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0304N37

Candidate's Seat No :_____

M.Sc Semester-4 Examination

508

Statistics

April-2024

Time : 2-30 Hours] **[Max. Marks : 70**

Note: Attempt all questions.

Q.1

(i) Define multiple linear regression model. Explain least-squares estimation of the regression coefficients. [7]

(ii) Discuss properties of the least-squares estimators. [7]

OR

(i) Explain test on individual regression coefficients. [7]

(ii) Explain Mallow C_p statistic. [7]

Q.2

(i) Define multicollinearity and discuss its sources. [7]

(ii) What is meant by heteroscedasticity? Draw a figure showing homoscedastic disturbances and the various forms of heteroscedastic disturbances. [7]

OR

(i) Explain, how is the presence of heteroscedasticity tested? [7]

(ii) What are the rules for detection of multicollinearity? Explain any one rule in detail. [7]

Q.3

(i) What do you mean by autocorrelation? Draw a figure showing positive and negative first-order autocorrelation. [7]

(ii) Explain, how is the presence of positive or negative first-order autocorrelation tested? [7]

OR

(i) Explain, how can autocorrelation be corrected? [7]

(ii) Define Dummy variables and describe cautions in the use of dummy variables. [7]

Q.4

(i) Explain: (a) Simultaneous equations system (ii) structural equations. [7]

(ii) Explain reduced-form equations with example. [7]

OR

(i) What do you understand by Identification? When is an equation of a system exactly identified , overidentified and underidentified? [7]

(ii) Explain Wald test. [7]

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N37-2

Q.5 Answer any seven: [14]

(i) In usual notations, which of the following is correct for hat matrix?

(a) $H = X(X'X)^{-1}X'$ (b) $H = (X'X)^{-1}X'$ (c) $H = X(X'X)^{-2}X'$ (d) $H = X(X'X)^{-3}X'$

(ii) In the multiple regression model, the adjusted R^2 ,

(a) cannot be negative

(b) will never be greater than the regression R^2

(c) equals the square of the correlation coefficient r

(d) cannot decrease when an additional explanatory variable is added

(iii) Explain Variance Inflation Factor.

(iv) Estimation of regression coefficients in presence of high but not perfect multicollinearity may result in all of these except

(a) high confidence intervals for the estimates (b) a high R^2

(c) almost all the estimates are statistically significant (d) estimates are all BLUE

(v) Define condition number k.

(vi) Define condition index.

(vii) In usual notations, which of the following relation is correct for adjusted R^2 $(\text{i.e. } \overline{R}^2)$ and R^2 ?

(a) $\overline{R}^2 = 1-(1-R^2)\frac{n-1}{n-k}$ (b) $\overline{R}^2 = (1-R^2)\frac{n-1}{n-k}$

(c) $\overline{R}^2 = 1-(1+R^2)\frac{n-1}{n-k}$ (d) $\overline{R}^2 = (1-R^2)\frac{n-k}{n-1}$

(viii) With autocorrelation, the OLS parameter estimates are

(a) unbiased (b) consistent (c) biased (d) both (a) and (b)

(ix) If a qualitative variable has 'm' categories, we can introduce

(a) only 'm - 1' dummy variables (b) only 'm' dummy variables

(c) only 'm + 1' dummy variables (d) only 'm^2' dummy variables

(x) What do you mean by simultaneous equations bias?

(xi) Define Exogenous variables.

(xii) Define Endogenous variables.

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