

**M.Phil./Ph.D. PROGRAMME IN ECONOMICS****Term-End Examination****December, 2014**

00493

**REC-003 : ECONOMETRIC METHODS***Time : 3 hours**Maximum Marks : 100*

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**Note :** You are required to answer any **two** questions (each carrying 20 marks) from Section A and any **five** questions (each carrying 12 marks) from Section B.

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**SECTION A**

1. Consider a regression model of relating Y (the dependent variable) to X (the independent variable)  $Y_i = \beta_0 + \beta_1 X_i + \varepsilon_i$  where  $\varepsilon_i$  is the stochastic or error term. Suppose that the estimated regression equation is stated as  $\hat{Y}_i = \hat{\beta}_0 + \hat{\beta}_1 X_i$  and  $e_i$  is the residual error term.

- (a) Find out the relationship between  $e_i$  and  $\varepsilon_i$ . 3
- (b) Give four reasons why  $\varepsilon_i$  should be added to the regression model. 4

- (c) What is the relationship between  $\beta_1$  and  $\hat{\beta}_1$  ? 2
- (d) What is the Gauss-Markov theorem (statement only)? Write down four essential assumptions about  $\varepsilon_i$  for Gauss-Markov theorem to be true. 4
- (e) What is meant by sampling distribution of  $\hat{\beta}_1$  ? What is the standard error of  $\hat{\beta}_1$  ? 4
- (f) If  $\text{var}(\varepsilon_i) = \sigma^2$  (a constant), what is an unbiased estimator for  $\sigma^2$  ? 3

2. Explain the maximum likelihood method of estimation. Derive estimates for the parameters of the model  $Y_i = \beta_0 + \beta_1 X_i + \varepsilon_i$ . Derive estimate of error variance in the model. 4+10+6

3. (a) What is meant by autocorrelation in a regression model ? 5

(b) Consider the regression model :

$$Y = \alpha + \beta X + u.$$

Estimate the parameters using the data given below : 15

X	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Y	2	2	2	1	3	5	6	6	10	10	10	12	15	10	11

4. Give the structure of AR and MA models. What are the components of ARIMA model ? Outline the steps suggested by Box-Jenkins for identification of ARIMA models. 5+5+10

## SECTION B

5. What is meant by panel data ? Distinguish between fixed effect and random effect models for panel data. 4+8

6. What is meant by discrete dependent variable models ? Explain the estimation procedure of one such model. 4+8

7. (a) What is identification problem in a simultaneous equation model ? 3

(b) Explain the identification status of each of the equations in the following macroeconomic model : 4

$$C_t = \beta_1 + \beta_2 Y_t + u_1$$

$$I_t = \alpha_1 + \alpha_2 Y_t + \alpha_3 R_t + u_2$$

$$Y_t = C_t + I_t + G_t$$

where C = Consumption, Y = Income,  
I = Investment, R = Rate of Interest,  
G = Government expenditure; and C, Y and I are endogenous variables.

(c) Suggest a method of estimating the consumption function in the above model. 5

8. What is the problem of heteroscedasticity ? What are its consequences ? Give the outline of a method to remove heteroscedasticity problem from a dataset. 12
9. Multicollinearity is basically a data problem. Do you agree ? Suggest methods of resolving multicollinearity in a dataset. 12
10. What is the problem of stationarity ? Give the outline of a method to identify presence of stationarity in a time series. What is the common practice to make the data stationary ? 4+6+2
11. Derive the coefficient of determination ( $R^2$ ) for a regression model. What is the difference between  $R^2$  and adjusted- $R^2$  ? 8+4
12. Write short notes on any *two* of the following : 6+6
- (a) Likelihood ratio test
  - (b) Co-integration
  - (c) F-test
  - (d) Chow test
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