

INDIAN STATISTICAL INSTITUTE
CHENNAI CENTRE
M.Stat. : 2015-17
(Year I – Semester I)

Mid-Semester Examination – Regression Analysis

Date: 9th September 2015

Duration : 3 Hours

ANSWER ALL QUESTIONS. TOTAL MARKS IS 100.

1. Consider the simple linear regression model $Y = \beta_0 + \beta_1 X + \epsilon$. From a random sample of size 50, the correlation coefficient between X and Y is observed as 0.6 and the lag 1 autocorrelation coefficient of residuals is observed as 0.2.

- a) Test the significance of the regression model.
- b) Find 95% confidence interval for the correlation coefficient.
- c) Test for autocorrelation of residuals using DW statistic.

[15]

2. Consider the multiple linear regression model $Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \epsilon$, where Y , X_1 and X_2 all are transformed using unit length scaling. From a random sample of size 30, the sample correlation coefficients are computed as : $r_{12} = 0.1$, $r_{1Y} = 0.8$ and $r_{2Y} = 0.6$.

- a) Find the regression model and test for its significance.
- b) An observation in the above dataset is recorded as $y = 0.65$ for $x_1 = 0.5$ and $x_2 = 0.4$ (all values are scaled). Compute studentized residual, leverage, Cook's D for this observation and interpret them.

[10 + 15 = 25]

3. Find an appropriate model for the following data:

X	1	2	3	4	5	6	7	8	9	10
Y	10	50	500	5000	20000	40000	30000	10000	2000	150

[15]

4. Develop an appropriate model using a cubic spline for the following data set:

X	1	2	3	4	5	6	7	8	9	10
Y	50	80	90	60	25	5	30	60	150	400

[15]

5. Consider the following data on time (X) and oxygen demand (Y). Fit an appropriate non-linear model. Mention the starting values of parameters of the chosen model. Compute R^2 of the fitted model.

X	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Y	11.8	16	20	24	27	29.5	33	35	36.2	38.8	39.3	41	43	45	46.1

[15]

6. Write short notes on any two of the following:

- White's test for homoscedasticity of residuals.
- Cochran-Orcutt procedure for eliminating autocorrelation.
- Methods for detecting multi-collinearity.
- PRESS statistic and $R^2_{\text{prediction}}$.

[15]
