

Stat 205 Homework 9

You will analyze two data sets from your text in R; both are available from the course web page.

1. Consider the data of Exercise 12.2.5 (p. 491). $n = 20$ plots (measuring 10×4 meters each) were measured for plant density (number of plants in the plot) and average cob weight (average grams of weight per cob).
 - (a) Obtain (and show) a scatterplot of the data in R, plot weight vs. density, e.g. `plot(density, weight)`. How does weight typically change with density? Is the relationship perfect?
 - (b) Use R to obtain the sample correlation and test $H_0 : \rho = 0$, e.g. `cor.test(weight, density)`. Is the linear relationship significant at the 5% level?
 - (c) Use R to obtain the fitted regression line and summary statistics, e.g. `summary(lm(weight~density))`. Write down the fitted regression line. How does weight typically vary with density? That is, interpret b_1 .
 - (d) What is the P-value for testing $H_0 : \beta_1 = 0$? Does average weight significantly vary with density at the 5% level? Does this agree with part (b)?
 - (e) Interpret “Multiple R-squared” from the R output.
 - (f) Interpret the “Residual standard error” s_e from the R output.
 - (g) **Extra credit:** Obtain (and show) a plot of the residuals vs. the fitted values; does the regression model seem appropriate? Why or why not?
 - (h) **Extra credit:** Obtain (and show) a normal probability plot of the residuals; is normality okay here?
2. Consider the data of Exercise 12.3.6 (p. 504); $n = 12$ rowan trees were examined and their bud respiration rate ($\mu\text{liters}/\text{hour} \times \text{mg}$) and altitude of origin (in meters) were recorded. It is of interest to see if there is a relationship between respiration and altitude.
 - (a) Obtain (and show) a scatterplot of the data in R, plot respiration vs. altitude. How does respiration typically change with altitude? Is the relationship perfect?
 - (b) Use R to obtain the sample correlation and test $H_0 : \rho = 0$. Is the linear relationship significant at the 5% level?
 - (c) Use R to obtain the fitted regression line and summary statistics; write down the fitted regression line. How does respiration typically vary with altitude? That is, interpret b_1 .
 - (d) What is the P-value for testing $H_0 : \beta_1 = 0$? Does average respiration significantly vary with altitude at the 5% level? Does this agree with part (b)?
 - (e) Interpret “Multiple R-squared” from the R output.
 - (f) Interpret the “Residual standard error” s_e from the R output.
 - (g) **Extra credit:** Obtain (and show) a plot of the residuals vs. the fitted values; does the regression model seem appropriate? Why or why not?
 - (h) **Extra credit:** Obtain (and show) a normal probability plot of the residuals; is normality okay here?