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STH 454

II Semester M.Sc. Degree Examination, Sept./Oct. 2022
STATISTICS
Econometrics

Time : 3 Hours

Max. Marks : 70

Instructions : Question No. 1 is **compulsory**. Answer **any four** from the remaining **seven** questions.

1. Answer **any six** subdivisions from the following : **(6×3=18)**
- a) Define econometrics. Briefly explain the various aspects we come across in econometrics.
 - b) Show that $\hat{\beta}_{ols}$ and $\hat{\sigma}^2$ are independently distributed.
 - c) Define Mallows's C_p statistic. Explain its role in the best subset selection.
 - d) Obtain the restricted least squares estimators of β in $Y = X\beta + \varepsilon$ under the restriction $R\beta = r$ and show that it dominates the OLS estimator.
 - e) Describe multicollinearity in multiple linear regression model. Explain its consequences on OLSE.
 - f) Explain stochastic regression model. Mention its consequences on least squares estimate of parameters.
 - g) Explain Durbin-Watson test for detecting autocorrelation in regression model.
 - h) Define the following in the context of system of simultaneous equation.
 - i) Over identification and exact identification.
 - ii) Zero restrictions.
2. a) Obtain the least squares estimators of slope and intercept terms along with their standard errors in a simple linear regression model.
- b) Define recursive residuals. Explain the procedure to obtain the same.
- c) Define Multiple Linear Regression Model. By stating basic ideal conditions, derive the OLS estimator of model parameters. **(5+4+4)**

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3. a) Explain logistic regression model. Describe a test for testing significance of the Individual regressor in model.
 b) Show that for the model satisfying all the basic ideal conditions, OLS estimators of β and σ^2 are jointly sufficient for β and σ^2 .
 c) Explain the concept of outlier analysis. (4+6+3)

4. a) Derive the maximum likelihood ratio test statistic to test 'm' exact linear restrictions on the regression coefficient vector.
 b) Explain asymptotically uncooperative regressors. Propose a consistent estimator for regression coefficient. (7+6)

5. a) Define Best Linear Unbiased Predictor (BLUP). Obtain the expression for BLUP in simple linear regression model satisfying all the basic ideal conditions.
 b) Show that in case of non-zero mean error term in the regression model, simultaneously unbiased estimators for β and σ^2 cannot be obtained.
 c) Explain a test procedure for detecting heteroscedasticity. (5+5+3)

6. a) Describe the Instrumental Variable (IV) method of estimation and the properties of the resulting estimators.
 b) Derive Generalised Least square estimator of regression coefficients in heteroscedastic model. (7+6)

7. a) Explain errors in variables in regression model. Show that the OLSE of regression coefficients are inconsistent in this case.
 b) Explain the estimation of the parameters of auto correlated regression model. Let

$$Q = \alpha P + \beta Z + U_1$$

$$P = \gamma Q + U_2$$
 where Q denotes the quantity, P denotes the price, Z denotes personal income. Assume that Q and P are endogenous variables. Examine whether the above system is identifiable.
 c) Distinguish between structural and reduced form of system of simultaneous equations. (3+5+5)

8. a) Explain grouping of equations. Explain how to estimate the regression coefficient in this case.
 b) Show that OLS estimators of reduced form parameters are consistent.
 c) Explain Two Stage Least Squares estimation in simultaneous equation model. State its properties. (3+5+5)