ZC-116

April-2014

M.Sc. Sem. IV

STA-508 : Statistics

(Econometrics)

Time : 3 Hours] **[Max. Marks : 70**

Instructions : (1) **All** the questions are of equal marks.

(2) Scientific calculator is permitted to use statistical table will be supplied on request.

1. (a) Describe General Linear Model (GLM) in k independent variables. Justify the inclusion of a random error in this model. If error vector $\underline{U} \sim N(\underline{O}, \sigma^2 I)$, show that the rule $\hat{\underline{\beta}}$ of $\underline{\beta}$ have the normal distribution $N(\underline{\beta}, \sigma^2(X'X)^y)$, assuming $X'X$ to be an invertible matrix.

OR

Specify the GLM. Show that under certain conditions (to be stated) the least-squares and the maximum likelihood methods produce identical estimators of the coefficients in the model.

(b) Consider the GLM $\underline{Y} = X\underline{\beta} + \underline{U}$. Obtain OLS estimator of the parameters under linear restrictions $C\underline{\beta} = \underline{d}$ and discuss their properties.

OR

What is GLS model ? Obtain the estimate of the regression coefficients of this model under given linear parametric restrictions.

2. (a) Define multicollinearity. Suppose that we have n sets of observations on y and X's as given by

$$Y_i = \beta_1 + \beta_2 X_{2i} + \beta_3 X_{3i} + U_i; \quad i = 1, 2, \ldots, n;$$

where β's and U_i's are unknown. What will happen to the least square estimation procedure when X_2 and X_3 are connected by an exact linear relation ? How do you proceed ?

OR

Describe the problem of multicollinearity in econometrics. How will you detect it ?

(b) How you can tackle the problem of multicollinearity using eigen value technique ? Discuss fully.

OR

What is Ridge regression ? Show that Ridge regression estimator is a biased estimator but it can remove multicollinearity in an efficient manner.

3. (a) Define hetroscadasticity. Explain how generalized least-square approach can be used to estimate the parameters in this situation.

OR

Discuss the problem of hetroscadasticity in GLM. Describe Glejser test for detecting hetroscadasticity. What are the difficulties in using Glejser test ? How do you overcome these difficulties ?

(b) Explain the term 'Auto Correlation'. What are the consequences of auto correlation ? Explain how the Durbin Watson d statistic is used to detect the presence of auto correlation.

OR

In simple two-variable model $Y = \alpha + \beta X + U$, where U has first order regression scheme as $u_t = \rho u_{t-1} + G_t$, $|\rho|<l$. Show that $\rho^k = \dfrac{\text{CoV}(u_t, u_{t+k})}{\text{V}(u_t)}$ and least square estimates of the parameters are not efficient estimators.

4. (a) What is dummy variable ? Discuss how to use dummy variables in GLM. Discuss some salient features of dummy variables method.

OR

Discuss some applications of dummy variables.

(b) Define the terms : exogenous variable, endogenous variable, explanatory variable, reduced form equation.

In the following system of equations identify exogenous and endogenous variables sand write it reduced form equation

$C = a + by + \mu$, $y = c + I$.

Where   C = aggregate consumption, y = aggregate income

   I = investment, μ = error term.

OR

Show that OLS estimator to simultaneous system leads to biased and inconsistent estimators.

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5. Attempt the following :

   (i) Check the identifiability of equation (2) in the following system of equations :

   (1) $D = a_0 + a_1 p_1 + a_2 p_2 + a_3 y + a_4 t + u$

   (2) $S = b_0 + b_1 p_1 + b_2 p_2 + b_3 c + b_4 t + w$

   (3) $D = S$

   Where U and W are error terms.

   (ii) In the data given below, suggest how many dummy variables are required to run GLM for predicting sales.

Sales	Gender	Region (three)	Age group
			Below 30, 30-50, above 50

   (iii) State Theil-Nagar formula to estimate ρ with the meaning of variables used in the formula.

   (iv) State Durbim-Watson test statistic and its range.

   (v) State the reasons for happening of autocorrelation in GLM.

   (vi) State the two situations that give rise to hetroscadasticity.

   (viii) State how and where VIF is used.

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