

1. (Ex. 4.3 on page 156) Foresters want to estimate the average age of trees in a stand. Determining age is cumbersome, because one needs to count the tree rings on a core taken from the tree. In general, though, the older the tree, the larger the diameter, and diameter is easy to measure. The foresters measure the diameter of all 1132 trees and find that the population mean equals 10.3. They then randomly select 200 trees for age measurement. The data are given in the *forest.csv* file.
  - a. Draw a scatterplot of  $y$  vs  $x$ .
  - b. Estimate the population mean age of trees in the stand using ratio estimation and give an approximate standard error for your estimate.
  - c. Repeat (b) using regression estimation.
  - d. Label your estimates on your graph. How do they compare?
2. The data set *cherry.csv*, from Hand et al. (1994), contains measurements of diameter (inches), height (feet) and timber volume (cubic feet) for a sample of 31 black cherry trees. Diameter and height of trees are easily measured, but volume is more difficult to measure.
  - a. Plot volume vs. diameter for the 31 trees.
  - b. Suppose that these trees are an SRS from a forest of  $N = 2967$  trees and that the sum of the diameters for all trees in the forest is  $t_x = 41,835$  inches. Use ratio estimation to estimate the total volume for all trees in the forest. Give a 95% CI.
  - c. Use regression estimation to estimate the total volume for all trees in the forest. Give a 95% CI.
3. An SRS of 1200 USF students was selected from a list of 48,000 USF students. Among all selected students, 940 reported that they live off campus. The table below summarizes the responses of the 940 selected students who live off campus on the number of pets each student owns.

Number of Pets	Number of Respondents
0	550
1	320
2	45
3	15
4	6
5	2
8	1
10	1

- a. Estimate the proportion of USF students who live off campus and have pets. Find the standard error of your estimate.
- b. Estimate the average number of pets per student for USF students who live off campus. Find the standard error of your estimate.
- c. Report the 99% CI interval for the average number of pets per student among USF students who live off campus.
- d. Estimate the total number of pets owned by all USF students who live off campus. Report the standard error of your estimate.