MATH 427- Homework 2-Spring 2023

1 Text Book problems

1. Problem # 11.1, 11.5(use R), 11.17(use R), 11.20, 11.21 and 11.30(a) from text book (page 573 to 589)

2 Additional exercises-Using R

2.1 Exercise 1

This exercise relates to the "Hwk-data2" data set, which can be found in Canvas.

One study enrolled a group of 10 nurses, ages 50-54 years, who had smoked at least 1 pack per day and quit for at least 6 years. The nurses reported their weight before and 6 years after quitting smoking. A commonly used measure of obesity is $BMI = wt/ht^2$ ($weight/height^2$). The BMI of the 10 women before and 6 years after quitting smoking are given in the last two columns of: "Hwk-data2.csv"

(a) What test can be used to asses whether the mean BMI changed among heavy-smoking women 6 years after quitting smoking? Specify the hypotheses.

(b) Implement the test in part(a).(Is there sufficient evidence that the mean BMI changed among heavy-smoking women 6 years after quitting smoking?)

(c) Provide a 98% confidence interval for the true mean change in BMI among heavy-smoking women.

One issue is that there has been a secular change in weight in society. For this purpose, a control group of 50-to 54 year old never-smoking women were recruited and their BMI was reported at baseline (ages 50-54) and 6 years later at a follow-up visit. The results are given in the first two columns of: "Hwk-data2.csv"

(d) What test can be used to assess whether the mean change in BMI over 6 years is different between women who quit smoking and women who have never smoked? Specify the hypotheses.

(e) Implement the test in part (d) (Do the data provide sufficient evidence to indicate a difference in mean BMI between the heavy-smoking women 6 years after quitting smoking and the never-smoking women at 6-year follow-up.)

(f) Provide a 90% Confidence interval for the difference in mean BMI between the heavy-smoking women 6 years after quitting smoking and the never-smoking women at 6-year follow-up.

2.2 Exercise 2

This exercise relates to the **Auto** data set, which can be found in the in Canvas.

(a) Use the appropriate function in R to perform a simple linear regression with *mpg* as the response variable and *horsepower* as the predictor.

(b) Give an interpretation of the coefficients in term of *mpg* and *horsepower*

(c)Test whether there is a linear relationship between the predictor and the response? (i.e test whether the regression coefficient(slope) is zero: $H_0 : \beta_1 = 0$ vs $H_a : \beta_1 \neq 0$.)

(d) Use the appropriate function in R to obtain 98% confidence intervals of the coefficient(s).

(e) Display a scatter plot between **mpg** and **horsepower**. Does the scatter plot suggest a linear relationship between the two variables? Explain why?

(f) Display the least square regression line in the scatter plot in (a).