Your Roll No...............

Sr. No. of Question Paper : 8537         **HC**

Unique Paper Code       : 32377908

Name of the Paper       : Econometrics

Name of the Course     : **STATISTICS : DSE for Honours**

Semester                : V

Duration : 3 Hours         Maximum Marks : 75

## Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.

2. Attempt **five** questions in all.

3. Question 1 is compulsory.

4. Attempt **four** more questions, selecting **two** questions from each of the Section **A** and **B**.

1. (a) Fill in the blanks (Attempt any five) :

     (i) In a regression analysis, values are fixed for the _____ variables.

     (ii) Variables such as gender, marital status, colour of the eye are examples of _____ scales.

(iii) Multicollinearity is essentially a _____ phenomenon.

(iv) A regression model that includes the lagged values of explanatory variables is called a _____ model.

(v) The coefficients estimated in the presence of Heteroscedasticity are not _____ estimators.

(vi) If the Durbin-Watson d test statistic is found to be equal to 0, this means that _____ order autocorrelation is _____.

(vii) Structural parameters express the _____ effect of each explanatory variable on the dependent variable.                                           (5)

(b) State whether True/False (Attempt any five) :

(i) The smallest possible multiple regression model comprises of two variables.

(ii) Stochastic variables are non-random variables.

(iii) A hypothesis such as $H_0 : \beta_2 = \beta_3 = 0$ can be tested using an F-test.

(iv) If a qualitative variable has m categories, we need to introduce $(m - 1)$ dummies.

(v) Errors of measurement is not a cause for model specification errors.

(vi) In Koyck method, $\beta_k = \beta_0 \lambda^k$, $k = 0, 1,...$ and $0 < \lambda < 1$, $(1 - \lambda)$ is known as rate of decay of distributed lags.

(vii) The measure of proportion of variation in Y explained by the explanatory variables $X_2$, $X_3$, ... jointly is given by $R^2$.                (5)

(c) Give short answers (Attempt any two) :

(i) Derive the relationship between the coefficient of determination and F-test used in the analysis of variance.

(ii) From a cross-sectional data on 41 countries, the following regression was obtained :

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

Running the auxiliary regression

$e_i^2 = -5.8417 + 2.5629 \ln X_{2i} + 0.6918 \ln X_{3i} - 0.4081 (\ln X_{2i})^2$

$-0.049 (\ln X_{3i})^2 + 0.0015 (\ln X_{2i})(\ln X_{3i})$   $R^2 = 0.1148$

Test the presence of Heteroscedasticity using White's test. (Chi-square value at 5% level of significance is 11.0705)

(iii) Interpret the following estimated regression model.

$$\hat{Y}_i = -1.9356 + 0.1608\ X_2 + 0.1995\ X_3$$

$$(0.033) \qquad (0.1858)$$

p-value =        (<0.001)      (0.300)      $R^2 = 0.95$

(2.5×2)

## SECTION – A

2.  (i) Define Structural and Reduced form models. If

$$Q_d = \beta_0 + \beta_1 P + \beta_2 Y + U$$

$$Q_s = \alpha_0 + \alpha_1 P + V$$

$$Q_d = Q_s$$

is demand-supply model, then find the reduced form model.

(ii) Stating clearly the underlying assumptions, obtain the restricted least squares estimator of $\beta$ and its variance under the set of linear restrictions given by $R\ \beta = r$, for the GLM $\underset{n \times 1}{Y} = \underset{n \times k}{X}\ \underset{k \times 1}{\beta} + \underset{n \times 1}{U}$.                     (7,8)

(i) What types of model specification errors is one likely to encounter in practice? What are the consequences of including an irrelevant variable?

(ii) Discuss briefly the problem of Multicollinearity and its consequences. Describe any two remedial measures.                    (7,8)

4.  (i) Discuss the types of data available for econometric analysis, giving suitable examples.

(ii) In the case of General Linear model $\underset{\sim}{Y} = X\beta + \underset{\sim}{U}$, obtain the Best Linear Unbiased Estimator (BLUE) of $\beta$, clearly stating all the assumptions. Comment on the MLE of $\beta$.                    (6,9)

## SECTION – B

(i) What happens if Ordinary Least Squares estimators are applied to a model suffering from Autocorrelated disturbances? Discuss its consequences on estimation procedure. Describe Durbin-Watson test for detection of autocorrelation by stating its assumptions.

(ii) Explain the Durbin two-stage procedure for the estimation of autocorrelation parameters.    (10,5)

(i) What are dummy variables? What caution should be undertaken in the use of these variables?

(ii) What do you understand by lag? In the Geometric Lag Model :

$$Y_t = \alpha + \beta_0 X_t + \beta_1 X_{t-1} + \ldots\ldots + \beta_k X_{t-k} + \ldots\ldots + U_t$$

where $\beta_k = \beta_0 \lambda^k$, $0 \leq \lambda \leq 1$, discuss Koyck's scheme of reducing the number of parameters to be estimated.

(6,9)

7. (i) For a generalized least squares model $\underset{\sim}{Y} = X\beta + \underset{\sim}{U}$,

with $E\left(\underset{\sim}{U}\,\underset{\sim}{U}'\right) = \sigma^2 \Omega$, $\Omega$ being known, symmetric, positive definite matrix, estimate $\beta$ and find its variance. Also, find unbiased estimator for $\sigma^2$.

(ii) Define Heteroscedasticity and discuss White's Te. for Heteroscedasticity.

(8,7)

Statistics

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