Data analysis activity

STAT3530 Applied Linear Models

Each dataset below comes with a question. Answer it using an appropriately specified simple linear model. Report the single result that best answers the question of interest. Make sure to verify that your answer is well-supported by the data by examining model assumptions and checking for any influential anomalies. Then create a slide in the shared deck that summarizes the result and that you can present to the class.

The script `scripts/08-data-analysis.R` loads each dataset and shows a few rows. Everything after that is yours.

1. **Florida 2000.** Votes cast for Pat Buchanan and total votes cast, in each of Florida's 67 counties in the 2000 presidential election. Palm Beach County used a "butterfly" ballot that voters complained had led them to vote for the wrong candidate.

   Question: going by the other counties, how many votes would you expect Buchanan to receive in Palm Beach, and is the actual count consistent with that?

   Model:

   Result:

   Notes:

2. **Pipeline inspections.** Depths of 107 corrosion defects in the Alaska oil pipeline, each measured twice: in the field with a portable ultrasonic device, and again in the laboratory. How deep a defect runs decides whether a length of pipe is left alone, repaired, or cut out and replaced. The laboratory measurement is the one inspectors trust, but it is slow and expensive; the portable device gives a reading on the spot, so a crew could act on it the same day.

   Question: can the field measurement stand in for the laboratory one?

   Model:

   Result:

   Notes:

3. **Rubber specimens.** Hardness, in Shore units, and abrasion loss, in grams per horsepower-hour, for 30 rubber specimens tested to destruction. Abrasion loss is how fast a compound is rubbed away, and it sets how long a tire tread, conveyor belt, or seal lasts before it has to be replaced. Hardness is cheap to measure and easy to dial in while mixing a compound, but harder rubber grips and flexes less well, so a manufacturer needs to know how much wear resistance a unit of hardness actually buys.

   Question: how does abrasion loss change with hardness?

   Model:

   Result:

   Notes: