BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI
SECOND SEMESTER 2021-22
ECON F342: APPLIED ECONOMETRICS **DATE: 12 March 2022**
TIME: 90 min **MAX MARKS: 60**

MID SEMESTER EXAMINATION (CLOSED BOOK)

NOTE:

- 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
  SECTION –II: Long Answer

- 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.
- **Note that you have 90 minutes to complete this exam.**

SECTION – 1: Short answer questions. (30.0 Marks)

A1 Answer to the point. No partial credits (6 x 3.0 = 18.00)

a) Mention the two important disadvantages associated with non-nested alternative test like Davidson-MacKinnon test?

b) What does it mean for a time series to be *causal*?

c) Define, precisely, what it means for a time series Y_t *to* be an AR (1) series where

$$Y_t = \phi Y_{t-1} + \varepsilon_t .$$

What condition will ensure that an AR (1) series will be stationary and causal.

d) Suppose that Y_t is a stationary, causal AR (1) series.

$$Y_t = \phi Y_{t-1} + \varepsilon_t$$

Describe, as exactly as you can, the type of ARMA series which is produced by taking simple differences of Y_t. Also compute the variance of the differenced series.

e) Consider the following MA (2) model: $Y_t = 0.3 + 0.5u_{t-1} - 0.4u_{t-2} + u_t$

What is the optimal two-step ahead forecast from this model, made at time t, if the values of the residuals from the model at time t and t-1 were 0.6 and -0.1 respectively and the values of the actual series y at time t-1 was -0.4?

f) You plan to run an instrumental variables regression (a two-stage least squares model). You run a first-stage regression in order to examine the relationship between your candidate instrument and the variable you suspect of being endogenous in the main regression. Which concern would you have if the first-stage regression results were as indicated: ***(*****Choose the correct best answer from the given options and briefly explain)**

i. the relationship between the candidate instrument and the endogenous regressor seems weak — the t-stat is low, the R^2 is low, and the F-stat is low. Consequently, you suspect that the instrument might not be valid.
ii. the relationship between the candidate instrument and the endogenous regressor seems strong — conditions opposite of those listed in (A). Consequently, you suspect that the instrument might not be valid.
iii. the relationship between the candidate instrument and the endogenous regressor seems weak. Consequently, you suspect that the instrument might lead to imprecise estimates of the effect of interest in the second stage.

Write YES or No and provide the explanation in one or two sentence answers. Answer to the point.

(6 x 2 = 12 Marks)

A2 Which of the following problems make the OLS estimator of β_1 inconsistent?

I. Nonzero correlation between x1 and u.

II. Classical measurement error in x_1.

III. Classical measurement error in y.

IV. A sampling probability that depends on x_1.

V. A sampling probability that depends on y.

A3 Determine the following statement is TRUE or FALSE: *'Measurement error in the dependent variable is more serious than measurement error in the independent variables.'*

SECTION – 1: Long answer questions. (30.0 Marks)

B1 A researcher has considered the following population regression model:
$Y_i = \beta_0+\beta_1X_i+u_i$ with Cov $(X_i, u_i) = 0$.
He noted that Y_i but does not observe X_i, instead he observed a noisy measure $X_i^* = X_i + \varepsilon_i$, where $\varepsilon_i = \varepsilon$ (it is identical for all i).
The researcher has a large sample with i.i.d observations on Yi and X_i^* and estimates the following equation by OLS:
$Y_i = \beta_0 + \beta_1 X_i^* + v_i$
What is Cov(X_i^*, v_i) ? Also comment that is the OLS estimator of β_1 is consistent?

(10.0 Marks)

B2 Consider an econometric model where two variables Y and X are jointly determined by the following equations:

$Y = \beta_1 + \beta_2 X + \beta_3 Z + U$ ……………………… (1)

$X = \alpha_1 + \alpha_2 Y + V$ ………………………………… (2)

The Greek letters denote unknown parameters, U and V are model errors, mutually uncorrelated, with zero mean, and Z is an exogenous variable, independent of the errors.

a) Explain with detailed arguments, whether β_2 are α_2 identified under the information provided in the problem provided in the problem.

b) Is the ordinary least squares (OLS) estimate of α_2 in the equation (2) above is asymptotically biased in general? What is your conclusion if $\beta_2 = 0$? Which would be your conclusion if $\alpha_2\beta_2 = 1$?

c) Explain with detailed arguments whether there is any valid instrument to estimate α_2. If your answer is positive, demonstrate that the corresponding instrumental variable (IV) estimate is consistent.

d) Is the Two Stage Least Squares (2SLS) estimate of α_2 is identical to the instrumental (IV) estimate in part (c).

   Recall that the 2SLS estimate is the OLS estimate of α_2 in model (2) when Y is replaced by its predicted (fitted) values by OLS in the reduced form equation: $Y = \Upsilon_1 + \Upsilon_2 Z + W$.
   where W is an error term and the GREEK LETTERS continue to be parameters. Is it consistent?

(20.00)