BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI
SECOND SEMESTER 2022-23

ECON F342: APPLIED ECONOMETRICS **DATE: 15 March 2023**
TIME: 90 min **MAX MARKS: 60**

MID SEMESTER EXAMINATION (CLOSED BOOK)

Instructions:

- Write your Name and ID No on your all pages of answer sheets.
- Leave sufficient margins on all sides of the answer sheet.
- This is a closed-book and closed-notes exam. You may use a calculator if you wish.
- Cell phones or any other electronic and communication devices are not allowed. Any discussion or otherwise inappropriate communication between examinees, as well as the appearance of any unnecessary material, will be dealt with severely.
- **This exam contains TWO SECTIONS:**
  SECTION -1: Short answer Questions - Numerical/analytical Problem questions with sub parts.
  SECTION –II: Long answer questions - Numerical/analytical Problem questions with sub parts.
- Attempt all questions. Answer to the point and show your work. Start answering all parts of a question at one place. Write legibly. Illegible answers carry no weightage. Clearly indicate your final answer to each question.
- If required write the assumptions if any, clearly, and start answering the question.

1) Read the following statements and decide if you AGREE or DISAGREE with the statements. Write the answer and provide a brief explanation to your answer to get full credit. **(10.0)**

i. **"**Ordinary Least Squares (OLS) estimator is inconsistent in the presence of lagged dependent variables and serially correlated errors."

ii. "Like cross-sectional observations, we can assume that most time series observations are independently distributed."

iii. "A trending variable cannot be used as the dependent variable in multiple regression analysis."

iv. "Seasonality is not an issue when using annual time series observations."

v. "Sometimes apparent heteroscedasticity can be caused by a mathematical misspecification of the regression model. This can happen, for example, if the dependent variable ought to be logarithmic, but a linear regression is estimated."

2) What are the important disadvantages associated with non-nested test like Davidson-MacKinnon test "J-Test"?

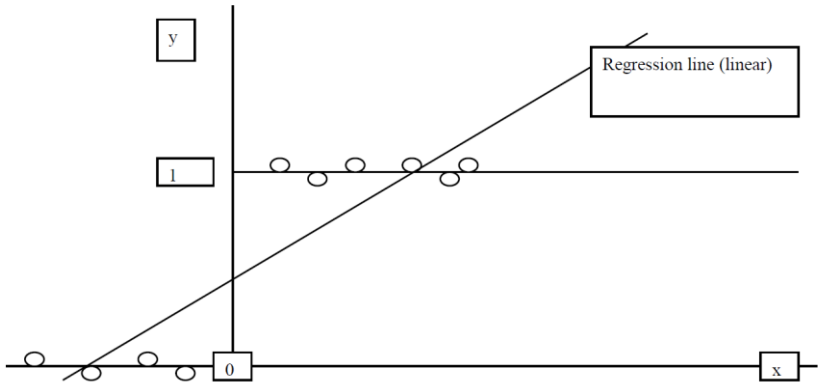
3) A researcher has estimated an equation which explains that the weekly hours of television viewing by a child in terms of the child's age, mother's education, father's education, and number of siblings:

$$tvhours^* = \beta_0 + \beta_1 age + \beta_2 age^2 + \beta_3 motheduc + \beta_4 fatheduc + \beta_5 sibs + u.$$

The researcher worried that tvhours* is measured with error in that survey. Let "tvhours" denote the reported hours of television viewing per week.

What do the classical errors-in-variables (CEV) assumptions require in this particular model? Do you think the CEV assumptions are likely to hold? Briefly explain.

4) The following model, where the regression line is fitted between the 0 and 1 observations. Examine the model fit and comment on the model and goodness of fit. Did you notice any further problems associated with such model fit list them correctly?



5) Given the following set of results based on a LPM, using 60 observations:

$$\hat{p}_i = 0.7 - 0.5d_t + 0.9\,f_t + 0.7\,y_t$$
$$(0.6)\ (0.1)\quad (0.3)\quad (0.2)$$
$$\mathrm{R}^2 = 0.2, DW = 1.89$$

Where the dependent variable is whether a country defaults on its bank loans (1) or not (0).
The explanatory variables are *d* (democracy), *f* (fixed exchange rate), *y* (income) (all in logs).

