15.3.13: Chapter 14 Lab

Simple Linear Regression

Open MINITAB file lab13.mpj from the website: this file contains geographic and weather data for several California cities.

1. First design a regression Model in which Latitude (degrees North) is the Independent variable and Precipitation (annual rainfall in inches) is the response. Run Minitab Stat>Regression>Fitted Line Plot
   a. Make a scatterplot and graph the least square line. Interpret the slope.
   b. Conduct the appropriate hypothesis test for a significant correlation between precipitation and latitude using a significance level of 5%.
   c. Find and interpret r^2.
   d. Run Minitab Stat>Regression>Regression>Fit Regression Model. Then find a 95% confidence interval for the expected precipitation for a city at latitude 40 degrees north using Stat>Regression>Regression>Predict. Interpret the interval.
2. Next design a regression Model in which Altitude (feet above sea level) is the Independent variable and Precipitation (annual rainfall in inches) is the response. Run Minitab Stat>Regression>Fitted Line Plot
   a. Make a scatterplot and graph the least square line. Interpret the slope.
   b. Conduct the appropriate hypothesis test for a significant correlation between precipitation and altitude, using a significance level of 5%.
   c. Find and interpret r^2.
   d. Run Minitab Stat>Regression>Regression>Fit Regression Model. Click Results and change Fits and Diagnostics to for all observations. Then find a 95% prediction interval for the precipitation for a city at altitude of 150 feet using Stat>Regression>Regression>Predict.
   e. Interpret the interval. Analyze the residuals. Which city fits the model best? Which city fits the model worst?
3. Finally, design a regression Model in which Distance from Coast (in miles) is the Independent variable and Precipitation (annual rainfall in inches) is the response. Run Minitab Stat>Regression>Fitted Line Plot
   a. Make a scatterplot and graph the least square line. Interpret the slope.
   b. Conduct the appropriate hypothesis test for a significant correlation between precipitation and distance from coast using a significance level of 5%.
   c. Find and interpret r^2.
   d. Looking at the scatterplot, it seems that a non-linear regression model might be a better fit for precipitation and distance from coast. Rerun the fitted line plot but choose cubic instead of linear. Paste the graph here. Under this model, what percentage of the variability precipitation is explained by distance from coast?