



Register Number:

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**ST JOSEPH'S COLLEGE (AUTONOMOUS), BANGALORE - 27**  
**SEMESTER EXAMINATION- NOVEMBER-2020**  
**B.Sc. ECONOMICS-VSEMESTER**  
**ECS 5118: BASIC ECONOMETRICS**

**Duration: 2.5 Hrs**

**Max Marks: 70**

**This question paper has two printed page and THREE parts**

**PART A: Answer any TEN of the following questions**

**10x3=30**

1. What is the difference between error term and residual? Use simple regression framework to give an example.
2. What is the difference between an estimator and an estimate? Explain in the context of simple regression model given underlying population regression line:  
$$Y_i = \beta_0 + \beta_1 X_i + u_i$$
3. Can  $R^2$  be generally expected to be greater than 1? Explain your answer.
4. Consider the following regression line:  $\widehat{Marks} = 698.9 - 2.28 * STR$ . You are told that the t-statistic on the slope coefficient is 4.38. What is the standard error of the slope coefficient and is it significant (in the standard sense and at 95% confidence interval)?
5. How would you make the following equation to be linear in parameters:  $y = Ax^\beta e^u$ . Write the reformulated equation
6. What is autocorrelation?
7. Rewrite the equation  $\ln(Y_i) = \beta_0 + \beta_1 X_i + u_i$  such that  $\beta_1$  represents elasticity of Y with respect to X and explain why it represents elasticity?
8. Assume that the true model includes variables  $X_1$  and  $X_2$  along with the constant term. What is the impact of including  $X_3$  which is an irrelevant variable on the slope coefficients?
9. A researcher wants to understand the impact of firm size (Size) on revenue (Rev) and so wants to run this model:  $Rev = \beta_0 + \beta_1 \log(Size) + \beta_2 \log(Size^2) + u$ . This model is not estimable. Why?
10. Distinguish between t-test and F-test.
11. If we expect heteroscedasticity, when would we use heteroskedastic-robust (white) standard errors?
12. Describe the Goldfeld-Quant test.

**PART B: Answer any TWO of the following questions**

**2x5=10**

13. What is multicollinearity? What are the problems associated with multicollinearity? Describe potential solutions.
14. Suppose that the units of measurement of X are changed so that the new measure,  $X^*$ , is related to the original one by  $X^* = \mu X$ . Use the OLS estimator formula to show that the new estimate of the slope coefficient is  $\beta/\mu$ , where  $\beta$  is the slope coefficient in the original regression with one explanatory variable X.
15. A researcher is interested in understanding how wage is affected by being part of union. In addition, she is interested in finding if being a union member affects wage differently for male and female. Can an interaction model be used for this analysis? Explain.

**PART C: Answer any TWO of the following questions**

**2x15=30**

16. If a variable should be included in the model but is not, there is omitted variable bias. Consider the true model which includes  $X_1$  and  $X_2$  but the estimated model excludes one of these variables. Derive the Omitted Variable Bias and give the intuition for the bias.
17. Graphically show the difference between the following models (X is a continuous variable and D a dummy variable):
- $Y = \beta_0 + \beta_1 X + \beta_2 D + u$
  - $Y = \beta_0 + \beta_1 X + \beta_2 D + \beta_3 (X * D) + u$
  - $Y = \beta_0 + \beta_1 X + \beta_2 (X * D) + u$
18. In a regression of the rate of growth of employment on the rate of growth of real GDP using a sample of 31 OECD countries,  $R^2 = 0.2837$ . The F-test of the goodness of fit can be calculated as  $F = \frac{ESS/k-1}{RSS/n-k-1}$  where n is the number of observations and k the number of parameters excluding the intercept term. ESS stands for Explanatory Sum of Squares and RSS for Residual Sum of Squares. Calculate the corresponding F statistic and explain what it implies.

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