

2020

STATISTICS — GENERAL

Paper : DSE-A-1

(Econometrics)

Full Marks : 50

The figures in the margin indicate full marks.

*Candidates are required to give their answers in their own words
as far as practicable.*

Day 1

1. Answer *any ten* questions :

1×10

- (a) Give an example of trivariate data relevant to Econometrics where one variable is qualitative.
- (b) Give an example of a structural econometric model.
- (c) Write down the name of a test for detecting heteroscedasticity.
- (d) As incomes grow, people have more choices about their savings behaviour. Write down a suitable linear regression model of savings on income clearly stating the assumptions.
- (e) State a use of Durbin–Watson d-statistic.
- (f) State a reason for correlation between regressor and the error term.

State with reason whether the following statements (g to o) are true, false, or uncertain :

- (g) In cases of high multicollinearity, it is not possible to assess the individual significance of one or more partial regression coefficients.
- (h) High pair-wise correlations do not suggest that there is high multicollinearity.
- (i) Multicollinearity is harmless if the objective of the analysis is prediction only.
- (j) In the presence of heteroscedasticity, the ordinary least squares estimator of the regression coefficient in a two-variable linear regression model is biased.
- (k) The first-difference transformation to eliminate autocorrelation assumes that the coefficient of autocorrelation ρ is -1 .
- (l) Often, the exclusion of an important variable from a regression model is a source of autocorrelation.
- (m) In the presence of autocorrelation, the ordinary least squares estimator of the regression coefficient in a two-variable linear regression model is unbiased.
- (n) A generalized least squares estimate is an ordinary least squares estimate obtained from the transformed variables that satisfy the standard assumptions of ordinary least squares method.
- (o) Suppose a variable Z is a candidate instrument for a stochastic regressor X . To be a valid instrument, Z must satisfy the criteria that X and Z are uncorrelated.

Please Turn Over

2. Answer **any four** questions :

5×4

- (a) What is an econometric regression model? Justify the insertion of the stochastic error term in an econometric regression model with an example(s).
- (b) Write a short note on *dummy variables* with example(s) from Econometrics.
- (c) Discuss the remedial method of pooling cross-sectional and time series data to address the problem of multicollinearity.
- (d) What do you mean by heteroscedasticity? Discuss the graphical method of detecting heteroscedasticity.
- (e) “The problem of heteroscedasticity is likely to be more common in cross section data than in time series data”— explain with examples.
- (f) What do you mean by autocorrelation? Discuss a method for detecting autocorrelation.

3. Answer **any two** questions :

- (a) Explain the concept of multicollinearity. Show that in cases of high multicollinearity, the ordinary least squares estimators of the regression coefficients have large variances and covariances; you may consider a three-variable linear regression model. State some other practical consequences of multicollinearity. 2+5+3
 - (b) Consider the two-variable linear regression model $Y_i = \alpha + \beta x_i + U_i, i = 1(1)n$. Assume, however, that the classical homoscedasticity assumption is violated. For the first m observations, the variance of the error terms $Var(U_i) = 1$ and for the remaining $(n - m)$ observations $Var(U_i) = 4$. How would you estimate α and β by the method of generalized least squares? What problems arise if you estimate β by the ordinary least squares method? 7+3
 - (c) Suppose in the regression model $Y_i = \alpha + \beta x_i + U_i, i = 1(1)n$ the error term $U_t = \rho U_{t-1} + \varepsilon_t$, where $|\rho| < 1$ and ε_t are uncorrelated and with $E(\varepsilon_t) = 0$ and $Var(\varepsilon_t) = \sigma_\varepsilon^2$. Mention a consequence if the ordinary least squares method is used in estimation of the parameters α and β . Suggest an appropriate method to estimate the model parameters when ρ is unknown. 3+7
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