

"The coefficient of a variable in an estimated model is significantly different from zero at 20% level. If we drop this variable from the regression, then both R^2 and $\overline{R}^2$ will necessarily fall."

(c) The following matrix gives the variance and covariances of three variables Y, X_1 and X_2 :

	Y	X_1	X_2
Y	7 59	3 12	26 99
X_1	—	29 16	30 80
X_2	—	—	133 00

where Y log of food consumption per capita, X_1 log of food price and X_2 log of disposable income per capita. Fit the consumption function for n 20. Also, calculate R^2 and $\overline{R}^2$.

(1+1)+2+(2×3)+2+2=14

UNIT—III

5. *(a)* *(i)* Distinguish between exact and near-exact multicollinearities on the basis of a k-variable linear model.

(ii) Explain how near-exact multi-collinearity can influence the variance of OLS estimators.

(b) For the three-variable linear regression model

$$Y_i \quad {}_1X_{1i} \quad {}_2X_{2i} \quad u_i,$$
$$(u_i \sim iidN(0, \quad ^2)),$$

the following OLS results were obtained on the basis of 100 observations :

$$\text{SE}\ (\hat{\ }_1) \quad 0\ 785$$
$$\text{RSS} \quad 8850\ 55$$

and $\text{var}(X_1)$ 14 75.

(Symbols have their usual meanings.) Comment on the degree of multi-collinearity on the basis of some suitable measures.

(c) Bring out the basic intuition behind 'ridge regression'. Can Lagrangian optimization produce ridge estimates? If so, how? (2+3)+4+5=14

6. *(a)* Briefly explain the concept of 'non-spherical' disturbances in linear regression models.

(b) You are asked to estimate the linear model $Y_i \quad _1 \quad _2X_i \quad u_i$ on the basis of grouped data where only group means $(\overline{X}_i, \overline{Y}_i)$ are given along with number of observations in each group (n_i). Examine whether OLS is an appropriate method of estimation in this case. If not, what method would produce efficient estimates of parameters? Explain briefly.

(c) Estimate the parameters of the model $Y_i \quad {}_1 \quad {}_2 X_i \quad u_i$ on the basis of the following data for group means, and number of observations in each group using a suitable method :

$\overline{X}_i$	2	3	1	5	9
$\overline{Y}_i$	4	7	3	9	17
n_i	12	6	11	10	11

Here $\overline{X}_i$ and $\overline{Y}_i$ are the arithmetic means of X and Y respectively for ith group.

2+6+6=14

UNIT—IV

7. *(a)* Suppose you are given data on work experience in months (X_i) and annual salaries drawn (Y_i) for samples of IT workers from four major Indian IT firms. Frame an appropriate single-equation model that can estimate the impact of experience on salary levels for all four firms separately. How would you test the following hypotheses?

(i) A unit increase in experience has the same effect on salary levels in all four firms.

(ii) Salary levels are equal across firms, irrespective of experience levels.

(b) "Hours of reading per week does not vary across age-groups." How would you test this hypothesis on all graduates residing in a particular ward of a municipality? Outline the estimation procedure in this case. 14

8. *(a)* Elaborate Tobin's censored normal regression model for truncated data. Examine the estimation procedure for such data.

(b) Compare the standard methods for measuring goodness of fit in case of qualitative dependent variable models.

9+5=14

UNIT—V

9. *(a)* Discuss in brief, the structure of polynomial lag regression model. What are the impacts and intermediate multi-pliers in this context? Elaborate.

(b) Compute mean lag for the following polynomial lag model :

$$Y_t \qquad D(L) \;\; X_t \quad u_t$$

where $D(L) \quad B(L) / A(L)$ and $A(L) \quad 1 \quad {}_1 L$; $B(L) \quad {}_0 \quad {}_1 L$ with ${}_1 \quad 0$, ${}_0 \quad 0$, ${}_1 \quad 0$. Also, examine the condition of convergence of coefficients.

7+5+2=14

10. Write brief notes on any *two* of the following : 7×2=14

(a) Adaptive expectation models

(b) Rational expectations in a demand supply framework

(c) Short- and long-run multipliers and their estimation

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