Ramakrishna Mission vivekananda University

MSc. Big Data Analytics, Second Year

Mid-Semestral Examination: (2017)

Introduction to Econometrics

Date: 24 Sep 2017 Maximum Marks 60 Duration 2 hours

Student Name:

All notations are self-explanatory. This question paper carries 70 marks. You can answer any part of any question. However, the maximum that you can score is 60. Marks allotted to each question are given within parentheses.

1. Consider the multiple linear regression model as $Y = X\beta + \epsilon$, where X is stochastic. Discuss the differences among the three situations: (a) ϵ and X is uncorrelated, (b) $E(\epsilon \backslash X) = 0$, and (c) ϵ and X is independent.

   [3+5+2=10]

2. Consider the multiple linear regression model as $Y = X\beta + \epsilon$, where X is stochastic but exogenous. Assume that all other CLRM assumptions hold. Show that the OLS estimate of β is unbiased. Do you feel this estimate is consistent always? Prove your point analytically. [5+5=10]

3. Consider the linear regression model $y_n = \mu + \beta x_n + \varepsilon_n,\ n = 1,2, \ldots \ldots \ldots N$. Assume that $\{\varepsilon_n\}$ is a sequence of independent random variables with the following distribution: $P\{\varepsilon_n = \pm 1\} = \frac{1}{2}(1 - 2^{-n}),\ P\{\varepsilon_n = \pm 2^{-n}\} = \frac{1}{2^{n+1}}$.
   a. Check if CLRM conditions hold for ε_n.
   b. Show that OLS estimator of β is consistent. [10+10=20]

4. Consider the above regression model (question number 3) with $x_n = n\ \forall\, n = 1, \ldots, N$.
   a. Check if CLRM assumptions on 'X' hold or not.
   b. Show that OLS estimator of β is consistent. [10+10=20]

5. Consider the multiple linear regression model as $Y = X\beta + \epsilon$, where X is stochastic but exogenous. One is suspicious about the presence of heteroscedasticity. How would you test for heteroscedasticity? Discuss how you would perform *t-test* for any slope parameter based on OLS estimator. [5+5=10]