Indian Institute of Technology Kharagpur

Department of Humanities and Social Sciences

Autumn Semester 2022-23: Mid-Semester Exam. Full Marks: 30 Time: 2hrs.

Subject No: HS30207/HS40007 Subject Name: Econometric Analysis II

Instructions: Answer all the questions. Write the answers in sequence of question no.

---

1. Comment on the following statements with justification/ proof: $2.5 \times 4 = 10$

(a) The consequence of including an irrelevant variable is more severe as compared to omitting a relevant variable from a regression model.

(b) Application of the Koyck transformation procedure in a distributed lag model does not make much sense if some of the lag coefficients are positive and the rests are negative.

(c) All econometric models are essentially dynamic.

(d) The Granger test is a test of precedence rather than a test of causality.

2. Assume that firms' in-house R&D intensity depends on the nature of their ownership, type of industry they belong to, if they are involved in mergers and acquisitions or have any technology alliances with other firms, along with some other factors relating to market structure, other business strategies, performance and policies. Specify a suitable econometric model to examine the influence of these factors on firms' in-house R&D intensity. Explain how you will interpret the coefficients of the model. 4

3. Consider the following three alternative models:

Model A: $Y_i = \alpha_0 + \sum_{j=1}^{k} \alpha_j X_{ji} + \sum_{j=1}^{m} \beta_j W_{ji} + u_i$

$\hat{\beta} = \hat{a}_0 + j\hat{a}_1 + \ldots + j^{q}$

$var(\hat{\beta}) = var(\hat{a}_0) + j^2 var(\hat{a}_1) + j^{q}$

Model B: $Y_i = \gamma_0 + \sum_{j=1}^{k} \gamma_j X_{ji} + \sum_{j=1}^{p} \delta_j Z_{ji} + v_i$

Model C: $Y_i = \phi_0 + \sum_{j=1}^{k} \phi_j X_{ji} + \sum_{j=1}^{m} \varphi_j W_{ji} + \sum_{j=1}^{p} \lambda_j Z_{ji} + \varepsilon_i$

How can one make decision on the model to be finally selected? Justify your answer. 4

$Y_i^* = \alpha + \beta x_i^* + u$

4. Consider the model: $Y_i = \alpha + \beta X_i + u_i$ with X_i and Y_i being measured as $X_i^* = X_i + \eta_i$ and $Y_i^* = Y_i + \varepsilon_i$ respectively. Prove that $p\lim \beta_{YX} \le \beta \le \frac{1}{p\lim \beta_{XY}}$ where β_{YX} and β_{XY} are the slope coefficients of regressing Y on X and X on Y respectively. 4

5. Consider the distributed lag model $Y_t = \alpha + \sum_{j=0}^{k} \beta_j X_{t-j} + u_t$. If $\beta_j = a_0 + a_1 j + a_2 j^2 + \ldots + a_m j^m$, how will you transform the original model to estimate the coefficients? What will be the formula for obtaining variance of the estimated slope coefficients ($\hat{\beta}_j$) of the original model? 4

6. Transform the regression model $Y_t^* = \alpha X_{t-1}^{\beta} Z_{t-1}^{\gamma} e^{u_t}$ in terms of observable measures of the variables. Can the transformed model be estimated by applying the OLS method? 4

$Y_t =$