

Exercise 6

Thanksgiving Day, that is celebrated the fourth Thursday in November, is a day of celebration in the United States. The traditional meal for Thanksgiving is turkey. Table 1 gives the weight (in pounds) of randomly selected Thanksgiving-turkeys from two states in the US.

Table 1: Weight of Thanksgiving-turkeys from two states in the US.

State	Virginia	Wisconsin
Weight	13.1	11.5
(in pounds)	12.4	14.2
	13.2	15.4
	11.8	13.1
		13.8
Average	12.625	13.600
Empirical standard deviation	0.655	1.440

We denote by μ_1 the expected weight for a randomly selected turkey from Virginia, while μ_2 is the expected weight for a randomly selected turkey from Wisconsin.

- a) Determine a 95% confidence interval for $\mu_2 - \mu_1$, and discuss what the interval tells you. Describe the assumptions that the confidence interval are based on.

The Thanksgiving-turkeys were not of the same age when they were slaughtered. Table 2 shows the age of the turkeys (in weeks). For the sake of completeness, we also give the weights of the turkeys in the table.

Table 2: Weight and age at slaughter for turkeys.

Virginia		Wisconsin	
Age	Weight	Age	Weight
29	13.1	21	11.5
27	12.4	27	14.2
28	13.2	29	15.4
26	11.8	23	13.1
		25	13.8

- b) Plot the weight of the turkeys versus their age at slaughter. Make the plot in one diagram, but use different plotting symbols for the two states. Give your comments to the plot.

In order to study the importance of state and age for the weight of the Thanksgiving-turkeys, we will use the regression model:

$$y_i = \beta_0 + \beta_1 x_{1i} + \beta_2 x_{2i} + \epsilon_i. \quad (1)$$

In model (1) we have that:

- y_i is the weight at slaughter for turkey number i (from both states combined),
 - x_{1i} is the age at slaughter of turkey number i ,
 - $x_{2i} = 1$ if turkey number i is from Wisconsin, $x_{2i} = 0$ if turkey number i is from Virginia.
- c) Give an interpretation of the parameters β_1 and β_2 in the regression model (1), and describe the assumptions on which the regression model is based. Do you find model (1) reasonable in light of the plot in question d?

From the numbers in table 2 we get the least square estimates $\hat{\beta}_0 = 0.311$, $\hat{\beta}_1 = 0.448$ and $\hat{\beta}_2 = 2.094$, and also that the estimated standard error of $\hat{\beta}_2$ is $se(\hat{\beta}_2) = 0.235$.

- d) Determine a 95% confidence interval for β_2 , and discuss what the interval tells you. Comment on the confidence interval in light of the confidence interval you found in question a.