Homework 8 Solution

Sta113, ISDS

April 18, 2003

Total 15 points.

11.2

2 points

- The line passes through the point (0,1), indicating that $\beta_0 = 1$. And it also passes through the point (2,3), so $3 = 1 + 2\beta_1$. We get β_1 and hence the equation of the line.

11.56

9 points

- The plot is shown on Figure 1.
- $\hat{\beta}_1 = \frac{SS_{xy}}{SS_{xx}} = -0.0533$, $\hat{\beta}_0 = \overline{y} - \hat{\beta}_1\overline{x} = -13.622$
- For testing in d, we perform the test, $H_0 : \beta_1 = 0$ vs $H_a : \beta_1 \neq 0$.
- For e, the form of confidence interval is $\hat{\beta}_1 \pm t_{\alpha/2} s/\sqrt{SS_{xx}}$. Hence -0.053 ± 0.015, or $(-0.068, -0.038)$ for 90% confidence level. For every one degree increase in temperature, we are 90% confident that the change in mean proportion of impurity passing through helium will be between -0.068 and -0.038.
- For f, $r = \frac{SS_{xy}}{\sqrt{SS_{xx}SS_{yy}}} = -0.923$.

- For g, $r^2 = 0.825$. 82.5% of the total sum of squares of deviations of the proportion of impurities about their mean can be attributed to the linear relationship between the proportion of impurities and temperature.
- For h, the 99% prediction interval is $\hat{y} \pm t_{\alpha/2} s \sqrt{1 + \frac{1}{n} + \frac{(x-\overline{x})^2}{SS_{xx}}} = 0.769 \pm 0.474$
- For i, the 99% confidence interval is $\hat{y} \pm t_{\alpha/2} s \sqrt{1 + \frac{(x-\overline{x})^2}{SS_{xx}}} = 0.769 \pm 0.150$

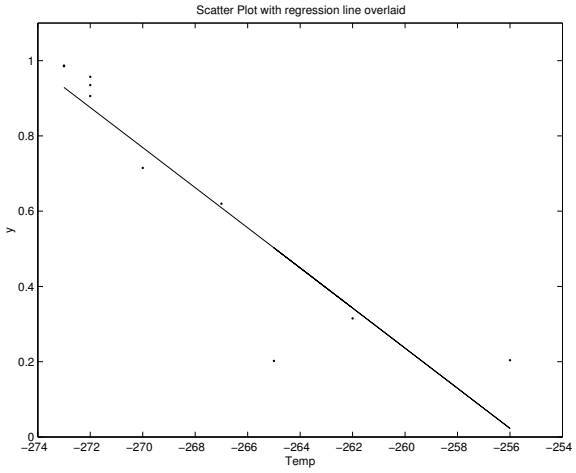

Figure 1: Scatter Plot in Problem 11.56

11.57

2 points

- This model is statistically useful. 1. The t test for $H_0 : Coefficient of Record = 0$ shows that H_0 can be rejected; 2. 98.3% of the total sum of squares of deviations of the number of Disk I/O's about their mean can be attributed to the linear relationship between the number of Disk I/O's and number of the records. 3. The ANOVA table with a large F-value(800.83) also shows that this model is useful.

11.59

2 points

- a. Use linear model $y = \beta_0 + \beta_1 x + \epsilon$ to fit the data. And using Matlab, we can get the estimation, $\hat{y} = 6.514 + 10.83x$.

- The hypothesis testing is $H_0 : \beta_1 = 0$ vs $H_a : \beta_1 \neq 0$. The t statistics is 6.34 with 8 degree of freedom. We reject null hypothesis.