

MA 69204 Statistical Software Lab

Assignment No. 9

1. To determine the maximum stopping ability of cars when their breaks are fully applied, 10 cars are to be driven each at a specified speed and the distance each requires come to a complete stop is to be measured. The various initial speeds (X) selected for each of the 10 cars and the stopping distances (Y) recorded are given below.

X	20	20	30	30	30	40	40	50	50	60
Y	16.3	26.7	39.2	63.5	51.3	98.4	65.7	104.1	155.6	217.2

- a) Draw scatter plots of (X, Y) and (X, \sqrt{Y}) .
 - b) Fit a simple linear regression line between $U = \sqrt{Y}$ and X .
 - c) Find 95% confidence intervals for the slope, intercept and σ^2 in the fitted model.
 - d) Test the significance of the slope and the intercept.
 - e) Find a 95% confidence interval for the expected stopping distance when the initial speed is 35.
 - f) Find a 95% prediction interval for stopping distance when the initial speed is 35.
 - g) Carry out a lack of fit analysis for the fitted model and check whether the model is adequate.
2. An instrument which measures lactic acid concentration in the blood is to be calibrated. The investigator uses $n = 20$ samples of known concentration X (in mM) and then computes the concentration Y (in mM) determined by the instrument. The data obtained are given below. Fit a simple linear regression line of Y on X . Does the scatter diagram exhibit a strong linear relationship? Also calculate the correlation coefficient. Test for the significance of coefficients of the model. Also find 95% confidence intervals for the parameters of the model.

X	Y	X	Y	X	Y	X	Y	X	Y
1	1.1	3	3.0	3	4.5	10	12.0	15	18.7
1	0.7	3	1.4	5	7.3	10	13.1	15	19.7
1	1.8	3	4.9	5	8.2	10	12.6	15	17.4
1	0.4	3	4.4	5	6.2	10	13.2	15	17.1

3. The following data is available on the independent variable X and the dependent variable Y .

X	1.00	1.05	1.10	1.15	1.21	1.32	1.44	1.53
Y	3.71	3.81	3.86	3.93	3.96	4.20	4.34	4.51
X	1.63	1.79	1.91	2.03	2.12	2.26	2.37	2.51
Y	4.73	5.35	5.74	6.14	6.51	6.98	7.44	7.76

- Fit a second order polynomial regression model to the above data.
 - Find 95% confidence intervals for the coefficients of the model and σ^2 .
 - Test for the significance for the coefficients of the model.
 - Find R^2 .
4. Fit a nonlinear relationship $y = a e^{bx}$ for the following data :

x	1	2	3	4	5	6
y	1.60	4.50	13.80	40.20	125.00	300.00

Draw the scatter diagram also. Does the fitted model adequately represent the data? Can you test for the significance of coefficients in the model? Give your conclusions on the tests.

5. Fit a nonlinear relationship $y = a b^x$ for the following data :

x	2	3	4	5	6
y	144.0	172.80	207.40	248.50	298.50

Draw the scatter diagram also. Does the fitted model adequately represent the data? Can you test for the significance of coefficients in the model? Give your conclusions on the tests.