KING FAHD UNIVERSITY OF PETROLEUM & MINERALS
DEPARTMENT OF MATHEMATICS & STATISTICS
DHAHRAN, SAUDI ARABIA

STAT 310: Linear Regression
Semester 161
Quiz 3 (Mathematical)
Thursday December 22, 2016
3:00 pm

Name: ID #:

Q.No.1:- Draw the scatter plot for y against x.
(a) Does the regressor need any transformation before fitting the regression line?

(b) Identify the best transformation for x using formal method of transforming the regressor variable.

(c) Fit the transformed model and perform the residual analysis for model adequacy.
Comments:

Q.No.2:- Fit the multiple linear model of y on both the regressors.

(1) Find the values of

(a) Sum of squares due to errors/residuals.

(b) Sum of square due to lack of fit.

(c) Sum of squares due to pure error.

(2) Formally, test the significance of lack of fit using the F statistic.

H_0:

H_1:

F_0= with v_1= and v_2=

Decision and conclusion:

Some useful formulas

$$SST = \boldsymbol{y'y} - \frac{(\sum y_i)^2}{n}, \quad SSR = SS_{Regression} = \widehat{\boldsymbol{\beta}}'\boldsymbol{X'y} - \frac{(\sum y_i)^2}{n}, \quad SSE = SS_{Residuals} = \boldsymbol{y'y} - \widehat{\boldsymbol{\beta}}'\boldsymbol{X'y}$$

$$\underbrace{\sum_{i=1}^{m}\sum_{j=1}^{n_i}\left(y_{ij}-\hat{y}_i\right)^2}_{\substack{SSE \\ DF=n-2}} = \underbrace{\sum_{i=1}^{m}\sum_{j=1}^{n_i}\left(y_{ij}-\bar{y}_i\right)^2}_{\substack{SS_{PE} \\ DF=n-m}} + \underbrace{\sum_{i=1}^{m} n_i(\bar{y}_i-\hat{y}_i)^2}_{\substack{SS_{LOF} \\ DF=m-2}}$$

$$\hat{y} = \hat{\beta}_0^* + \hat{\beta}_0^* x + \hat{\gamma} w, \quad \text{where } w = x\ln x, \qquad \alpha_i = \frac{\hat{\gamma}_i}{\hat{\beta}_i} + \alpha_{i-1}$$