

QP Code : 23/PT/11/XVIIIIB

POST-GRADUATE COURSE

Term End Examination — June, 2023/December, 2023

ECONOMICS

Paper-XVIIIIB : ADVANCED ECONOMETRICS - I

Time : 2 hours]

[Full Marks : 50

Weightage of Marks : 80%

Special credit will be given for precise and correct answer. Marks will be deducted for spelling mistakes, untidiness and illegible handwriting. The figures in the margin indicate full marks.

Use of scientific calculator is strictly prohibited.

1. Answer any *four* of the following questions : $2\frac{1}{2} \times 4 = 10$
- a) What is an interaction dummy ? Give examples.
 - b) Whenever the lagged dependent variable appears as an explanatory term, the R^2 is usually much higher than when it is not included. What are the reasons for this observation ?
 - c) Define endogeneity in the context of simultaneous equation models. Why does endogeneity pose a challenge in estimation ?
 - d) Explain how to interpret the coefficient in the Linear Probability Model. What do positive and negative coefficients signify ?
 - e) How do you measure the goodness of fit in the case of Logit model ?
 - f) Discuss the concept of marginal effects and how they can be derived from the estimated coefficients in the Probit model ?
2. Answer any *four* of the following questions : $5 \times 4 = 20$
- a) What is a dummy variable ? Suggest some of its applications.
 - b) Explain the process of specifying the lag structure in the 'Distributive Lag Model'. What considerations are important in choosing the appropriate lag lengths ?

- c) Explain the concept of identification in Simultaneous Equation Models (SEMs). Why is identification important, and what are the challenges associated with it ? 2 + 1 + 2

- d) Consider the following regression equation :

$$Y_i = \alpha + \beta X_i + u_i$$

where, X = family income

$Y = 1$ if the family owns a house

$= 0$ if the family does not own a house.

If a researcher estimates the above equation using OLS technique what problems may the researcher face ?

- e) Discuss the concepts of odd ratios and how they can be derived from the estimated coefficients in the Logistic model.
- f) How would you estimate a probit model using Maximum Likelihood Estimation technique ?

3. Answer any *two* of the following questions : 10 × 2 = 20

- a) i) What is a dummy variable trap ? How can a researcher overcome such problems ? 2 + 3
- ii) How do you interpret the coefficient in a Distributive Lag Model ? What do positive and negative coefficients signify ? 2 + 3
- b) i) Describe common diagnostic tests used to assess the validity of a simultaneous equation model. How do you test for the presence of endogeneity and other specification errors in SEMs ?

2 + 3

- ii) Consider the Koyck (or, for the matter, the adaptive expectation) model given as

$$Y_t = \alpha[1 - \lambda] + \beta_0 X_t + \lambda Y_{t-1} + (u_t - \lambda U_{t-1})$$

Suppose in the original model u_t follows the first-order autoregressive scheme.

$$u_t - \rho u_{t-1} = \varepsilon_t$$

Where ρ is the coefficient of auto correlation and where ε_t satisfies all the classical OLS assumptions.

- I. If $\rho = \lambda$, can the Koyck model be estimated by OLS ?
 - II. Will the estimates thus obtained be unbiased ? Consistent ?
Why or why not ?
 - III. How reasonable is it do assume that $\rho = \lambda$? 1 + 2 + 2
- c) From data for 54 standard metropolitan statistical areas [SMSA], a researcher estimated the following Logit model to explain high murder rate versus low murder rate.

$$\ln \hat{O}_i = 1.1387 + 0.0014P_i + 0.0561C_i - 0.4050R_i$$

$$SE = (0.0009)(0.0227)(0.1568)$$

Where O = the odds of a high murder rate

P = 1980 population size in thousands

C = Population growth rate from 1970 to 1980

R = reading quotient, and these are the asymptotic standard errors.

- i) How would you interpret the various coefficients ?
- ii) Which of the coefficients are individually statistically significant ?

- iii) What is the effect of a unit increase in the reading quotient on the odds of having a high murder rate ?
- iv) What is the effect of a percentage point increase in the population growth rate on the odds of having a high murder rate ? 2 + 4 + 2 + 2
- d) i) Compare and contrast Probit model with Linear probability model.
- ii) What are the assumptions behind a Probit model ?
- iii) Discuss the advantages and disadvantages of probit regression in different contexts, such as health care, finance or social sciences. 3 + 3 + 4
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