Advanced Statistics HW11

Due date: December 16, 2018

Exercises 1

The manager of a URL commercial address is interested in predicting the number of megabytes downloaded, `megasd`, by clients according to the number of minutes they are connected, `mconnected`. The manager randomly selects (megabyte, minute) pairs, records the data, and stores the pairs (`megasd`, `mconnected`) in the file `URLADDRESS`.

(a) Create a scatterplot of the data. Characterize the relationship between `megasd` and `mconnected`.

(b) Fit a regression line to the data. Superimpose the resulting line in the plot created in part (a).

(c) Compute the covariance matrix of the $\hat{\beta}$s.

(d) What is the standard error of $\hat{\beta}_1$?

(e) What is the covariance between $\hat{\beta}_0$ and $\hat{\beta}_1$?

(f) Construct a 95% confidence interval for the slope of the regression line.

(g) Compute R^2, R_a^2, and the residual variance for the fitted regression.

Exercises 2

A story by James R. Hagerty entitled *With Buyers Sidelined, Home Prices Slide* published in the Thursday October 25, 2007 edition of the *Wall Street Journal* contained data on so-called fundamental housing indicators in major real estate markets across the US. The author argues that "*... prices are generally falling and overdue loan payments are piling up*". Thus, we shall consider data presented in the article on

Y = Percentage change in average price from July 2006 to July 2007 (based on the S&P/Case-Shiller national housing index); and

x = Percentage of mortgage loans 30 days or more overdue in latest quarter (based on data from Equifax and Moody's).

The data are available in the file *indicators.txt*.

Fit the following model to the data:

$$Y = \beta_0 + \beta_1 x + \varepsilon.$$

Complete the following tasks:

(a) Find a 95% confidence interval for the slope of the regression model. On the basis of this confidence interval decide whether there is evidence of a significant negative linear association.

(b) Use the fitted regression model to estimate $\mathrm{E}(Y|x = 4)$. Find a 95% confidence interval for $\mathrm{E}(Y|x = 4)$. Is 0% a feasible value for $\mathrm{E}(Y|x = 4)$? Give a reason to support your answer.