Interpret the coefficients on the above model. Are the individual variables significant?
(he critical value of test statistics is 1.98)

6) Consider the following distributed lag model:

$$Y_t = \alpha + \beta X_t + \beta\lambda X_{t-1} + \beta\lambda^2 X_{t-2} \ldots \beta\lambda^n X_{t-n} \ldots + u_t \qquad 0 < \lambda < 1$$

a) Briefly explain the specification of this type of model. What problems might arise in estimating the equation in this form?
b) Write the approach that which transformation can be used to produce the following type of model:

$$Y_t = \alpha(1-\lambda) + \lambda Y_{t-1} + \beta X_t + v_t$$

c) Derive an expression for the long-run relationship between X and Y.

(6.0)

7) An econometrician fitted the Logit model and got the following results, where y is the dependent variable taking the value of 1 if a success and 0 if a failure (120 observations):

variable	Coefficient	standard error	t-statistic
Constant	0.90	0.30	3.00
x	0.06	0.28	2.00

Interpret the above set of results and briefly explain your answer.

8) What is the long-run steady state solution to the following model?

$$y_t = \alpha_0 + \alpha_1 \Delta x_{t-1} + \alpha_2 y_{t-2} + \alpha_3 x_{t-1} + u_t$$

9) Given the following set of results determine the short and long run coefficients for the Koyck distribution:

$$\hat{y}_t = 0.7 + 0.5x_t + 0.3y_{t-1}$$
$$(0.1)\ \ (0.2)\ \ (0.05)$$
$$\mathrm{R}^2 = 0.7, DW = 1.98.$$

10) Given the following partial adjustment model:

$$s_t^* = \alpha_0 + \alpha_1 p_t + u_t$$
$$s_t - s_{t-1} = \lambda(s_t^* - s_{t-1})$$

Where *s* are stock prices and '*p*' are company profits.

Derive the estimating equation. Consider this estimated equation and model it with a specific restriction as autoregressive distributed lag model and explain.

11) A colleague of yours is interested in estimating the value of β in a regression:

$Y_t = X_t \beta + u_t$, where X_t and β are both scalars. The colleague wants to estimate β and test the null hypothesis that $\beta = 0$. The colleague is concerned about heteroscedasticity of u_t and is considering three options.

Option 1: Estimate β by OLS, use the OLS standard error to form a *t* test of the null hypothesis that $\beta = 0$.

Option 2: Use White heteroscedasticity- consistent standard errors.

Option 3: Use Feasible GLS.

Your colleague is in a hurry and wants a very quick summary notes not a long explanation and notes.

(6.0)

a) What are the main advantages and disadvantages of Option 2 relative to Option 1 in terms of the estimate of β and the validity of the t test?

b) What are the main advantages and disadvantages of Option 3 relative to Option 2 in terms of the estimate of β and the validity of the t test?

12) An autoregressive distributed lag model is estimated as:

$$y_t = 31.2 + 0.61y_{t-1} + 0.19y_{t-2} + 1.40x_t + 0.58x_{t-1} + u_t$$

Consider the effect on y of a one-unit increase in x at time $t*$ in the following two cases:
a) x remains one unit higher permanently after time t^*.
b) x immediately returns to its former level at time $t^* + 1$.

Obtain the estimated effect on y in each of these cases at the four time periods: t^*, $t^* + 1$, $t^* + 2$, and the long run effect, $t^* + \infty$.

(8.0)

13) A researcher fitted a regression model with a constant term and three explanatory variables, which include the lagged dependent variable y_{t-1} and two other variables, x_{1t} and x_{2t}. The estimated model is

$$y_t = 2.1 + 0.8y_{t-1} - 2.0x_{1t} + 0.5x_{2t} + e_t$$

a) Obtain the estimated effect on y of a permanent one-unit increase in x_1 at time $t*$ (that is, x_1 remains one unit higher permanently after time t^*) at the four time periods: t^*; $t^* + 1$; $t^* + 2$; and the long run effect, $t^* + \infty$.

b) Compare the size of the estimated effect on y of a permanent one-unit increase in x_1 with the size of the estimated effect on y of a permanent one-unit increase in x_2. Mention their initial (time t^*) effects and their long run effects.

(6.0)